Generation Interconnection

Feasibility Study Report

for

Queue Project AE1-010

LOCUST GROVE-PAYTES 115 KV

33 MW Capacity / 33 MW Energy

January, 2019

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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 ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer 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. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. 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 Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models

which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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 project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC) has proposed a battery storage uprate to an existing AC1-076 Solar generating facility located in Orange County, VA. This project requests an increase to the install capability of 33 MW with 33 MW of this output being recognized by PJM as Capacity. The AC1-076 and AE1-010 facilities will have a total capability of 95.5 MW with 56.8 MW of this output being recognized by PJM as Capacity. The proposed in service date for this project is 9/30/2021. This study does not imply an ITO commitment to this in-service date.

Queue Number	**AE1-010**
Project Name	LOCUST GROVE-PAYTES 115 KV
State	Virginia
County	Orange
Transmission Owner	Dominion
MFO	95.5
MWE	33
MWC	33
Fuel	Storage
Basecase Study Year	2022

Point of Interconnection

AE1-010 will interconnect with the ITO transmission system via a tap of the Locust Grove to Paytes Tap 115 kV line.

Cost Summary

The AE1-010 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$0
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$0
Total Costs	$0

In addition, the AE1-010 project may be responsible for a contribution to the following costs

(Reference System Reinforcements in the Network Impacts section for details):

Description	Total Cost
System Upgrades	$50,200,000

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

Note: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

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

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

Transmission Owner Scope of Work

Attachment Facilities

None.

Direct Connection Cost Estimate

None.

Non-Direct Connection Cost Estimate

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

Interconnection Customer Requirements

ITO's Facility Connection Requirements as posted on PJM's website http://www.pjm.com/~/media/planning/plan-standards/private-dominion/facility-connection-requirements1.ashx

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

The Queue Project AE1-010 was evaluated as a 33 MW (Capacity 33 MW) uprate to AC1-076 which is an injection tapping the Locust Grove to Paytes Tap 115 kV line in the ITO area. Project AE1-010 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-010 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19830	313703	3UNIONVILLE	DVP	314764	3LOCST G	DVP	1	DVP_P7-1: LN 70-2153-B	tower	235.0	96.34	100.33	DC	9.39
19049	314764	3LOCST G	DVP	313703	3UNIONVILLE	DVP	1	DVP_P4-2: 573T594	breaker	235.0	95.55	103.46	DC	18.59
19055	314778	3PAY TAP	DVP	314755	3SPOTSYL	DVP	1	DVP_P4-2: 2T70	breaker	260.0	94.09	103.06	DC	23.33
19809	314778	3PAY TAP	DVP	314755	3SPOTSYL	DVP	1	DVP_P7-1: LN 70-2153-B	tower	260.0	95.37	104.45	DC	23.61

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)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
18788	314755	3SPOTSYL	DVP	314779	3TDTAVRN	DVP	1	DVP_P4-2: 573T594	breaker	260.0	143.37	148.92	DC	14.41
18879	314775	3NI RVER	DVP	314135	3CHANCE	DVP	1	DVP_P4-2: 573T594	breaker	260.0	129.37	134.92	DC	14.41
18837	314779	3TDTAVRN	DVP	314775	3NI RVER	DVP	1	DVP_P4-2: 573T594	breaker	260.0	133.87	139.42	DC	14.41
18988	926000	AC1-076 TAP	DVP	314778	3PAY TAP	DVP	1	DVP_P4-2: 2T70	breaker	260.0	102.42	111.4	DC	23.33
19786	926000	AC1-076 TAP	DVP	314778	3PAY TAP	DVP	1	DVP_P7-1: LN 70-2153-B	tower	260.0	103.66	112.74	DC	23.61

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 developer 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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19503	313703	3UNIONVILLE	DVP	314764	3LOCST G	DVP	1	DVP_P1-2: LN 2-A	operation	191.76	116.25	121.3	DC	9.67
19598	314764	3LOCST G	DVP	926000	AC1-076 TAP	DVP	1	DVP_P1-2: LN 2-A	operation	212.44	104.18	108.74	DC	9.67
19475	314778	3PAY TAP	DVP	314755	3SPOTSYL	DVP	1	DVP_P1-2: LN 2-A	operation	212.44	114.77	125.75	DC	23.33
19610	314815	3OAK GRE	DVP	313703	3UNIONVILLE	DVP	1	DVP_P1-2: LN 2-A	operation	224.66	102.48	106.78	DC	9.67
19412	926000	AC1-076 TAP	DVP	314778	3PAY TAP	DVP	1	DVP_P1-2: LN 2-A	operation	212.44	124.98	135.96	DC	23.33

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
19786,18988	7	**AC1-076 TAP 115.0 kV - 3PAY TAP 115.0 kV Ckt 1**	Description: Wreck and rebuild 3 miles of 115kV line # 153 between AC1-076 Tap and the Paytes substation. Note: line # 153 is the Oak Green-Spotsylvania line. A VA CPCN is required. Time Estimate: 24-36 Months Cost: $6,500,000	$6,500,000
19049	2	**3LOCST G 115.0 kV - 3UNIONVILLE 115.0 kV Ckt 1**	Description: Wreck and rebuild 5 miles of 115kV line between the Locust Grove DP and the Unionville Substation. Note: line # 153 is the Oak Green-Spotsylvania 115kV line. A local approval is required. Time Estimate: 30-36 Months Cost: $10,000,000	$10,000,000
19830	1	**3UNIONVILLE 115.0 kV - 3LOCST G 115.0 kV Ckt 1**		
19809,19055	3	**3PAY TAP 115.0 kV - 3SPOTSYL 115.0 kV Ckt 1**	Description : Wreck & Rebuild 3 miles of the Paytes-Spotsylvania 115kV Line #153. Local approval is required. Time Estimate : 30-36 Months Cost : $6,000,000	$6,000,000
18879	5	**3NI RVER 115.0 kV - 3CHANCE 115.0 kV Ckt 1**	Description : Wreck & Rebuild 1.3 miles of Line 198 between NI River and Chancellor. Local approval is required. Time Estimate : 30-36 Months Cost : $2,700,000	$2,700,000
18788	4	**3SPOTSYL 115.0 kV - 3TDTAVRN 115.0 kV Ckt 1**	Description: Wreck and rebuild 7.5 miles of Line # 198 between Spotsylvania and Todds Tavern DP. Note: line # 198 is the Chancellor-Spotsylvania 115kV line. Local approval is required. Time Estimate: 30-36 Months Cost: $15,000,000	$15,000,000
18837	6	**3TDTAVRN 115.0 kV - 3NI RVER 115.0 kV Ckt 1**	Description: Wreck and rebuild 5 miles of line #198 between Todds Tavern DP and NI River DP. A local approval is required Time Estimate: 30-36 Months Cost: $10,000,000	$10,000,000
		TOTAL COST	**$50,200,000**	

Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19830	313703	3UNIONVILLE	DVP	314764	3LOCST G	DVP	1	DVP_P7-1: LN 70-2153-B	tower	235.0	96.34	100.33	DC	9.39

Bus #	Bus	MW Impact
925671	AC1-043 C	22.19
925672	AC1-043 E	36.2
926481	AC1-120 C O1	23.12
926482	AC1-120 E O1	11.91
926501	AC1-121 C O1	7.94
926502	AC1-121 E O1	3.74
932781	AC2-102 C	17.75
932782	AC2-102 E	28.96
934861	AD1-115 C	11.09
934862	AD1-115 E	18.1
938081	AE1-010	9.39
CARR	CARR	0.07
CBM-S1	CBM-S1	0.57
CBM-S2	CBM-S2	0.37
CBM-W1	CBM-W1	0.74
CBM-W2	CBM-W2	3.87
CIN	CIN	0.35
CPLE	CPLE	0.15
G-007	G-007	0.23
IPL	IPL	0.22
LGEE	LGEE	0.1
MEC	MEC	0.67
MECS	MECS	0.35
O-066	O-066	0.77
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.09

Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19049	314764	3LOCST G	DVP	313703	3UNIONVILLE	DVP	1	DVP_P4-2: 573T594	breaker	235.0	95.55	103.46	DC	18.59

Bus #	Bus	MW Impact
926001	AC1-076 C	13.41
926002	AC1-076 E	21.8
926731	AC1-158 C	151.64
926732	AC1-158 E	66.54
934541	AD1-078 C	6.25
934542	AD1-078 E	3.67
938081	AE1-010	18.59
BAYOU	BAYOU	0.01
BIG_CAJUN1	BIG_CAJUN1	0.02
BIG_CAJUN2	BIG_CAJUN2	0.04
BLUEG	BLUEG	0.15
CALDERWOOD	CALDERWOOD	0.01
CANNELTON	CANNELTON	0.01
CBM-N	CBM-N	0.02
CBM-S2	CBM-S2	0.05
CHEOAH	CHEOAH	0.0
CHILHOWEE	CHILHOWEE	0.0
CHOCTAW	CHOCTAW	0.01
COFFEEN	COFFEEN	0.01
COTTONWOOD	COTTONWOOD	0.06
CPLE	CPLE	0.04
DEARBORN	DEARBORN	0.02
DUCKCREEK	DUCKCREEK	0.03
EDWARDS	EDWARDS	0.01
ELMERSMITH	ELMERSMITH	0.01
FARMERCITY	FARMERCITY	0.01
G-007A	G-007A	0.1
GIBSON	GIBSON	0.01
NEWTON	NEWTON	0.04
NYISO	NYISO	0.1
O-066A	O-066A	0.05
PRAIRIE	PRAIRIE	0.06
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.0
TATANKA	TATANKA	0.02
TILTON	TILTON	0.02
TRIMBLE	TRIMBLE	0.02
TVA	TVA	0.03
UNIONPOWER	UNIONPOWER	0.01
VFT	VFT	0.26

Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19809	314778	3PAY TAP	DVP	314755	3SPOTSYL	DVP	1	DVP_P7-1: LN 70-2153-B	tower	260.0	95.37	104.45	DC	23.61

Bus #	Bus	MW Impact
925671	AC1-043 C	22.19
925672	AC1-043 E	36.2
926001	AC1-076 C	17.03
926002	AC1-076 E	27.69
926481	AC1-120 C O1	23.12
926482	AC1-120 E O1	11.91
926501	AC1-121 C O1	7.94
926502	AC1-121 E O1	3.74
932781	AC2-102 C	17.75
932782	AC2-102 E	28.96
934541	AD1-078 C	9.86
934542	AD1-078 E	5.79
934861	AD1-115 C	11.09
934862	AD1-115 E	18.1
938081	AE1-010	23.61
CARR	CARR	0.07
CBM-S1	CBM-S1	0.57
CBM-S2	CBM-S2	0.37
CBM-W1	CBM-W1	0.74
CBM-W2	CBM-W2	3.87
CIN	CIN	0.35
CPLE	CPLE	0.15
G-007	G-007	0.23
IPL	IPL	0.22
LGEE	LGEE	0.1
MEC	MEC	0.67
MECS	MECS	0.35
O-066	O-066	0.77
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.09

Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
18788	314755	3SPOTSYL	DVP	314779	3TDTAVRN	DVP	1	DVP_P4-2: 573T594	breaker	260.0	143.37	148.92	DC	14.41

Bus #	Bus	MW Impact
925671	AC1-043 C	8.71
925672	AC1-043 E	14.22
926001	AC1-076 C	10.39
926002	AC1-076 E	16.9
926481	AC1-120 C O1	10.65
926482	AC1-120 E O1	5.48
926501	AC1-121 C O1	3.66
926502	AC1-121 E O1	1.72
926611	AC1-143 C O1	3.85
926612	AC1-143 E O1	1.76
926731	AC1-158 C	195.86
926732	AC1-158 E	85.96
932781	AC2-102 C	7.87
932782	AC2-102 E	12.83
934541	AD1-078 C	6.35
934542	AD1-078 E	3.73
934861	AD1-115 C	4.36
934862	AD1-115 E	7.11
938081	AE1-010	14.41
CARR	CARR	0.01
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	0.06
CBM-W1	CBM-W1	0.16
CBM-W2	CBM-W2	0.47
CIN	CIN	0.07
G-007	G-007	0.04
HAMLET	HAMLET	0.05
IPL	IPL	0.05
LGEE	LGEE	0.02
MEC	MEC	0.12
MECS	MECS	0.1
O-066	O-066	0.14
RENSSELAER	RENSSELAER	0.01
WEC	WEC	0.02

Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
18879	314775	3NI RVER	DVP	314135	3CHANCE	DVP	1	DVP_P4-2: 573T594	breaker	260.0	129.37	134.92	DC	14.41

Bus #	Bus	MW Impact
925671	AC1-043 C	8.71
925672	AC1-043 E	14.22
926001	AC1-076 C	10.39
926002	AC1-076 E	16.9
926481	AC1-120 C O1	10.65
926482	AC1-120 E O1	5.48
926501	AC1-121 C O1	3.66
926502	AC1-121 E O1	1.72
926611	AC1-143 C O1	3.85
926612	AC1-143 E O1	1.76
926731	AC1-158 C	195.86
926732	AC1-158 E	85.96
932781	AC2-102 C	7.87
932782	AC2-102 E	12.83
934541	AD1-078 C	6.35
934542	AD1-078 E	3.73
934861	AD1-115 C	4.36
934862	AD1-115 E	7.11
938081	AE1-010	14.41
CARR	CARR	0.01
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	0.06
CBM-W1	CBM-W1	0.16
CBM-W2	CBM-W2	0.47
CIN	CIN	0.07
G-007	G-007	0.04
HAMLET	HAMLET	0.05
IPL	IPL	0.05
LGEE	LGEE	0.02
MEC	MEC	0.12
MECS	MECS	0.1
O-066	O-066	0.14
RENSSELAER	RENSSELAER	0.01
WEC	WEC	0.02

Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
18837	314779	3TDTAVRN	DVP	314775	3NI RVER	DVP	1	DVP_P4-2: 573T594	breaker	260.0	133.87	139.42	DC	14.41

Bus #	Bus	MW Impact
925671	AC1-043 C	8.71
925672	AC1-043 E	14.22
926001	AC1-076 C	10.39
926002	AC1-076 E	16.9
926481	AC1-120 C O1	10.65
926482	AC1-120 E O1	5.48
926501	AC1-121 C O1	3.66
926502	AC1-121 E O1	1.72
926611	AC1-143 C O1	3.85
926612	AC1-143 E O1	1.76
926731	AC1-158 C	195.86
926732	AC1-158 E	85.96
932781	AC2-102 C	7.87
932782	AC2-102 E	12.83
934541	AD1-078 C	6.35
934542	AD1-078 E	3.73
934861	AD1-115 C	4.36
934862	AD1-115 E	7.11
938081	AE1-010	14.41
CARR	CARR	0.01
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	0.06
CBM-W1	CBM-W1	0.16
CBM-W2	CBM-W2	0.47
CIN	CIN	0.07
G-007	G-007	0.04
HAMLET	HAMLET	0.05
IPL	IPL	0.05
LGEE	LGEE	0.02
MEC	MEC	0.12
MECS	MECS	0.1
O-066	O-066	0.14
RENSSELAER	RENSSELAER	0.01
WEC	WEC	0.02

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
19786	926000	AC1-076 TAP	DVP	314778	3PAY TAP	DVP	1	DVP_P7-1: LN 70-2153-B	tower	260.0	103.66	112.74	DC	23.61

Bus #	Bus	MW Impact
925671	AC1-043 C	22.19
925672	AC1-043 E	36.2
926001	AC1-076 C	17.03
926002	AC1-076 E	27.69
926481	AC1-120 C O1	23.12
926482	AC1-120 E O1	11.91
926501	AC1-121 C O1	7.94
926502	AC1-121 E O1	3.74
932781	AC2-102 C	17.75
932782	AC2-102 E	28.96
934861	AD1-115 C	11.09
934862	AD1-115 E	18.1
938081	AE1-010	23.61
CARR	CARR	0.07
CBM-S1	CBM-S1	0.57
CBM-S2	CBM-S2	0.37
CBM-W1	CBM-W1	0.74
CBM-W2	CBM-W2	3.87
CIN	CIN	0.35
CPLE	CPLE	0.15
G-007	G-007	0.23
IPL	IPL	0.22
LGEE	LGEE	0.1
MEC	MEC	0.67
MECS	MECS	0.35
O-066	O-066	0.77
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.09

Contingency Name	Contingency Definition
DVP_P4-2: 573T594	CONTINGENCY 'DVP_P4-2: 573T594' /* SPOTSYLVANIA 500 KV OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00 OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
DVP_P7-1: LN 70-2153-B	CONTINGENCY 'DVP_P7-1: LN 70-2153-B' OPEN BRANCH FROM BUS 926610 TO BUS 314743 CKT 1 /* AC1-143 TAP 115.00 - 3BRANDY 115.00 OPEN BRANCH FROM BUS 314345 TO BUS 314743 CKT 1 /* 3MT RUN 115.00 - 3BRANDY 115.00 OPEN BRANCH FROM BUS 314345 TO BUS 314753 CKT 1 /* 3MT RUN 115.00 - 3CULPEPR 115.00 OPEN BRANCH FROM BUS 314753 TO BUS 314873 CKT 1 /* 3CULPEPR 115.00 - 3CULPE_1 115.00 OPEN BUS 314743 /* ISLAND: 3BRANDY 115.00 OPEN BUS 314753 /* ISLAND: 3CULPEPR 115.00 OPEN BUS 314873 /* ISLAND: 3CULPE_1 115.00 OPEN BRANCH FROM BUS 314080 TO BUS 314758 CKT 1 /* 6REMNGTN 230.00 - 6GORDNVL 230.00 END
DVP_P4-2: 2T70	CONTINGENCY 'DVP_P4-2: 2T70' /* MOUNTAIN RUN 115 KV OPEN BRANCH FROM BUS 314345 TO BUS 925670 CKT 1 /* MT. RUN 115.00 - AC1-043 TAP 115.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BRANCH FROM BUS 926610 TO BUS 314743 CKT 1 /* AC1-143 TAP 115.00 115.00 - 3BRANDY 115.00 OPEN BRANCH FROM BUS 314345 TO BUS 314743 CKT 1 /* 3MT RUN 115.00 - 3BRANDY 115.00 OPEN BRANCH FROM BUS 314345 TO BUS 314753 CKT 1 /* 3MT RUN 115.00 - 3CULPEPR 115.00 OPEN BRANCH FROM BUS 314753 TO BUS 314873 CKT 1 /* 3CULPEPR 115.00 - 3CULPE_1 115.00 OPEN BUS 314743 /* ISLAND: 3BRANDY 115.00 OPEN BUS 314753 /* ISLAND: 3CULPEPR 115.00 OPEN BUS 314873 /* ISLAND: 3CULPE_1 115.00 END

Short Circuit

Short Circuit

The following Breakers are over-duty:

None.