



**Generation Interconnection
Feasibility Study Report
for
Queue Project AE2-328
BRIERY DP-CLOVER 230 KV
68.1 MW Capacity / 100 MW Energy**

July, 2019

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1 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.

2 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in Prince Edward County, Virginia. The installed facilities will have a total capability of 100 MW with 68.1 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is April 1, 2022. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

Queue Number	AE2-328
Project Name	BRIERY DP-CLOVER 230 KV
Interconnection Customer	
State	Virginia
County	Prince Edward
Transmission Owner	Dominion
MFO	100
MWE	100
MWC	68.1
Fuel	Solar
Basecase Study Year	2022

2.1 Point of Interconnection

AE2-328 “Briery DP – Clover 230 kV” will interconnect with the Dominion’s transmission system through a new three breaker 230 kV switching station tapping the Briery DP to Clover 230 kV line. The new AE2-328 switchyard will be adjacent to the transmission right-of-way. This is the primary Point of Interconnection (POI) chosen by the IC with the ITO’s transmission system. The IC is responsible for securing right-of-way, permits and constructing the proposed attachment line from the solar facility site to the proposed new switching station. Attachment 1 shows a one-line diagram of the proposed interconnection facilities. The IC may not install any facilities on Dominion’s right-of-way without first obtaining the necessary approval from Dominion Energy.

2.2 Cost Summary

The AE2-328 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 2,100,000
Direct Connection Network Upgrade	\$ 8,300,000
Non Direct Connection Network Upgrades	\$TBD in Facilities Study Phase
Total Costs	\$10,400,000 + Remote Relaying Work

In addition, the AE2-328 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$134,495,000

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

3 Transmission Owner Scope of Work

Dominion assessed the impact of the proposed Queue Project AE2-328 was evaluated as a 68.1 MW Capacity (100.0 MW Energy) injection at the AE2-328 230 kV substation in the Dominion Transmission System, for compliance with NERC Reliability Criteria on Dominion Transmission System. The system was assessed using the summer 2022 AE2 case provided to Dominion by PJM. When performing a generation analysis, Dominion's main analysis will be load flow study results under single contingency (both normal and stressed system conditions). Dominion Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of Dominion's Planning Criteria and interconnection requirements can be found in the Company's Facility Connection Requirements which are publicly available at: <http://www.dominionenergy.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 in Planning Studies 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 Dominion 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 required Attachment Facilities, Direct Connection and Non-Direct Connection work for the interconnection of the AE2-230 generation project to the Dominion Transmission System is detailed in the following sections. The associated one-line with the generation project attachment facilities and primary direct and non-direct connection are shown in Attachment 1.

Note that the ITO findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in a future study phases. Further note that the cost estimate data contained in this document should be considered high level estimates since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. ITO herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission systems.

4 Attachment Facilities

To accommodate the proposed AE2-328 Project, Dominion Energy will install one span of overhead 230 kV line to the point of interconnection (“POI”) including 230 kV interconnection metering. The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation (Metering)	\$ 600,000
Transmission (one span)	\$ 1,500,000
Total Attachment Facility Costs	\$ 2,100,000

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.

5 Direct Connection Cost Estimate

To accommodate the proposed AE2-328 Project, Dominion Energy will build a new three breaker 230 kV Switching Station and re-arrange the existing section of line between Clover and Farmville Substations to allow for the proposed interconnection. The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Three Breaker Ring and Associated Equipment	\$ 6,500,000
Transmission (one span)	\$ 1,800,000
Total Direct Connection Facility Costs	\$ 8,300,000

It is estimated to take 24-30 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.

6 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Remote terminal work	\$TBD in Facilities Study Phase
Total Non-Direct Connection Facility Costs	\$TBD in Facilities Study Phase

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.

7 System Reinforcements Cost Estimates

Upgrade Description	Cost
dom-081 (247) : Rebuild 16.71 miles of 230 kV Line 2068 from AD1-087 Tap to Sedge Hill with 2-795 ACSR. Project Type : FAC Cost : \$25,065,000 Time Estimate : 36-40 Months	\$25,065,000
dom-072 (234) : Rebuild 18.94 miles of 230 kV Line 2028 from Brema Dist to Mt Eagle with 2-636 ACSR. Project Type : FAC Cost : \$47,350,000 Time Estimate : 36-40 Months	\$47,350,000
dom-073 (236) : Rebuild 6.47 miles of 230 kV Line 2028 from Mt Eagle to Charlottesville with 2-636 ACSR. Project Type : FAC Cost : \$16,175,000 Time Estimate : 30-36 Months	\$16,175,000

Upgrade Description	Cost
dom-006 (128) : For DEV portion, rebuild 2 miles of 230 kV Line 296 from AC1-221 Tap to Persons DEP with 2-636 ACSR. Project Type : FAC Cost : \$3,000,000 Time Estimate : 30-36 Months <u>CPLE</u> NonPJMArea : The external (i.e. Non-PJM) Transmission Owner, CPLE, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$3,000,000
dom-034 (168) : Rebuild 15.51 miles of 230 kV Line 298 from Buckingham to Brema with 2-636 ACSR. Project Type : FAC Cost : \$23,265,000 Time Estimate : 30-36 Months	\$23,265,000
dom-035 (170) : Rebuild 12.76 miles of 230 kV Line 298 from Buckingham to Farmville with 2-636 ACSR. Project Type : FAC Cost : \$19,140,000 Time Estimate : 30-36 Months	\$19,140,000
dom-071 (233) : Rebuild 0.16 miles of Line 2028 from Brema to Brema Dist with 2-636 ACSR. Project Type : FAC Cost : \$500,000 Time Estimate : 30-36 Months	\$500,000
TOTAL COST	\$134,495,000

8 Schedule

Elapsed times for the Attachment Facilities and Direct Connection work are provided in Sections 4 and 5 of this report. The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimate elapsed time to complete each of the required reinforcements is identified in the “System Reinforcements” section of the report.

9 Transmission Owner Analysis

9.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2022 summer peak load flow model and the results were verified by Dominion. Additionally, Dominion performed an analysis of its transmission system. At the Primary POI, the AE2-328 project contributes to overloads on the Dominion transmission system as shown in the “Network Impacts” section of the report. The estimated cost of system reinforcements necessary to mitigate these overloads is also provided.

9.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by Dominion. The connection of AE2-328 project to the system does not result in any newly overdutied circuit breakers on the Dominion transmission system and does not have a significant fault current contribution to existing overdutied circuit breakers

9.3 Stability Analysis

PJM will complete a dynamic stability analysis, if necessary, as part of the System Impact Study. The results of this analysis will be reviewed by Dominion. Should stability concerns be identified in PJM’s study, Dominion will develop appropriate system reinforcement(s) and included the estimated cost of any reinforcement(s) in Dominion’s System Impact Study report

10 Interconnection Customer Requirements

10.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in Dominion's "Dominion Energy Electric Transmission Generator Interconnection Requirements" documented in Dominion's Facility Interconnection Requirements "Exhibit C" located at: <https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

10.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with Dominion's "Dominion's Facility Interconnection Requirements" document located at: <https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated protection device (circuit breaker, circuit switcher, fuse) to protect the IC's GSU transformer(s).
2. The purchase and installation of the minimum required Dominion generation interconnection relaying and control facilities as described in the System Protection noted above. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the Dominion Transmission System Control Center.
4. Compliance with the Dominion and PJM generator power factor and voltage control requirements.

The GSU(s) associated with the IC queue request shall meet the grounding requirements as noted in Dominion's "Dominion's Facility Interconnection Requirements" document located at: <https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>.

The IC will also be required to meet all PJM, SERC, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and SERC audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the Dominion system.

10.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the Dominion transmission system.

11 Revenue Metering and SCADA Requirements

11.1 PJM Requirements

The Interconnection Customer 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 Section 8 of Attachment O.

11.2 Dominion Requirements

See Section 3.4.6 "Metering and Telecommunications" of Dominion's "Dominion's Facility Interconnection Requirements" document located at: <https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>.

12 Network Impacts

The Queue Project AE2-328 was evaluated as a 100.0 MW (Capacity 68.1 MW) injection tapping the Briery DP to Clover 230 kV line in the Dominion area. Project AE2-328 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-328 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

13 Generation Deliverability

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

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
8138725	314747	6BREMO	DVP	314744	3BREMO	DVP	1	DVP_P1-2: LN 2028	single	269.78	98.66	100.86	DC	5.93

14 Multiple Facility Contingency

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

None

15 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
8138122	313867	6BREMOMIST	DVP	314765	6MTEAGLE	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	128.46	131.44	DC	19.73
8138124	313867	6BREMOMIST	DVP	314765	6MTEAGLE	DVP	1	DVP_P1-2: LN 2027-A	single	661.76	123.99	126.97	DC	19.73
7744816	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P4-2: 556T591	breaker	699.0	117.86	124.96	DC	49.96
7744817	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P4-2: 511T556	breaker	699.0	117.86	124.96	DC	49.96
7744818	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P4-2: 511T591	breaker	699.0	117.79	124.89	DC	49.96
8138143	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P1-2: LN 556	single	571.52	114.06	119.87	DC	34.01
8138145	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P1-2: LN 563	single	571.52	101.41	106.27	DC	27.76
8138541	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 570	single	814.98	117.13	118.57	DC	11.8
8138542	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 6002_FSA	single	814.98	117.13	118.57	DC	11.8
8138543	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 570_FSA	single	814.98	117.11	118.56	DC	11.8
7744831	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P4-2: 511T556	breaker	684.0	116.23	123.48	DC	49.98
7744832	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P4-2: 556T591	breaker	684.0	116.23	123.48	DC	49.98
7744833	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P4-2: 511T591	breaker	684.0	116.15	123.41	DC	49.98

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
8138160	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P1-2: LN 556	single	559.3	113.02	118.96	DC	34.02
8138162	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P1-2: LN 563	single	559.3	100.15	105.11	DC	27.77
8138104	314697	6SEEDGE HILL	DVP	927250	AC1-221 TAP	DVP	1	DVP_P1-2: LN 6002_FSA	single	674.92	123.33	124.93	DC	10.81
8138105	314697	6SEEDGE HILL	DVP	927250	AC1-221 TAP	DVP	1	DVP_P1-2: LN 570	single	674.92	123.33	124.93	DC	10.81
8138106	314697	6SEEDGE HILL	DVP	927250	AC1-221 TAP	DVP	1	DVP_P1-2: LN 570_FSA	single	674.92	123.3	124.9	DC	10.81
8137820	314712	3OTTER R	DVP	314666	3ALTVSTA	DVP	1	DVP_P1-2: LN 556	single	224.66	116.07	117.77	DC	3.83
8138094	314747	6BREMO	DVP	313867	6BREMODIST	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	130.77	133.75	DC	19.73
8138096	314747	6BREMO	DVP	313867	6BREMODIST	DVP	1	DVP_P1-2: LN 2027-A	single	661.76	126.31	129.29	DC	19.73
8138206	314765	6MTEAGLE	DVP	314749	6CHARLV	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	125.12	128.1	DC	19.73
8138208	314765	6MTEAGLE	DVP	314749	6CHARLV	DVP	1	DVP_P1-2: LN 2027-A	single	661.76	120.65	123.63	DC	19.73
8138068	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	DVP_P1-2: LN 556	single	718.0	124.62	127.23	DC	22.49
8138069	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	DVP_P1-2: LN 6002_FSA	single	718.0	125.05	126.55	DC	10.81
8138472	934610	AD1-087 TAP	DVP	314697	6SEEDGE HILL	DVP	1	DVP_P1-2: LN 570	single	814.98	122.75	124.19	DC	11.8
8138473	934610	AD1-087 TAP	DVP	314697	6SEEDGE HILL	DVP	1	DVP_P1-2: LN 6002_FSA	single	814.98	122.75	124.19	DC	11.8
8138474	934610	AD1-087 TAP	DVP	314697	6SEEDGE HILL	DVP	1	DVP_P1-2: LN 570_FSA	single	814.98	122.72	124.17	DC	11.8

16 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
8138734	313802	6PRINCE EDW	DVP	314692	6FARMVIL	DVP	1	DVP_P1-2: LN 556	operation	571.52	91.16	101.59	DC	59.49

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
8138120	313867	6BREMIST	DVP	314765	6MTEAGLE	DVP	1	DVP_P1-2: LN 2027-B	operation	661.76	146.2	150.58	DC	28.98
8138128	313867	6BREMIST	DVP	314765	6MTEAGLE	DVP	1	Base Case	operation	661.76	99.01	102.28	DC	21.6
8138733	313868	6CARTERV	DVP	933500	AC2-165 TAP	DVP	1	DVP_P1-2: LN 2028	operation	800.88	98.32	101.27	DC	23.61
8138717	314268	6BRIERY	DVP	313802	6PRINCE EDW	DVP	1	DVP_P1-2: LN 556	operation	571.52	92.23	102.66	DC	59.49
8138693	314310	6JUDES F	DVP	314322	6MDLTHAN	DVP	1	DVP_P1-2: LN 2028	operation	800.88	102.39	105.33	DC	23.6
8138656	314333	6POWHATN	DVP	314310	6JUDES F	DVP	1	DVP_P1-2: LN 2028	operation	800.88	106.16	109.1	DC	23.6
8138142	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P1-2: LN 556	operation	571.52	141.52	150.2	DC	49.94
8138544	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 570	operation	814.98	102.02	104.16	DC	17.33
8138545	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 6002_FSA	operation	814.98	102.02	104.16	DC	17.33
8138159	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P1-2: LN 556	operation	559.3	139.45	148.32	DC	49.95
8138103	314697	6SEGE HILL	DVP	927250	AC1-221 TAP	DVP	1	DVP_P1-2: LN 556	operation	674.92	147.05	151.93	DC	33.02
8138092	314747	6BREMO	DVP	313867	6BREMIST	DVP	1	DVP_P1-2: LN 2027-B	operation	661.76	148.51	152.89	DC	28.98
8138100	314747	6BREMO	DVP	313867	6BREMIST	DVP	1	Base Case	operation	661.76	101.34	104.61	DC	21.6
8138718	314747	6BREMO	DVP	313868	6CARTERV	DVP	1	DVP_P1-2: LN 2028	operation	800.88	99.02	101.97	DC	23.61
8138724	314747	6BREMO	DVP	314744	3BREMO	DVP	1	DVP_P1-2: LN 2028	operation	269.78	100.72	102.19	DC	8.7
8138204	314765	6MTEAGLE	DVP	314749	6CHARLV	DVP	1	DVP_P1-2: LN 2027-B	operation	661.76	141.16	145.54	DC	28.97
8138686	924160	AB2-060 TAP	DVP	314267	3CHASCTY2	DVP	1	DVP_P1-2: LN 298	operation	269.78	104.34	105.91	DC	9.38
8138067	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	DVP_P1-2: LN 556	operation	718.0	150.14	154.71	DC	33.02
8138075	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	Base Case	operation	542.0	103.67	106.31	DC	14.33
8138654	933500	AC2-165 TAP	DVP	314333	6POWHATN	DVP	1	DVP_P1-2: LN 2028	operation	800.88	106.56	109.51	DC	23.61
8138475	934610	AD1-087 TAP	DVP	314697	6SEGE HILL	DVP	1	DVP_P1-2: LN 6002_FSA	operation	814.98	112.3	114.45	DC	17.33
8138476	934610	AD1-087 TAP	DVP	314697	6SEGE HILL	DVP	1	DVP_P1-2: LN 570	operation	814.98	112.3	114.45	DC	17.33
8138716	943050	AE2-328 TAP	DVP	314268	6BRIERY	DVP	1	DVP_P1-2: LN 556	operation	571.52	92.91	103.34	DC	59.49

17 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
8138474,8138472,8138473	11	AD1-087 TAP 230.0 kV - 6SEEDGE HILL 230.0 kV Ckt 1	dom-081 (247) : Rebuild 16.71 miles of 230 kV Line 2068 from AD1-087 Tap to Sedge Hill with 2-795 ACSR. Project Type : FAC Cost : \$25,065,000 Time Estimate : 36-40 Months	\$25,065,000
8138124,8138122	2	6BREMODIST 230.0 kV - 6MTEAGLE 230.0 kV Ckt 1	dom-072 (234) : Rebuild 18.94 miles of 230 kV Line 2028 from Brema Dist to Mt Eagle with 2-636 ACSR. Project Type : FAC Cost : \$47,350,000 Time Estimate : 36-40 Months	\$47,350,000
8138206,8138208	9	6MTEAGLE 230.0 kV - 6CHARLVL 230.0 kV Ckt 1	dom-073 (236) : Rebuild 6.47 miles of 230 kV Line 2028 from Mt Eagle to Charlottesville with 2-636 ACSR. Project Type : FAC Cost : \$16,175,000 Time Estimate : 30-36 Months	\$16,175,000
8138725	1	6BREMO 230.0 kV - 3BREMO 115.0 kV Ckt 1	b2989 (350) : PJM Baseline Upgrade b2989. Install a second 230 -115 kV Transformer(224 MVA) approximately 1 mile north of Brema and tie 230 kV Line #2028(Brema Charlottesville) and 115 kV Line #91 (Brema-Sherwood) together. A three breaker 230 kV ring bus will split Line #2028 into two lines and Line #91 will also be split into two lines with a new three breaker 115 kV ring bus. Install a temporary 230-115 kV transformer at Brema substation for the interim until the new substation is complete. The baseline project has an projected in-service date of 10/31/2019. Project Type : CON Cost : \$0 Time Estimate : N/A Months	\$0
8138542,8138543,8138541	4	6CLOVER 230.0 kV - AD1-087 TAP 230.0 kV Ckt 1	No Reinforcement Needed. Not a valid violation ¹	\$0

¹ If “No Reinforcement Needed. Not a valid violation” was provided as the Upgrade Description for a facility in the System Reinforcements table then that facility met one of the following conditions:

- The loading on the facility at your queue position was less than 100%; therefore, the facility is not yet overloaded, but may be overloaded by end of the AE2 queue.
- The TO reviewed their ratings on the facility and determined that the current rating was greater than the rating in PJM’s model. This new rating was greater than the loading at your queue position making the violation invalid.
- The TO reviewed the contingency and determined that contingency was not valid; therefore the violation is invalid. Any contingency corrections will be assessed and corrected in the AE2 impact study phase.

ID	Index	Facility	Upgrade Description	Cost
8138069,8138068	10	AC1-221 TAP 230.0 kV - 6PERSON230 T 230.0 kV Ckt 1	dom-006 (128) : For DEV portion, rebuild 2 miles of 230 kV Line 296 from AC1-221 Tap to Persons DEP with 2-636 ACSR. Project Type : FAC Cost : \$3,000,000 Time Estimate : 30-36 Months <u>CPLE</u> NonPJMArea : The external (i.e. Non-PJM) Transmission Owner, CPLE, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$3,000,000
7744816,7744817,8138145,7744818,8138143	3	6BUCKING 230.0 kV - 6BREMO 230.0 kV Ckt 1	dom-034 (168) : Rebuild 15.51 miles of 230 kV Line 298 from Buckingham to Brema with 2-636 ACSR. Project Type : FAC Cost : \$23,265,000 Time Estimate : 30-36 Months	\$23,265,000
8138106,8138104,8138105	6	6SEEDGE HILL 230.0 kV - AC1-221 TAP 230.0 kV Ckt 1	No Reinforcement Needed. Not a valid violation ¹	\$0
8137820	7	3OTTER R 115.0 kV - 3ALTVSTA 115.0 kV Ckt 1	No Reinforcement Needed. Not a valid violation ¹	\$0
8138160,8138162,7744831,7744832,7744833	5	6FARMVIL 230.0 kV - 6BUCKING 230.0 kV Ckt 1	dom-035 (170) : Rebuild 12.76 miles of 230 kV Line 298 from Buckingham to Farmville with 2-636 ACSR. Project Type : FAC Cost : \$19,140,000 Time Estimate : 30-36 Months	\$19,140,000
8138094,8138096	8	6BREMO 230.0 kV - 6BREMODIST 230.0 kV Ckt 1	dom-071 (233) : Rebuild 0.16 miles of Line 2028 from Brema to Brema Dist with 2-636 ACSR. Project Type : FAC Cost : \$500,000 Time Estimate : 30-36 Months	\$500,000
			TOTAL COST	\$134,495,000

18 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.

18.1 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
8138725	314747	6BREMO	DVP	314744	3BREMO	DVP	1	DVP_P1-2: LN 2028	single	269.78	98.66	100.86	DC	5.93

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.13
315191	1BEARGRDN G1	3.16
315192	1BEARGRDN G2	3.16
315193	1BEARGRDN S1	6.5
920291	AA2-127	0.66
923861	AB2-026 C	0.15
924031	AB2-045 C	0.23
925611	AC1-036 C	0.04
925831	AC1-062	0.02
932511	AC2-071 C	0.22
933501	AC2-165 C	5.84
934621	AD1-088 C	4.52
935221	AD1-157 C	0.09
935231	AD1-160 C	0.53
936261	AD2-033 C	4.29
938371	AE1-056 C	3.1
938561	AE1-075 C	1.08
939371	AE1-168 C	6.2
940241	AE2-006	0.17
941791	AE2-182 C	0.82
942461	AE2-259 C O1	5.7
943051	AE2-328 C	5.93
BLUEG	BLUEG	2.57
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.14
CARR	CARR	0.01
CBM-S2	CBM-S2	0.61
CHEOAH	CHEOAH	0.11
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.24
COTTONWOOD	COTTONWOOD	0.6
CPL	CPL	0.55
DUCKCREEK	DUCKCREEK	0.53
EDWARDS	EDWARDS	0.25
ELMERSMITH	ELMERSMITH	0.24
FARMERCITY	FARMERCITY	0.15
G-007A	G-007A	0.09
GIBSON	GIBSON	0.1
NEWTON	NEWTON	0.64
PRAIRIE	PRAIRIE	1.08
RENSSELAER	RENSSELAER	0.01

Bus #	Bus	MW Impact
SANTEETLA	SANTEETLA	0.03
SMITHLAND	SMITHLAND	0.08
TATANKA	TATANKA	0.28
TILTON	TILTON	0.31
TRIMBLE	TRIMBLE	0.29
TVA	TVA	0.54
UNIONPOWER	UNIONPOWER	0.16
VFT	VFT	0.22

18.2 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
8138122	313867	6BREMODIST	DVP	314765	6MTEAGLE	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	128.46	131.44	DC	19.73

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.43
314704	3LAWRENC	0.11
315150	1BUGGS 1	7.33
315151	1BUGGS 2	7.33
315153	1CLOVER1	5.27
315154	1CLOVER2	5.2
315158	1KERR 1	0.15
315159	1KERR 2	0.61
315160	1KERR 3	0.6
315161	1KERR 4	0.6
315162	1KERR 5	0.6
315163	1KERR 6	0.6
315164	1KERR 7	0.6
315170	1BREMO 3	30.25
315171	1BREMO 4	66.46
315191	1BEARGRDN G1	10.83
315192	1BEARGRDN G2	10.83
315193	1BEARGRDN S1	22.29
315266	1PLYWOOD A	0.49
920291	AA2-127	2.25
924021	AB2-043 C O1	0.31
924031	AB2-045 C	0.77
924161	AB2-060 C O1	0.91
924301	AB2-077 C O1	0.19
924311	AB2-078 C O1	0.19
924321	AB2-079 C O1	0.19
924401	AB2-089 C	1.15
925171	AB2-174 C O1	2.12
925611	AC1-036 C	0.14
925781	AC1-054 C O1	3.68
925831	AC1-062	0.06
925991	AC1-075 C	2.53
926021	AC1-080 C	0.84
926271	AC1-105 C O1	3.2
927251	AC1-221 C	0.76
927261	AC1-222 C	1.83
932511	AC2-071 C	0.76
932761	AC2-100 C	1.74
933501	AC2-165 C	32.68
934231	AD1-050 C	2.53
934311	AD1-055 C	1.27

Bus #	Bus	MW Impact
934341	AD1-058 C	1.89
934611	AD1-087 C O1	4.25
934621	AD1-088 C	14.59
934991	AD1-131 C	0.62
935171	AD1-152 C O1	4.22
935221	AD1-157 C	0.3
935231	AD1-160 C	1.78
936261	AD2-033 C	14.42
936331	AD2-043 C	2.38
936361	AD2-046 C O1	5.5
936481	AD2-063 C O1	14.23
937481	AD2-202 C O1	1.17
938371	AE1-056 C	10.47
938821	AE1-108 C O1	38.04
939181	AE1-148 C O1	5.53
939371	AE1-168 C	20.88
939841	AE1-220 C O1	12.08
940241	AE2-006	0.57
940661	AE2-053	2.06
941011	AE2-092 C	24.32
941791	AE2-182 C	2.64
942451	AE2-258	1.89
942461	AE2-259 C O1	19.25
942711	AE2-287 C O1	6.46
942751	AE2-291 C O1	3.67
942761	AE2-292 C O1	4.58
943051	AE2-328 C	19.73
AA2-074	AA2-074	1.47
CARR	CARR	0.29
CBM-S1	CBM-S1	2.8
CBM-S2	CBM-S2	4.07
CBM-W1	CBM-W1	1.66
CBM-W2	CBM-W2	17.05
CIN	CIN	0.83
CPLE	CPLE	2.17
IPL	IPL	0.5
LGEE	LGEE	0.25
MEC	MEC	2.21
MECS	MECS	0.22
RENSSELAER	RENSSELAER	0.23
WEC	WEC	0.22

18.3 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
7744818	314677	6BUCKING	DVP	314747	6BREMO	DVP	1	DVP_P4-2: 511T591	breaker	699.0	117.79	124.89	DC	49.96

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.69
315150	1BUGGS 1	13.27
315151	1BUGGS 2	13.27
315153	1CLOVER1	15.93
315154	1CLOVER2	15.72
315159	1KERR 2	1.04
315266	1PLYWOOD A	1.07
924021	AB2-043 C O1	0.53
924022	AB2-043 E O1	7.09
924031	AB2-045 C	1.15
924032	AB2-045 E	4.39
924161	AB2-060 C O1	1.55
924162	AB2-060 E O1	6.0
924301	AB2-077 C O1	0.33
924302	AB2-077 E O1	1.8
924311	AB2-078 C O1	0.33
924312	AB2-078 E O1	1.8
924321	AB2-079 C O1	0.33
924322	AB2-079 E O1	1.8
924401	AB2-089 C	1.92
924402	AB2-089 E	0.99
925611	AC1-036 C	0.22
925612	AC1-036 E	1.66
925781	AC1-054 C O1	6.07
925782	AC1-054 E O1	2.8
925831	AC1-062	0.09
925991	AC1-075 C	4.97
925992	AC1-075 E	2.82
926021	AC1-080 C	1.66
926022	AC1-080 E	0.93
926271	AC1-105 C O1	6.78
926272	AC1-105 E O1	3.38
927251	AC1-221 C	1.67
927252	AC1-221 E	1.67
927261	AC1-222 C	4.08
927262	AC1-222 E	3.88
932511	AC2-071 C	1.13
932512	AC2-071 E	4.67
932761	AC2-100 C	3.84
932762	AC2-100 E	1.88
934231	AD1-050 C	4.23

Bus #	Bus	MW Impact
934232	AD1-050 E	2.31
934311	AD1-055 C	2.83
934312	AD1-055 E	0.73
934341	AD1-058 C	4.18
934342	AD1-058 E	1.06
934611	AD1-087 C O1	12.07
934612	AD1-087 E O1	5.67
934621	AD1-088 C	29.91
934622	AD1-088 E	14.04
934991	AD1-131 C	1.37
934992	AD1-131 E	0.91
935171	AD1-152 C O1	12.0
935172	AD1-152 E O1	8.0
935221	AD1-157 C	0.47
935222	AD1-157 E	2.59
935231	AD1-160 C	2.85
935232	AD1-160 E	3.93
936261	AD2-033 C	23.77
936262	AD2-033 E	15.84
936331	AD2-043 C	5.29
936332	AD2-043 E	6.26
936361	AD2-046 C O1	9.36
936362	AD2-046 E O1	4.31
936481	AD2-063 C O1	23.83
936482	AD2-063 E O1	15.89
937481	AD2-202 C O1	3.32
937482	AD2-202 E O1	1.67
938371	AE1-056 C	16.75
938372	AE1-056 E	9.15
939181	AE1-148 C O1	9.41
939182	AE1-148 E O1	6.27
939371	AE1-168 C	33.76
939372	AE1-168 E	22.5
940241	AE2-006	0.94
940661	AE2-053	3.5
941791	AE2-182 C	5.41
941792	AE2-182 E	2.55
942451	AE2-258	3.22
942461	AE2-259 C O1	30.47
942462	AE2-259 E O1	20.32
942711	AE2-287 C O1	10.05
942712	AE2-287 E O1	6.7
942751	AE2-291 C O1	6.67
942752	AE2-291 E O1	4.45
942761	AE2-292 C O1	8.31
942762	AE2-292 E O1	5.54
943051	AE2-328 C	34.03
943052	AE2-328 E	15.94
AA2-074	AA2-074	2.39
CARR	CARR	0.25
CBM-S1	CBM-S1	5.4
CBM-S2	CBM-S2	6.67

Bus #	Bus	MW Impact
CBM-W1	CBM-W1	5.02
CBM-W2	CBM-W2	34.78
CIN	CIN	2.29
CPL	CPL	3.51
G-007	G-007	0.84
IPL	IPL	1.43
LGEE	LGEE	0.66
MEC	MEC	5.23
MECS	MECS	1.96
O-066	O-066	5.34
RENSSELAER	RENSSELAER	0.2
WEC	WEC	0.61

18.4 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
8138543	314686	6CLOVER	DVP	934610	AD1-087 TAP	DVP	1	DVP_P1-2: LN 570_FSA	single	814.98	117.11	118.56	DC	11.8

Bus #	Bus	MW Impact
314421	6WINCHST	0.04
314507	3THOMPSN	0.1
315090	1YORKTN1	10.65
315091	1YORKTN2	11.05
315092	1YORKTN3	6.44
315098	1CHESPKA	0.13
315099	1CHESPKB	0.31
315102	1BRUNSWICKG1	4.13
315103	1BRUNSWICKG2	4.13
315104	1BRUNSWICKG3	4.13
315105	1BRUNSWICKS1	8.59
315108	1ELIZAR1	0.93
315109	1ELIZAR2	0.92
315110	1ELIZAR3	0.94
315116	1SURREY 1	6.74
315153	1CLOVER1	16.29
315154	1CLOVER2	16.08
315191	1BEARGRDN G1	1.24
315192	1BEARGRDN G2	1.24
315193	1BEARGRDN S1	2.54
315233	1SURREY 2	7.49
315260	1GOSPORTA	0.1
315261	1GOSPORTB	0.13
315262	1GOSPORTC	0.11
916191	Z1-068 C	0.01
916301	Z1-086 C	24.14
920291	AA2-127	0.26
924031	AB2-045 C	0.15
925521	AC1-027 C	0.09
926661	AC1-147 C	0.11
926751	AC1-161 C O1	13.14
932041	AC2-012 C	3.97
932511	AC2-071 C	0.15
933291	AC2-141 C	13.14
933731	AC2-196 C	0.08
934061	AD1-033 C	2.86
934233	AD1-050 BAT	5.08
934621	AD1-088 C	17.85
937251	AD2-164	1.77
938181	AE1-027 C	0.87
938191	AE1-028 C	0.51

Bus #	Bus	MW Impact
938491	AE1-068 C O1	38.23
938501	AE1-069 C O1	30.93
939311	AE1-162 C	0.81
939411	AE1-173 C	43.23
940251	AE2-007	67.63
940471	AE2-031 C O1	15.34
940641	AE2-051 C O1	8.77
940891	AE2-078 C	0.87
940901	AE2-079 C	0.87
940911	AE2-080 C	0.87
941031	AE2-094 C	23.49
941281	AE2-122 C O1	10.89
941291	AE2-123 C O1	11.19
941301	AE2-124 C O1	10.16
941591	AE2-156	6.99
941791	AE2-182 C	3.23
942211	AE2-233 C	7.68
942921	AE2-311 C O1	22.14
942931	AE2-313 C	23.68
943051	AE2-328 C	11.8
AC1-131	AC1-131	9.78
BLUEG	BLUEG	18.52
CALDERWOOD	CALDERWOOD	3.67
CANNELTON	CANNELTON	1.25
CATAWBA	CATAWBA	3.52
CBM-N	CBM-N	0.67
CHEOAH	CHEOAH	3.42
CHILHOWEE	CHILHOWEE	1.19
COFFEEN	COFFEEN	2.13
COTTONWOOD	COTTONWOOD	12.22
DUCKCREEK	DUCKCREEK	4.38
EDWARDS	EDWARDS	1.96
ELMERSMITH	ELMERSMITH	2.2
FARMERCITY	FARMERCITY	1.53
G-007A	G-007A	3.0
GIBSON	GIBSON	0.79
HAMLET	HAMLET	6.6
NEWTON	NEWTON	5.55
NYISO	NYISO	2.9
PRAIRIE	PRAIRIE	11.52
SANTEETLA	SANTEETLA	1.02
SMITHLAND	SMITHLAND	1.02
TATANKA	TATANKA	2.59
TILTON	TILTON	2.32
TRIMBLE	TRIMBLE	2.04
TVA	TVA	10.31
UNIONPOWER	UNIONPOWER	5.07
VFT	VFT	7.99

18.5 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
7744833	314692	6FARMVIL	DVP	314677	6BUCKING	DVP	1	DVP_P4-2: 511T591	breaker	684.0	116.15	123.41	DC	49.98

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.69
315150	1BUGGS 1	13.28
315151	1BUGGS 2	13.28
315153	1CLOVER1	15.94
315154	1CLOVER2	15.73
315159	1KERR 2	1.04
315266	1PLYWOOD A	1.07
924021	AB2-043 C O1	0.53
924022	AB2-043 E O1	7.09
924161	AB2-060 C O1	1.55
924162	AB2-060 E O1	6.0
924301	AB2-077 C O1	0.33
924302	AB2-077 E O1	1.8
924311	AB2-078 C O1	0.33
924312	AB2-078 E O1	1.8
924321	AB2-079 C O1	0.33
924322	AB2-079 E O1	1.8
924401	AB2-089 C	1.92
924402	AB2-089 E	0.99
925611	AC1-036 C	0.22
925612	AC1-036 E	1.66
925781	AC1-054 C O1	6.08
925782	AC1-054 E O1	2.8
925831	AC1-062	0.09
925991	AC1-075 C	4.97
925992	AC1-075 E	2.82
926021	AC1-080 C	1.66
926022	AC1-080 E	0.94
926271	AC1-105 C O1	6.79
926272	AC1-105 E O1	3.38
927251	AC1-221 C	1.67
927252	AC1-221 E	1.67
927261	AC1-222 C	4.08
927262	AC1-222 E	3.89
932761	AC2-100 C	3.85
932762	AC2-100 E	1.88
934231	AD1-050 C	4.23
934232	AD1-050 E	2.31
934311	AD1-055 C	2.83
934312	AD1-055 E	0.73
934341	AD1-058 C	4.19

Bus #	Bus	MW Impact
934342	AD1-058 E	1.06
934611	AD1-087 C O1	12.08
934612	AD1-087 E O1	5.68
934621	AD1-088 C	29.92
934622	AD1-088 E	14.04
934991	AD1-131 C	1.37
934992	AD1-131 E	0.92
935171	AD1-152 C O1	12.0
935172	AD1-152 E O1	8.0
935221	AD1-157 C	0.47
935222	AD1-157 E	2.59
935231	AD1-160 C	2.85
935232	AD1-160 E	3.93
936261	AD2-033 C	23.78
936262	AD2-033 E	15.85
936331	AD2-043 C	5.29
936332	AD2-043 E	6.26
936361	AD2-046 C O1	9.37
936362	AD2-046 E O1	4.31
936481	AD2-063 C O1	23.85
936482	AD2-063 E O1	15.9
937481	AD2-202 C O1	3.33
937482	AD2-202 E O1	1.68
938371	AE1-056 C	16.75
938372	AE1-056 E	9.15
939181	AE1-148 C O1	9.42
939182	AE1-148 E O1	6.28
939371	AE1-168 C	33.77
939372	AE1-168 E	22.51
940241	AE2-006	0.94
940661	AE2-053	3.51
941791	AE2-182 C	5.41
941792	AE2-182 E	2.55
942451	AE2-258	3.23
942461	AE2-259 C O1	30.48
942462	AE2-259 E O1	20.32
942711	AE2-287 C O1	10.07
942712	AE2-287 E O1	6.71
942751	AE2-291 C O1	6.68
942752	AE2-291 E O1	4.46
942761	AE2-292 C O1	8.32
942762	AE2-292 E O1	5.55
943051	AE2-328 C	34.04
943052	AE2-328 E	15.94
AA2-074	AA2-074	2.39
CARR	CARR	0.25
CBM-S1	CBM-S1	5.45
CBM-S2	CBM-S2	6.69
CBM-W1	CBM-W1	5.11
CBM-W2	CBM-W2	35.13
CIN	CIN	2.33
CPL	CPL	3.52

Bus #	Bus	MW Impact
G-007	G-007	0.82
IPL	IPL	1.45
LGEE	LGEE	0.67
MEC	MEC	5.3
MECS	MECS	2.02
O-066	O-066	5.24
RENSSELAER	RENSSELAER	0.2
WEC	WEC	0.62

18.6 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
8138106	314697	6SEEDGE HILL	DVP	927250	AC1-221 TAP	DVP	1	DVP_P1-2: LN 570_FSA	single	674.92	123.3	124.9	DC	10.81

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.21
314704	3LAWRENC	0.09
315102	1BRUNSWICKG1	3.32
315103	1BRUNSWICKG2	3.32
315104	1BRUNSWICKG3	3.32
315105	1BRUNSWICKS1	6.9
315108	1ELIZAR1	0.79
315109	1ELIZAR2	0.77
315110	1ELIZAR3	0.8
315150	1BUGGS 1	9.82
315151	1BUGGS 2	9.82
315153	1CLOVER1	12.46
315154	1CLOVER2	12.3
315158	1KERR 1	0.09
315159	1KERR 2	0.38
315160	1KERR 3	0.38
315161	1KERR 4	0.38
315162	1KERR 5	0.38
315163	1KERR 6	0.38
315164	1KERR 7	0.38
315191	1BEARGRDN G1	1.33
315192	1BEARGRDN G2	1.33
315193	1BEARGRDN S1	2.74
315233	1SURREY 2	6.31
315266	1PLYWOOD A	1.51
916301	Z1-086 C	19.45
920291	AA2-127	0.28
923861	AB2-026 C	0.11
924021	AB2-043 C O1	0.29
924031	AB2-045 C	0.17
924161	AB2-060 C O1	0.84
924301	AB2-077 C O1	0.19
924311	AB2-078 C O1	0.19
924321	AB2-079 C O1	0.19
925611	AC1-036 C	0.09
925831	AC1-062	0.03
925991	AC1-075 C	7.28
926021	AC1-080 C	2.43
926271	AC1-105 C O1	9.33
926751	AC1-161 C O1	10.99
927261	AC1-222 C	6.55

Bus #	Bus	MW Impact
932511	AC2-071 C	0.16
933291	AC2-141 C	10.99
933501	AC2-165 C	3.64
934311	AD1-055 C	4.55
934611	AD1-087 C O1	15.28
934621	AD1-088 C	14.64
935171	AD1-152 C O1	15.18
935221	AD1-157 C	0.14
935231	AD1-160 C	0.83
936261	AD2-033 C	9.82
936331	AD2-043 C	8.48
936361	AD2-046 C O1	3.79
936481	AD2-063 C O1	11.33
937481	AD2-202 C O1	4.21
938371	AE1-056 C	4.87
938491	AE1-068 C O1	30.87
938501	AE1-069 C O1	24.92
938561	AE1-075 C	0.76
939181	AE1-148 C O1	3.91
939371	AE1-168 C	11.32
939411	AE1-173 C	35.72
940241	AE2-006	0.36
940251	AE2-007	57.07
940471	AE2-031 C O1	12.7
940641	AE2-051 C O1	7.2
940661	AE2-053	1.46
941031	AE2-094 C	19.05
941791	AE2-182 C	2.65
942211	AE2-233 C	6.22
942451	AE2-258	1.78
942461	AE2-259 C O1	7.53
942711	AE2-287 C O1	5.52
942751	AE2-291 C O1	9.12
942761	AE2-292 C O1	11.36
942921	AE2-311 C O1	18.27
942931	AE2-313 C	19.03
943051	AE2-328 C	10.81
AC1-131	AC1-131	10.99
BLUEG	BLUEG	17.69
CALDERWOOD	CALDERWOOD	3.8
CANNELTON	CANNELTON	1.22
CATAWBA	CATAWBA	3.83
CBM-N	CBM-N	0.59
CHEOAH	CHEOAH	3.55
CHILHOWEE	CHILHOWEE	1.23
COFFEEN	COFFEEN	2.08
COTTONWOOD	COTTONWOOD	12.53
DUCKCREEK	DUCKCREEK	4.25
EDWARDS	EDWARDS	1.9
ELMERSMITH	ELMERSMITH	2.15
FARMERCITY	FARMERCITY	1.51
G-007A	G-007A	2.66

Bus #	Bus	MW Impact
GIBSON	GIBSON	0.77
HAMLET	HAMLET	7.29
NEWTON	NEWTON	5.41
NYISO	NYISO	2.54
PRAIRIE	PRAIRIE	11.42
SANTEETLA	SANTEETLA	1.06
SMITHLAND	SMITHLAND	1.02
TATANKA	TATANKA	2.55
TILTON	TILTON	2.24
TRIMBLE	TRIMBLE	1.94
TVA	TVA	10.54
UNIONPOWER	UNIONPOWER	5.28
VFT	VFT	7.06

18.7 Index 7

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
8137820	314712	3OTTER R	DVP	314666	3ALTVSTA	DVP	1	DVP_P1-2: LN 556	single	224.66	116.07	117.77	DC	3.83

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.11
315150	1BUGGS 1	6.27
315151	1BUGGS 2	6.27
315153	1CLOVER1	4.43
315154	1CLOVER2	4.38
315158	1KERR 1	0.1
315159	1KERR 2	0.41
315160	1KERR 3	0.4
315161	1KERR 4	0.4
315162	1KERR 5	0.4
315163	1KERR 6	0.4
315164	1KERR 7	0.4
315266	1PLYWOOD A	0.8
924021	AB2-043 C O1	0.18
924161	AB2-060 C O1	0.52
924301	AB2-077 C O1	0.12
924311	AB2-078 C O1	0.12
924321	AB2-079 C O1	0.12
924401	AB2-089 C	0.76
925611	AC1-036 C	0.05
925781	AC1-054 C O1	2.42
925831	AC1-062	0.01
925991	AC1-075 C	16.9
926021	AC1-080 C	5.65
926271	AC1-105 C O1	4.86
927261	AC1-222 C	5.05
934231	AD1-050 C	1.67
934311	AD1-055 C	3.51
934611	AD1-087 C O1	4.25
934621	AD1-088 C	5.2
935171	AD1-152 C O1	4.22
935221	AD1-157 C	0.07
935231	AD1-160 C	0.39
936261	AD2-033 C	5.55
936331	AD2-043 C	6.86
936361	AD2-046 C O1	3.57
936481	AD2-063 C O1	6.74
937481	AD2-202 C O1	1.17
938371	AE1-056 C	2.3
939181	AE1-148 C O1	3.56
939371	AE1-168 C	5.82

Bus #	Bus	MW Impact
940241	AE2-006	0.2
940661	AE2-053	1.32
941791	AE2-182 C	0.94
942451	AE2-258	1.1
942461	AE2-259 C O1	3.13
942751	AE2-291 C O1	32.78
942761	AE2-292 C O1	40.81
943051	AE2-328 C	3.83
BLUEG	BLUEG	1.75
CANNELTON	CANNELTON	0.09
CBM-N	CBM-N	0.02
CBM-S2	CBM-S2	1.73
COFFEEN	COFFEEN	0.14
CPL	CPL	1.17
DUCKCREEK	DUCKCREEK	0.33
EDWARDS	EDWARDS	0.15
ELMERSMITH	ELMERSMITH	0.14
FARMERCITY	FARMERCITY	0.07
G-007A	G-007A	0.17
GIBSON	GIBSON	0.06
NEWTON	NEWTON	0.38
NYISO	NYISO	0.09
PRAIRIE	PRAIRIE	0.53
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.15
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.2
TVA	TVA	0.04
VFT	VFT	0.45

18.8 Index 8

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
8138094	314747	6BREMO	DVP	313867	6BREMODIST	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	130.77	133.75	DC	19.73

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.43
314704	3LAWRENC	0.11
315150	1BUGGS 1	7.33
315151	1BUGGS 2	7.33
315153	1CLOVER1	5.27
315154	1CLOVER2	5.2
315158	1KERR 1	0.15
315159	1KERR 2	0.61
315160	1KERR 3	0.6
315161	1KERR 4	0.6
315162	1KERR 5	0.6
315163	1KERR 6	0.6
315164	1KERR 7	0.6
315170	1BREMO 3	30.25
315171	1BREMO 4	66.46
315191	1BEARGRDN G1	10.83
315192	1BEARGRDN G2	10.83
315193	1BEARGRDN S1	22.29
315266	1PLYWOOD A	0.49
920291	AA2-127	2.25
924021	AB2-043 C O1	0.31
924031	AB2-045 C	0.77
924161	AB2-060 C O1	0.91
924301	AB2-077 C O1	0.19
924311	AB2-078 C O1	0.19
924321	AB2-079 C O1	0.19
924401	AB2-089 C	1.15
925171	AB2-174 C O1	2.12
925611	AC1-036 C	0.14
925781	AC1-054 C O1	3.68
925831	AC1-062	0.06
925991	AC1-075 C	2.53
926021	AC1-080 C	0.84
926271	AC1-105 C O1	3.2
927251	AC1-221 C	0.76
927261	AC1-222 C	1.83
932511	AC2-071 C	0.76
932761	AC2-100 C	1.74
933501	AC2-165 C	32.68
934231	AD1-050 C	2.53
934311	AD1-055 C	1.27

Bus #	Bus	MW Impact
934341	AD1-058 C	1.89
934611	AD1-087 C O1	4.25
934621	AD1-088 C	14.59
934991	AD1-131 C	0.62
935171	AD1-152 C O1	4.22
935221	AD1-157 C	0.3
935231	AD1-160 C	1.78
936261	AD2-033 C	14.42
936331	AD2-043 C	2.38
936361	AD2-046 C O1	5.5
936481	AD2-063 C O1	14.23
937481	AD2-202 C O1	1.17
938371	AE1-056 C	10.47
938821	AE1-108 C O1	38.04
939181	AE1-148 C O1	5.53
939371	AE1-168 C	20.88
939841	AE1-220 C O1	12.08
940241	AE2-006	0.57
940661	AE2-053	2.06
941011	AE2-092 C	24.32
941791	AE2-182 C	2.64
942451	AE2-258	1.89
942461	AE2-259 C O1	19.25
942711	AE2-287 C O1	6.46
942751	AE2-291 C O1	3.67
942761	AE2-292 C O1	4.58
943051	AE2-328 C	19.73
AA2-074	AA2-074	1.47
CARR	CARR	0.29
CBM-S1	CBM-S1	2.8
CBM-S2	CBM-S2	4.07
CBM-W1	CBM-W1	1.66
CBM-W2	CBM-W2	17.05
CIN	CIN	0.83
CPL	CPL	2.17
IPL	IPL	0.5
LGEE	LGEE	0.25
MEC	MEC	2.21
MECS	MECS	0.22
RENSSELAER	RENSSELAER	0.23
WEC	WEC	0.22

18.9 Index 9

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
8138206	314765	6MTEAGLE	DVP	314749	6CHARLVL	DVP	1	DVP_P1-2: LN 2027-B	single	661.76	125.12	128.1	DC	19.73

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.43
314704	3LAWRENC	0.11
315150	1BUGGS 1	7.32
315151	1BUGGS 2	7.32
315153	1CLOVER1	5.27
315154	1CLOVER2	5.2
315158	1KERR 1	0.15
315159	1KERR 2	0.61
315160	1KERR 3	0.6
315161	1KERR 4	0.6
315162	1KERR 5	0.6
315163	1KERR 6	0.6
315164	1KERR 7	0.6
315170	1BREMO 3	30.25
315171	1BREMO 4	66.46
315191	1BEARGRDN G1	10.83
315192	1BEARGRDN G2	10.83
315193	1BEARGRDN S1	22.29
315266	1PLYWOOD A	0.49
920291	AA2-127	2.25
924021	AB2-043 C O1	0.31
924031	AB2-045 C	0.77
924161	AB2-060 C O1	0.91
924301	AB2-077 C O1	0.19
924311	AB2-078 C O1	0.19
924321	AB2-079 C O1	0.19
924401	AB2-089 C	1.15
925171	AB2-174 C O1	2.12
925611	AC1-036 C	0.14
925781	AC1-054 C O1	3.68
925831	AC1-062	0.06
925991	AC1-075 C	2.53
926021	AC1-080 C	0.84
926271	AC1-105 C O1	3.2
926451	AC1-116 C	0.45
927251	AC1-221 C	0.76
927261	AC1-222 C	1.83
932511	AC2-071 C	0.76
932761	AC2-100 C	1.74
933501	AC2-165 C	32.68
934231	AD1-050 C	2.53

Bus #	Bus	MW Impact
934311	AD1-055 C	1.27
934341	AD1-058 C	1.89
934611	AD1-087 C O1	4.25
934621	AD1-088 C	14.58
934991	AD1-131 C	0.62
935171	AD1-152 C O1	4.22
935221	AD1-157 C	0.3
935231	AD1-160 C	1.78
936261	AD2-033 C	14.41
936331	AD2-043 C	2.38
936361	AD2-046 C O1	5.5
936481	AD2-063 C O1	14.23
937481	AD2-202 C O1	1.17
938371	AE1-056 C	10.47
938821	AE1-108 C O1	38.04
939181	AE1-148 C O1	5.52
939371	AE1-168 C	20.87
939841	AE1-220 C O1	12.07
940241	AE2-006	0.57
940661	AE2-053	2.06
941011	AE2-092 C	24.32
941791	AE2-182 C	2.64
942451	AE2-258	1.89
942461	AE2-259 C O1	19.25
942711	AE2-287 C O1	6.45
942751	AE2-291 C O1	3.67
942761	AE2-292 C O1	4.57
943051	AE2-328 C	19.73
AA2-074	AA2-074	1.47
CARR	CARR	0.29
CBM-S1	CBM-S1	2.79
CBM-S2	CBM-S2	4.06
CBM-W1	CBM-W1	1.65
CBM-W2	CBM-W2	17.0
CIN	CIN	0.83
CPLE	CPLE	2.17
IPL	IPL	0.5
LGEE	LGEE	0.24
MEC	MEC	2.2
MECS	MECS	0.21
RENSSELAER	RENSSELAER	0.23
WEC	WEC	0.22

18.10 Index 10

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
8138068	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	DVP_P1-2: LN 556	single	718.0	124.62	127.23	DC	22.49

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.4
314704	3LAWRENC	0.14
315150	1BUGGS 1	17.2
315151	1BUGGS 2	17.2
315153	1CLOVER1	27.86
315154	1CLOVER2	27.5
315156	1HALLBR1	0.91
315158	1KERR 1	0.22
315159	1KERR 2	0.91
315160	1KERR 3	0.89
315161	1KERR 4	0.89
315162	1KERR 5	0.89
315163	1KERR 6	0.89
315164	1KERR 7	0.89
315165	1HURT 1	5.15
315166	1HURT 2	5.15
315171	1BREMO 4	13.53
315191	1BEARGRDN G1	2.03
315192	1BEARGRDN G2	2.03
315193	1BEARGRDN S1	4.17
315266	1PLYWOOD A	2.35
920291	AA2-127	0.42
924021	AB2-043 C O1	0.52
924031	AB2-045 C	0.3
924161	AB2-060 C O1	1.49
924301	AB2-077 C O1	0.33
924311	AB2-078 C O1	0.33
924321	AB2-079 C O1	0.33
924401	AB2-089 C	1.61
925611	AC1-036 C	0.16
925661	AC1-042 C	1.59
925781	AC1-054 C O1	4.97
925831	AC1-062	0.05
925991	AC1-075 C	11.92
926021	AC1-080 C	3.98
926271	AC1-105 C O1	14.49
926641	AC1-145 C	1.9
927251	AC1-221 C	11.73
927261	AC1-222 C	10.12
932511	AC2-071 C	0.3
932761	AC2-100 C	26.98

Bus #	Bus	MW Impact
934231	AD1-050 C	3.55
934311	AD1-055 C	7.02
934341	AD1-058 C	29.39
934611	AD1-087 C O1	26.93
934621	AD1-088 C	31.81
934991	AD1-131 C	9.64
935171	AD1-152 C O1	26.76
935221	AD1-157 C	0.26
935231	AD1-160 C	1.55
936261	AD2-033 C	17.8
936331	AD2-043 C	13.11
936361	AD2-046 C O1	8.37
936481	AD2-063 C O1	20.34
937481	AD2-202 C O1	7.42
938371	AE1-056 C	9.12
939181	AE1-148 C O1	8.48
939371	AE1-168 C	20.88
939941	AE1-230 C1	0.72
940241	AE2-006	0.66
940661	AE2-053	3.16
941791	AE2-182 C	5.75
941801	AE2-185 C	4.49
941821	AE2-187 C	4.49
942331	AE2-246	1.39
942451	AE2-258	3.16
942461	AE2-259 C O1	14.35
942671	AE2-283 C	3.95
942711	AE2-287 C O1	8.66
942751	AE2-291 C O1	15.64
942761	AE2-292 C O1	19.47
943051	AE2-328 C	22.49
AC1-131	AC1-131	5.19
BLUEG	BLUEG	6.75
CALDERWOOD	CALDERWOOD	1.59
CANNELTON	CANNELTON	0.47
CATAWBA	CATAWBA	1.7
CBM-N	CBM-N	0.03
CHEOAH	CHEOAH	1.49
CHILHOWEE	CHILHOWEE	0.51
COFFEEN	COFFEEN	0.82
COTTONWOOD	COTTONWOOD	5.18
DUCKCREEK	DUCKCREEK	1.66
EDWARDS	EDWARDS	0.74
ELMERSMITH	ELMERSMITH	0.84
FARMERCITY	FARMERCITY	0.6
G-007A	G-007A	0.3
GIBSON	GIBSON	0.3
HAMLET	HAMLET	3.18
NEWTON	NEWTON	2.12
NYISO	NYISO	0.11
PRAIRIE	PRAIRIE	4.55
SANTEETLA	SANTEETLA	0.44

Bus #	Bus	MW Impact
SMITHLAND	SMITHLAND	0.41
TATANKA	TATANKA	1.01
TILTON	TILTON	0.86
TRIMBLE	TRIMBLE	0.74
TVA	TVA	4.33
UNIONPOWER	UNIONPOWER	2.22
VFT	VFT	0.78

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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
8138474	934610	AD1-087 TAP	DVP	314697	6SEGE HILL	DVP	1	DVP_P1-2: LN 570_FSA	single	814.98	122.72	124.17	DC	11.8

Bus #	Bus	MW Impact
314421	6WINCHST	0.04
314507	3THOMPSN	0.1
315090	1YORKTN1	10.65
315091	1YORKTN2	11.05
315092	1YORKTN3	6.44
315098	1CHESPKA	0.13
315099	1CHESPKB	0.31
315102	1BRUNSWICKG1	4.13
315103	1BRUNSWICKG2	4.13
315104	1BRUNSWICKG3	4.13
315105	1BRUNSWICKS1	8.59
315108	1ELIZAR1	0.93
315109	1ELIZAR2	0.92
315110	1ELIZAR3	0.94
315116	1SURREY 1	6.74
315153	1CLOVER1	16.29
315154	1CLOVER2	16.08
315191	1BEARGRDN G1	1.24
315192	1BEARGRDN G2	1.24
315193	1BEARGRDN S1	2.54
315233	1SURREY 2	7.49
315260	1GOSPORTA	0.1
315261	1GOSPORTB	0.13
315262	1GOSPORTC	0.11
916191	Z1-068 C	0.01
916301	Z1-086 C	24.14
920291	AA2-127	0.26
924031	AB2-045 C	0.15
925521	AC1-027 C	0.09
926661	AC1-147 C	0.11
926751	AC1-161 C O1	13.14
932041	AC2-012 C	3.97
932511	AC2-071 C	0.15
933291	AC2-141 C	13.14
933731	AC2-196 C	0.08
934061	AD1-033 C	2.86
934233	AD1-050 BAT	5.08
934611	AD1-087 C O1	20.5
934621	AD1-088 C	17.85
935171	AD1-152 C O1	20.38
937251	AD2-164	1.77

Bus #	Bus	MW Impact
937481	AD2-202 C O1	5.65
938181	AE1-027 C	0.87
938191	AE1-028 C	0.51
938491	AE1-068 C O1	38.23
938501	AE1-069 C O1	30.93
939311	AE1-162 C	0.81
939411	AE1-173 C	43.23
940251	AE2-007	67.63
940471	AE2-031 C O1	15.34
940641	AE2-051 C O1	8.77
940891	AE2-078 C	0.87
940901	AE2-079 C	0.87
940911	AE2-080 C	0.87
941031	AE2-094 C	23.49
941281	AE2-122 C O1	10.89
941291	AE2-123 C O1	11.19
941301	AE2-124 C O1	10.16
941591	AE2-156	6.99
941791	AE2-182 C	3.23
942211	AE2-233 C	7.68
942921	AE2-311 C O1	22.14
942931	AE2-313 C	23.68
943051	AE2-328 C	11.8
AC1-131	AC1-131	9.78
BLUEG	BLUEG	18.52
CALDERWOOD	CALDERWOOD	3.67
CANNELTON	CANNELTON	1.25
CATAWBA	CATAWBA	3.52
CBM-N	CBM-N	0.67
CHEOAH	CHEOAH	3.42
CHILHOWEE	CHILHOWEE	1.19
COFFEEN	COFFEEN	2.13
COTTONWOOD	COTTONWOOD	12.22
DUCKCREEK	DUCKCREEK	4.38
EDWARDS	EDWARDS	1.96
ELMERSMITH	ELMERSMITH	2.2
FARMERCITY	FARMERCITY	1.53
G-007A	G-007A	3.0
GIBSON	GIBSON	0.79
HAMLET	HAMLET	6.6
NEWTON	NEWTON	5.55
NYISO	NYISO	2.9
PRAIRIE	PRAIRIE	11.52
SANTEETLA	SANTEETLA	1.02
SMITHLAND	SMITHLAND	1.02
TATANKA	TATANKA	2.59
TILTON	TILTON	2.32
TRIMBLE	TRIMBLE	2.04
TVA	TVA	10.31
UNIONPOWER	UNIONPOWER	5.07
VFT	VFT	7.99

Affected Systems

19 Affected Systems

19.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

19.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

19.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

19.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

19.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

20 Contingency Descriptions

Contingency Name	Contingency Definition
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 570_FSA	CONTINGENCY 'DVP_P1-2: LN 570_FSA' OPEN BRANCH FROM BUS 304183 TO BUS 918500 CKT 1 /* 8WAKE 500 TT500.00 - AA1-064 TAP 500.00 END
DVP_P1-2: LN 556	CONTINGENCY 'DVP_P1-2: LN 556' OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 1 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 2 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 3 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314906 TO BUS 314936 CKT 1 /* 8CLOVER 500.00 - 8RAWLINGS 500.00 OPEN BUS 314906 /* ISLAND: 8CLOVER 500.00 OPEN BUS 314915 /* ISLAND: 8CLOVER_STC 500.00 END
DVP_P4-2: 511T556	CONTINGENCY 'DVP_P4-2: 511T556' /* RAWLINGS 500 KV OPEN BRANCH FROM BUS 942930 TO BUS 314936 CKT 1 /* AE2-313 TAP 500.00 - 8RAWLINGS 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 1 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 2 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 3 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314906 TO BUS 314936 CKT 1 /* 8CLOVER 500.00 - 8RAWLINGS 500.00 OPEN BUS 314906 /* ISLAND: 8CLOVER 500.00 OPEN BUS 314915 /* ISLAND: 8CLOVER_STC 500.00 END
DVP_P4-2: 556T591	CONTINGENCY 'DVP_P4-2: 556T591' /* RAWLINGS 500 KV OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 1 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 2 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 3 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314906 TO BUS 314936 CKT 1 /* 8CLOVER 500.00 - 8RAWLINGS 500.00 OPEN BUS 314906 /* ISLAND: 8CLOVER 500.00 OPEN BUS 314915 /* ISLAND: 8CLOVER_STC 500.00 OPEN BRANCH FROM BUS 314935 TO BUS 314936 CKT 1 /* 8HERITAGE 500.00 - 8RAWLINGS 500.00 END
DVP_P1-2: LN 298	CONTINGENCY 'DVP_P1-2: LN 298' OPEN BRANCH FROM BUS 314677 TO BUS 314692 CKT 1 /* 6BUCKING 230.00 - 6FARMVIL 230.00 OPEN BRANCH FROM BUS 314677 TO BUS 314747 CKT 1 /* 6BUCKING 230.00 - 6BREMO 230.00 OPEN BRANCH FROM BUS 314691 TO BUS 314692 CKT 2 /* 3FARMVIL 115.00 - 6FARMVIL 230.00 OPEN BUS 314677 /* ISLAND: 6BUCKING 230.00 END

Contingency Name	Contingency Definition
DVP_P1-2: LN 2027-A	CONTINGENCY 'DVP_P1-2: LN 2027-A' OPEN BRANCH FROM BUS 313868 TO BUS 933500 CKT 1 /* 6CARTERV 230.00 - AC2-165 TAP 230.00 OPEN BRANCH FROM BUS 313868 TO BUS 314747 CKT 1 /* 6CARTERV 230.00 - 6BREMO 230.00 OPEN BRANCH FROM BUS 314310 TO BUS 314333 CKT 1 /* 6JUDES F 230.00 - 6POWHATN 230.00 OPEN BUS 313868 /* ISLAND: 6CARTERV 230.00 END
DVP_P1-2: LN 2027-B	CONTINGENCY 'DVP_P1-2: LN 2027-B' OPEN BRANCH FROM BUS 933500 TO BUS 314333 CKT 1 /* AC2-165 TAP 230.00 - 6POWHATN 230.00 OPEN BRANCH FROM BUS 314310 TO BUS 314322 CKT 1 /* 6JUDES F 230.00 - 6MDLTHAN 230.00 OPEN BRANCH FROM BUS 314310 TO BUS 314333 CKT 1 /* 6JUDES F 230.00 - 6POWHATN 230.00 OPEN BUS 314310 /* ISLAND: 6JUDES F 230.00 OPEN BUS 314333 /* ISLAND: 6POWHATN 230.00 END
DVP_P1-2: LN 6002_FSA	CONTINGENCY 'DVP_P1-2: LN 6002_FSA' OPEN BRANCH FROM BUS 314935 TO BUS 918500 CKT 1 /* 8HERITAGE 500.00 - AA1-064 TAP 500.00 END
DVP_P1-2: LN 570	CONTINGENCY 'DVP_P1-2: LN 570' OPEN BRANCH FROM BUS 304183 TO BUS 918500 CKT 1 /* 8WAKE 500 TT500.00 - AA1-064 TAP 500.00 OPEN BRANCH FROM BUS 314935 TO BUS 918500 CKT 1 /* 8HERITAGE 500.00 - AA1-064 TAP 500.00 OPEN BUS 918500 /* ISLAND: AA1-064 TAP 500.00 END
Base Case	
DVP_P1-2: LN 2028	CONTINGENCY 'DVP_P1-2: LN 2028' OPEN BRANCH FROM BUS 313867 TO BUS 314747 CKT 1 /* 6BREMODIST 230.00 - 6BREMO 230.00 OPEN BRANCH FROM BUS 313867 TO BUS 314765 CKT 1 /* 6BREMODIST 230.00 - 6MTEAGLE 230.00 OPEN BRANCH FROM BUS 314749 TO BUS 314765 CKT 1 /* 6CHARLVL 230.00 - 6MTEAGLE 230.00 OPEN BUS 313867 /* ISLAND: 6BREMODIST 230.00 OPEN BUS 314765 /* ISLAND: 6MTEAGLE 230.00 END
DVP_P4-2: 511T591	CONTINGENCY 'DVP_P4-2: 511T591' /* RAWLINGS 500 KV OPEN BRANCH FROM BUS 942930 TO BUS 314936 CKT 1 /* AE2-313 TAP 500.00 - 8RAWLINGS 500.00 OPEN BRANCH FROM BUS 314935 TO BUS 314936 CKT 1 /* 8HERITAGE 500.00 - 8RAWLINGS 500.00 END

Short Circuit

21 Short Circuit

The following Breakers are overduty:

None

22 Attachment 1: One Line Diagram