Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-185

GLADYS DP-STONEMILL SWITCHING STATION 69 KV

45 MW Capacity / 60 MW Energy

July, 2019

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1 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).

2 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.

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.

3 General

The Interconnection Customer (IC) has proposed a Solar/Storage generating facility located in Campbell County, Virginia. The installed facilities will have a total capability of 60 MW with 45 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 1, 2020. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

This interconnection is located in a Dominion Energy Coop's service territory. Additional protection requirements or station configuration requirements may apply and will be analyzed in the system impact study phase.

Queue Number	AE2-185
Project Name	GLADYS DP-STONEMILL SWITCHING STATION 69 KV
Interconnection Customer	
State	Virginia
County	Campbell
Transmission Owner	Dominion
MFO	60
MWE	60
MWC	45
Fuel	Solar/Storage
Basecase Study Year	2022

3.1 Point of Interconnection

AE2-185 will interconnect with the Dominion transmission system tapping the Gladys DP to Stonemill Switching Station 69 kV line. 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. The IC may not install any facilities on Dominion's right-of-way without first obtaining the necessary approval from Dominion Energy.

3.2 Cost Summary

The AE2-185 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 1,700,000
Direct Connection Network Upgrade	$ 1,500,000
Non Direct Connection Network Upgrades	$ 1,600,000
Total Costs	$ 4,800,000

In addition, the AE2-185 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 43,232,000

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

4 Transmission Owner Scope of Work

Dominion assessed the impact of the proposed Queue Project AE2-185 was evaluated as a 45.0 MW Capacity (80.0 MW Energy) injection at the Gladys 69 kV substation in the Dominion Transmission System (REC territory), 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 AE2-185 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.

5 Attachment Facilities

To accommodate the proposed AE2-185 Project, Dominion Energy will install one span of overhead 69 kV line to the point of interconnection ("POI") including 69 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)	$ 500,000
Transmission (one span)	$ 1,200,000
Total Attachment Facility Costs	$ 1,700,000

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.

6 Direct Connection Cost Estimate

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
One Breaker Station and Associated Equipment	$ 1,500,000
Total Direct Connection Facility Costs	$ 1,500,000

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.

7 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
Transmission (One span)	$ 1,600,000
Total Direct Connection Facility Costs	$ 1,600,000

8 System Reinforcement Cost Estimates

Facility	Upgrade Description	Cost
4ALTVSTA 138.0 kV - 05OTTER 138.0 kV Ckt 1	**AEP** **AEPA0014a (178) : Rebuild / reconductor 0.9 miles of overhead conductor (ACSR ~ 397.5 ~ 30/7 ~ LARK)** **Project Type : FAC** **Cost : $1,350,000** **Time Estimate : 24-36 Months** **DVP** **dom-001 (443) : Relay Change Outs (Secondary) at Altavista Substation** **Project Type : FAC** **Cost : $120,000** **Time Estimate : 6-12 Months**	$1,470,000
05OTTER 138.0 kV - 05JOHNMT 138.0 kV Ckt 1	**AEP** **AEP_AE1_REF_r0038 (148) : Current AEP End Rating: S/N: 164, S/E: 205** **1) Replace Otter Riser, Sub cond 477 ACSR 26/7 STD. $175k** **2) Replace JohnMt - Otter Line, ACSR ~ 397.5 ~ 30/7 ~ LARK Conductor Section 1, 7 Miles. $10.5M** **Project Type : FAC** **Cost : $10,670,000** **Time Estimate : 18-24 Months**	$10,670,000
3SKIMMER 115.0 kV - 05SKIMMR 69.0 kV Ckt 1	**AEP** **AEPA0016a (183) : Increase relay thermal limit above 80 MVA** **Project Type : FAC** **Cost : $25,000** **Time Estimate : 12-18 Months** **DVP** **No violation.[1] Limiting equipment owned by AEP.**	$25,000
05SMITHMTN1 138.0 kV - AC1-083 TAP 138.0 kV Ckt 1	**AEP** **AEPA0012a (168) : Rebuild / reconductor 196 ft. of overhead conductor (ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN)** **Project Type : FAC** **Cost : $55,500** **Time Estimate : 24-36 Months**	$55,500

Facility	Upgrade Description	Cost
AE1-250 TAP 138.0 kV - 05BANSTR 138.0 kV Ckt 1	**AEP** **AEPA0013a (176) : Replace 1590 AAC 61 Str. Station condutor at Banister** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-18 Months** **AEPA0013b (177) : A Sag Study will be required for the 3.3 miles of overhead conductor (2 bundle ACSR ~ 556.5 ~ 26/7 ~ DOVE) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $13,200 (no remediation required, just sag study) and $6.6 million (complete line reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : FAC** **Cost : $13,200** **Time Estimate : 6-12 Months**	$113,200
05BANSTR 138.0 kV - 05EDAN 2 138.0 kV Ckt 1	**AEP** **AEP_AE1_REF_r0019 (133) : Current End Ratings: S/N: 293, S/N: 341** **1) Banister - East Danville ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN, Conductor Section 2. 196 feet, A Sag Study will be required on the 196 foot section of line to mitigate the overload . Depending on the sag study results, cost for this upgrade is expected to be between $20,000 (no remediations required just sag study, new ratings: S/N: 296, S/E: 398) and $55.6K (complete line reconductor/rebuild required)** **Project Type : FAC** **Cost : $55,600** **Time Estimate : 6-12 Months** **AEPA0010a (161) : Rebuild / reconductor 196 ft. of overhead conductor (ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN)** **Project Type : FAC** **Cost : $55,500** **Time Estimate : 24-36 Months** **AEPA0010b (162) : Replace 138 kV station conductor at East Danville and Banister (Sub cond 1590 AAC 61 Str.)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-18 Months** **AEPA0010c (163) : Increase Relay Thermal Limit above 458 MVA at East Danville** **Project Type : FAC** **Cost : $25,000** **Time Estimate : 12-18 Months** **AEPA0010d (164) : Increase Relay Compliance Trip Limit above 458 MVA at East Danville** **Project Type : FAC** **Cost : $25,000** **Time Estimate : 12-18 Months** **AEPA0010e (165) : A Sag Study will be required for the 10.7 miles of overhead conductor (2 bundle ACSR ~ 556.5 ~ 26/7 ~ DOVE) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $42,800 (no remediation required, just sag study) and $21.4 million (complete line reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : FAC** **Cost : $42,800** **Time Estimate : 6-12 Months**	$248,300

Facility	Upgrade Description	Cost
05EDAN 2 138.0 kV - 05EDAN 1 138.0 kV Ckt Z1	**AEP** **n6124 (75) : PJM Network Upgrade n6124. Increasing the Danville East Danville 138 kV circuit summer rating to 572/572/572 MVA will still require us to rebuild the line. The network project has a projected in-service date of 06/01/2021.** **Project Type : FAC** **Cost : $9,000,000** **Time Estimate : Months**	$9,000,000
05JOHNMT 138.0 kV - 05NEWLDN 138.0 kV Ckt 1	**AEP** **AEP_AE1_REF_r0039 (149) : Current Station Rating: S/N: 167, S/E: 240** **1) Replace ACSR ~ 397.5 ~ 30/7 ~ LARK ~ Fe Clamps 9 d, Conductor Section 1, 14.43 miles** **Project Type : FAC** **Cost : $21,650,000** **Time Estimate : 12-18 Months**	$21,650,000
	TOTAL COST	**$43,232,000**

9 Schedule

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.

10 Transmission Owner Analysis

10.1 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 AE2-185 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.

10.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by Dominion. The connection of AE2-185 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

10.3 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.

11 Interconnection Customer Requirements

11.1 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.

11.2 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.

11.3 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.

12 Revenue Metering and SCADA Requirements

12.1 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.

12.1.1 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

12.2 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.

13 Network Impacts

The Queue Project AE2-185 was evaluated as a 60.0 MW (Capacity 45.0 MW) injection at Gladys 69kV substation in the Dominion area. Project AE2-185 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-185 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

13.1 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
1594528	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P1-2_#5419-A	single	296.0	96.28	98.85	DC	7.64
1594676	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#5419-A	single	296.0	93.29	94.86	DC	4.67
1594478	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	AEP_P1-2_#5419-A	single	240.0	99.55	106.33	DC	16.26
1594429	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	Base Case	single	277.0	97.31	99.49	DC	6.03
7968531	314670	2ALTVSTA	DVP	314667	4ALTVSTA	DVP	1	Base Case	single	128.78	5.33	40.27	DC	45.0
1941089	314730	2STONE MIL	DVP	314670	2ALTVSTA	DVP	1	Base Case	single	101.52	6.76	51.08	DC	45.0
1594883	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	1	AEP_SUBT_P1-3_#2109_3SKIMMER 115_2	single	55.0	99.77	105.17	DC	2.97
1594946	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	2	AEP_SUBT_P1-3_#146_3SKIMMER 115_1	single	55.0	94.41	99.77	DC	2.95
7139244	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	1	AEP_P1-2_#375	single	55.0	81.81	87.48	DC	3.12
7139331	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	2	AEP_P1-2_#375	single	55.0	78.92	84.39	DC	3.01
7968886	942670	AE2-283 TAP	DVP	314730	2STONE MIL	DVP	1	Base Case	single	66.74	5.24	67.09	DC	45.0

13.2 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
1594267	242550	05BEARSK	AEP	940080	AE1-250 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	392.0	94.02	96.67	DC	10.41
1594268	242550	05BEARSK	AEP	940080	AE1-250 TAP	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	392.0	93.23	95.84	DC	10.2
7138601	242701	05LEESVI	AEP	247499	05SMITHMTN2	AEP	1	AEP_P4_#10294_05NEWLDN 138_D	breaker	284.0	47.24	59.27	DC	34.16
7138817	242734	05NEWLDN	AEP	242569	05BRUSHT	AEP	1	AEP_P4_#10317_05REUSEN 138_D	breaker	267.0	63.8	70.23	DC	17.19
7657792	314688	3CRSTL HILL	DVP	927260	AC1-222 TAP	DVP	1	AEP_P4_#10294_05NEWLDN 138_D	breaker	350.0	50.91	55.95	DC	17.64
7657612	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	1	DVP_P4-2: H2T2068	breaker	264.5	88.18	89.33	DC	6.74
7657653	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	2	DVP_P4-2: 3202	breaker	279.1	85.06	86.37	DC	8.15
7657654	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	2	DVP_P4-2: H1T2068	breaker	279.1	83.35	84.44	DC	6.72

13.3 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
1593749	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	135.53	139.05	DC	10.41
1593750	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	135.33	138.78	DC	10.2
1593934	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	118.59	120.75	DC	6.39

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
1594675	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#8677	single	296.0	102.69	103.9	DC	3.56
1594474	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	single	167.0	115.86	125.05	DC	15.36
1594441	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	single	167.0	121.31	130.5	DC	15.36
1594447	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	AEP_P1-2_#5419-A	single	245.0	101.23	107.87	DC	16.26
1594107	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	104.2	107.71	DC	10.41
1594108	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	103.22	106.68	DC	10.2
1594424	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#5366-B	single	277.0	120.09	122.96	DC	7.93
1594425	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#6213	single	277.0	120.34	122.91	DC	7.11
1594547	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#6213	single	277.0	109.65	112.22	DC	7.11
1594548	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#5366-B	single	277.0	108.02	110.88	DC	7.93
1594431	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	124.06	133.26	DC	15.36
1594437	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	AEP_P1-2_#5419-A	single	245.0	103.11	109.75	DC	16.26
1593868	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	124.54	128.06	DC	10.41
1593869	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	123.47	126.93	DC	10.2
1594137	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	392.0	103.77	106.42	DC	10.41
1594138	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	392.0	103.59	106.2	DC	10.2

13.4 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
1594522	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P1-2_#5419-A	operation	296.0	135.14	138.59	DC	10.18
1594527	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	Base Case	operation	296.0	100.77	103.41	DC	7.79
1595007	242550	05BEARSK	AEP	940080	AE1-250 TAP	AEP	1	AEP_P1-2_#5419-A	operation	392.0	93.1	95.7	DC	10.18
7139675	242561	05BOONSBORO	AEP	242765	05REUSEN	AEP	1	AEP_P1-2_#5479	operation	240.0	59.73	67.08	DC	17.63
1594670	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#5419-A	operation	296.0	118.42	120.53	DC	6.23

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
7139622	242641	05FOREST	AEP	242561	05BOONSBORO	AEP	1	AEP_P1-2_#5479	operation	240.0	65.4	72.74	DC	17.63
1594471	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	operation	167.0	131.56	143.82	DC	20.48
1594472	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	AEP_P1-2_#5419-A	operation	240.0	119.01	128.04	DC	21.68
7139477	242701	05LEESVI	AEP	247499	05SMITHMTN2	AEP	1	AEP_P1-2_#375	operation	284.0	46.99	59.02	DC	34.16
1594999	242720	05MONETA	AEP	939010	AE1-130 TAP	AEP	1	AEP_P1-2_#5366-B	operation	409.0	93.05	95.64	DC	10.58
7139527	242734	05NEWLDN	AEP	242641	05FOREST	AEP	1	AEP_P1-2_#5479	operation	240.0	70.82	78.16	DC	17.63
1594440	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	operation	167.0	137.01	149.27	DC	20.48
1594442	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	AEP_P1-2_#5419-A	operation	245.0	120.3	129.15	DC	21.68
1594969	242775	05ROCKCA	AEP	242720	05MONETA	AEP	1	AEP_P1-2_#5366-B	operation	409.0	97.01	99.6	DC	10.58
1594898	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P1-2_#5419-A	operation	296.0	103.05	106.5	DC	10.18
1594418	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#5366-B	operation	277.0	158.7	162.52	DC	10.58
1594423	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	Base Case	operation	277.0	124.35	127.26	DC	8.04
1594542	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#5366-B	operation	277.0	132.21	136.03	DC	10.58
1594552	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	Base Case	operation	277.0	102.23	105.14	DC	8.04
1594430	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	operation	167.0	139.76	152.03	DC	20.48
1594432	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	AEP_P1-2_#5419-A	operation	245.0	122.17	131.02	DC	21.68
1941477	314670	2ALTVSTA	DVP	314667	4ALTVSTA	DVP	1	Base Case	operation	128.78	59.56	106.15	DC	60.0
7969465	314688	3CRSTL HILL	DVP	927260	AC1-222 TAP	DVP	1	AEP_P1-2_#375	operation	285.76	62.06	68.23	DC	17.63
1941969	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	1	DVP_P1-3: 6SEDGE HILL-TX#2	operation	226.73	95.22	96.84	DC	8.17
7969517	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	2	DVP_P1-3: 6SEDGE HILL-TX#1	operation	256.06	84.04	85.48	DC	8.15
7969667	314714	3PERTH	DVP	314688	3CRSTL HILL	DVP	1	AEP_P1-2_#375	operation	285.76	46.22	52.39	DC	17.63
1941088	314730	2STONE MIL	DVP	314670	2ALTVSTA	DVP	1	Base Case	operation	101.52	75.55	134.65	DC	60.0
1594884	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	1	AEP_SUBT_P1-3_#2109_3SKIMMER 115_2	operation	55.0	103.8	107.04	DC	3.96
1594947	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	2	AEP_SUBT_P1-3_#146_3SKIMMER 115_1	operation	55.0	96.89	100.1	DC	3.93
1594618	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P1-2_#5419-A	operation	296.0	123.32	126.77	DC	10.18
1594623	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	Base Case	operation	296.0	93.19	95.83	DC	7.79
1594972	926520	AC1-123 TAP	AEP	242575	05CAMDLM	AEP	1	AEP_P1-2_#5419-A	operation	284.0	100.66	101.25	DC	3.71
7969189	927260	AC1-222 TAP	DVP	314696	3SEDGE HILL	DVP	1	Base Case	operation	285.76	52.79	57.17	DC	12.52
1594815	939010	AE1-130 TAP	AEP	243892	05MEADS8	AEP	1	AEP_P1-2_#5366-B	operation	409.0	109.12	111.7	DC	10.58
1594918	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P1-2_#5419-A	operation	392.0	103.45	106.06	DC	10.18
1594920	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	Base Case	operation	335.0	90.71	93.05	DC	7.79
7968885	942670	AE2-283 TAP	DVP	314730	2STONE MIL	DVP	1	Base Case	operation	66.74	5.24	89.92	DC	60.0

13.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
1594431,1594437	19	4ALTVSTA 138.0 kV - 05OTTER 138.0 kV Ckt 1	**AEP** AEPA0014a (178) : Rebuild / reconductor 0.9 miles of overhead conductor (ACSR ~ 397.5 ~ 30/7 ~ LARK) Project Type : FAC Cost : $1,350,000 Time Estimate : 24-36 Months **DVP** dom-001 (443) : Relay Change Outs (Secondary) at Altavista Substation Project Type : FAC Cost : $120,000 Time Estimate : 6-12 Months	$1,470,000
7138601	11	05LEESVI 138.0 kV - 05SMITHMTN2 138.0 kV Ckt 1	**AEP** No violation.[1] Post queue loading less than 100%.	$0
1594441,1594447	16	05OTTER 138.0 kV - 05JOHNMT 138.0 kV Ckt 1	**AEP** AEP_AE1_REF_r0038 (148) : Current AEP End Rating: S/N: 164, S/E: 205 1) Replace Otter Riser, Sub cond 477 ACSR 26/7 STD. $175k 2) Replace JohnMt - Otter Line, ACSR ~ 397.5 ~ 30/7 ~ LARK Conductor Section 1, 7 Miles. $10.5M Project Type : FAC Cost : $10,670,000 Time Estimate : 18-24 Months	$10,670,000
1594424,1594425,1594429	4	05MEADS8 138.0 kV - 05CLOVRD 138.0 kV Ckt 1	**AEP** No Violation.[1] Current AEP End Ratings: S/N: 348, S/E: 407.	$0
1941089	6	2STONE MIL 69.0 kV - 2ALTVSTA 69.0 kV Ckt 1	**DVP** No violation.[1] Post queue loading less than 100%.	$0
7968886	9	AE2-283 TAP 69.0 kV - 2STONE MIL 69.0 kV Ckt 1	**DVP** No violation.[1] Post queue loading less than 100%.	$0

[1] If "No violation" was provided as the Upgrade Description for a facility in the System Reinforcements table then that facility met one of the following conditions:

a. 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.
b. 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.
c. 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
7139244,1594883	7	3SKIMMER 115.0 kV - 05SKIMMR 69.0 kV Ckt 1	AEP AEPA0016a (183) : Increase relay thermal limit above 80 MVA Project Type : FAC Cost : $25,000 Time Estimate : 12-18 Months DVP No violation.[1] Limiting equipment owned by AEP.	$25,000
7968531	5	2ALTVSTA 69.0 kV - 4ALTVSTA 138.0 kV Ckt 1	DVP No violation.[1] Post queue loading less than 100%.	$0
1594267,1594268	10	05BEARSK 138.0 kV - AE1-250 TAP 138.0 kV Ckt 1	AEP No violation.[1] Post queue loading less than 100%.	$0
7138817	12	05NEWLDN 138.0 kV - 05BRUSHT 138.0 kV Ckt 1	AEP No violation.[1] Post queue loading less than 100%.	$0
1593869,1593868	20	AC1-083 TAP 138.0 kV - 05BEARSK 138.0 kV Ckt 1	AEP Current AEP Ratings are S/N: 409 MVA S/E: 409 MVA. Current AEP ratings are sufficient to mitigate the overloads.	$0
1594548,1594547	18	05SMITHMTN2 138.0 kV - 05ROCKCA 138.0 kV Ckt 1	AEP No Violation.[1] Current AEP End Ratings: S/N: 409, S/E: 409.	$0
1594108,1594107	17	05SMITHMTN1 138.0 kV - AC1-083 TAP 138.0 kV Ckt 1	AEP AEPA0012a (168) : Rebuild / reconductor 196 ft. of overhead conductor (ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN) Project Type : FAC Cost : $55,500 Time Estimate : 24-36 Months	$55,500
1594137,1594138	21	AE1-250 TAP 138.0 kV - 05BANSTR 138.0 kV Ckt 1	AEP AEPA0013a (176) : Replace 1590 AAC 61 Str. Station condutor at Banister Project Type : FAC Cost : $100,000 Time Estimate : 12-18 Months AEPA0013b (177) : A Sag Study will be required for the 3.3 miles of overhead conductor (2 bundle ACSR ~ 556.5 ~ 26/7 ~ DOVE) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $13,200 (no remediation required, just sag study) and $6.6 million (complete line reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $13,200 Time Estimate : 6-12 Months	$113,200

ID	Index	Facility	Upgrade Description	Cost
7657792	13	3CRSTL HILL 115.0 kV - AC1-222 TAP 115.0 kV Ckt 1	DVP No violation.[1] Post queue loading less than 100%.	$0
1594946,7139331	8	3SKIMMER 115.0 kV - 05SKIMMR 69.0 kV Ckt 2	AEP No violation.[1] Post queue loading less than 100%. DVP No violation.[1] Limiting equipment owned by AEP.	$0
7657612	14	3SEDGE HILL 115.0 kV - 6SEDGE HILL 230.0 kV Ckt 1	DVP No violation.[1] Post queue loading less than 100%.	$0

ID	Index	Facility	Upgrade Description	Cost
1593749,1594528,1593750	1	05BANSTR 138.0 kV - 05EDAN 2 138.0 kV Ckt 1	AEP AEP_AE1_REF_r0019 (133) : Current End Ratings: S/N: 293, S/N: 341 1) Banister - East Danville ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN, Conductor Section 2. 196 feet, A Sag Study will be required on the 196 foot section of line to mitigate the overload . Depending on the sag study results, cost for this upgrade is expected to be between $20,000 (no remediations required just sag study, new ratings: S/N: 296, S/E: 398) and $55.6K (complete line reconductor/rebuild required) Project Type : FAC Cost : $55,600 Time Estimate : 6-12 Months AEPA0010a (161) : Rebuild / reconductor 196 ft. of overhead conductor (ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN) Project Type : FAC Cost : $55,500 Time Estimate : 24-36 Months AEPA0010b (162) : Replace 138 kV station conductor at East Danville and Banister (Sub cond 1590 AAC 61 Str.) Project Type : FAC Cost : $100,000 Time Estimate : 12-18 Months AEPA0010c (163) : Increase Relay Thermal Limit above 458 MVA at East Danville Project Type : FAC Cost : $25,000 Time Estimate : 12-18 Months AEPA0010d (164) : Increase Relay Compliance Trip Limit above 458 MVA at East Danville Project Type : FAC Cost : $25,000 Time Estimate : 12-18 Months AEPA0010e (165) : A Sag Study will be required for the 10.7 miles of overhead conductor (2 bundle ACSR ~ 556.5 ~ 26/7 ~ DOVE) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $42,800 (no remediation required, just sag study) and $21.4 million (complete line reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $42,800 Time Estimate : 6-12 Months	$248,300
7657654,7657653	15	3SEDGE HILL 115.0 kV - 6SEDGE HILL 230.0 kV Ckt 2	AEP No violation.[1] Post queue loading less than 100%.	$0

ID	Index	Facility	Upgrade Description	Cost
1593934,1594676,1594675	2	05EDAN 2 138.0 kV - 05EDAN 1 138.0 kV Ckt Z1	AEP n6124 (75) : PJM Network Upgrade n6124. Increasing the Danville East Danville 138 kV circuit summer rating to 572/572/572 MVA will still require us to rebuild the line. The network project has a projected in-service date of 06/01/2021. Project Type : FAC Cost : $9,000,000 Time Estimate : Months	$9,000,000
1594474,1594478	3	05JOHNMT 138.0 kV - 05NEWLDN 138.0 kV Ckt 1	AEP AEP_AE1_REF_r0039 (149) : Current Station Rating: S/N: 167, S/E: 240 1) Replace ACSR ~ 397.5 ~ 30/7 ~ LARK ~ Fe Clamps 9 d, Conductor Section 1, 14.43 miles Project Type : FAC Cost : $21,650,000 Time Estimate : 12-18 Months	$21,650,000
			TOTAL COST	$43,232,000

13.6 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.

13.6.1 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
1593749	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	135.53	139.05	DC	10.41

Bus #	Bus	MW Impact
246843	05SMG1	2.65
246844	05SMG2	6.98
246845	05SMG3	4.09
246846	05SMG4	7.21
246847	05SMG5	2.73
247284	05LEESVG	1.52
315156	1HALLBR1	1.16
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.33
924572	AB2-109 E	0.76
925661	AC1-042 C	2.77
925662	AC1-042 E	4.52
925991	AC1-075 C	2.96
925992	AC1-075 E	1.68
926021	AC1-080 C	0.99
926022	AC1-080 E	0.56
926051	AC1-083 C O1	19.07
926052	AC1-083 E O1	31.12
926521	AC1-123 C O1	12.93
926522	AC1-123 E O1	6.08
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
933621	AC2-180 C	0.37
933622	AC2-180 E	0.73
933941	AD1-017 C	3.81
933942	AD1-017 E	6.22
934921	AD1-124 C	0.7
934922	AD1-124 E	0.35
935241	AD1-161 C	2.76
935242	AD1-161 E	2.27
938451	AE1-064 C	25.38
938452	AE1-064 E	13.01
939011	AE1-130 C O1	20.81
939012	AE1-130 E O1	10.2
939941	AE1-230 C1	1.25
939942	AE1-230 E1	0.83
939943	AE1-230 E2	1.39
940081	AE1-250 C	57.33
940082	AE1-250 E	38.22
941801	AE2-185 C	7.81
941802	AE2-185 E	2.6

Bus #	Bus	MW Impact
941821	AE2-187 C	7.81
941822	AE2-187 E	2.6
942331	AE2-246	2.42
942671	AE2-283 C	6.87
942672	AE2-283 E	3.61
942751	AE2-291 C O1	6.22
942752	AE2-291 E O1	4.15
942761	AE2-292 C O1	7.75
942762	AE2-292 E O1	5.16
BLUEG	BLUEG	0.31
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	1.18
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.09
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	1.23
NEWTON	NEWTON	0.22
O-066	O-066	0.7
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.03
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.06
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.95
UNIONPOWER	UNIONPOWER	0.58

13.6.2 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
1593934	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	118.59	120.75	DC	6.39

Bus #	Bus	MW Impact
246843	05SMG1	1.6
246844	05SMG2	4.2
246845	05SMG3	2.47
246846	05SMG4	4.35
246847	05SMG5	1.64
247284	05LEESVG	0.92
315165	1HURT 1	4.13
315166	1HURT 2	4.13
919841	AA2-070	0.8
925661	AC1-042 C	1.7
925662	AC1-042 E	2.77
925991	AC1-075 C	2.48
925992	AC1-075 E	1.4
926021	AC1-080 C	0.83
926022	AC1-080 E	0.47
926051	AC1-083 C O1	11.89
926052	AC1-083 E O1	19.4
926521	AC1-123 C O1	7.63
926522	AC1-123 E O1	3.59
926641	AC1-145 C	2.02
926642	AC1-145 E	3.3
933941	AD1-017 C	2.38
933942	AD1-017 E	3.88
934921	AD1-124 C	0.38
934922	AD1-124 E	0.19
936171	AD2-023 C O1	8.69
936172	AD2-023 E O1	4.72
938451	AE1-064 C	15.29
938452	AE1-064 E	7.84
939011	AE1-130 C O1	12.53
939012	AE1-130 E O1	6.14
939941	AE1-230 C1	0.77
939942	AE1-230 E1	0.51
939943	AE1-230 E2	0.85
940081	AE1-250 C	36.21
940082	AE1-250 E	24.14
941801	AE2-185 C	4.79
941802	AE2-185 E	1.6
941821	AE2-187 C	4.79
941822	AE2-187 E	1.6
942331	AE2-246	1.49
942671	AE2-283 C	4.22

Bus #	Bus	MW Impact
942672	AE2-283 E	2.22
942751	AE2-291 C O1	4.59
942752	AE2-291 E O1	3.06
942761	AE2-292 C O1	5.72
942762	AE2-292 E O1	3.81
BLUEG	BLUEG	2.81
CALDERWOOD	CALDERWOOD	0.08
CANNELTON	CANNELTON	0.15
CBM-N	CBM-N	0.01
CBM-S2	CBM-S2	1.49
CHEOAH	CHEOAH	0.06
CHILHOWEE	CHILHOWEE	0.03
COFFEEN	COFFEEN	0.25
COTTONWOOD	COTTONWOOD	0.45
CPLE	CPLE	1.18
DUCKCREEK	DUCKCREEK	0.56
EDWARDS	EDWARDS	0.26
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.15
G-007A	G-007A	0.17
GIBSON	GIBSON	0.11
NEWTON	NEWTON	0.67
NYISO	NYISO	0.03
PRAIRIE	PRAIRIE	1.08
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.08
TATANKA	TATANKA	0.28
TILTON	TILTON	0.33
TRIMBLE	TRIMBLE	0.32
TVA	TVA	0.44
UNIONPOWER	UNIONPOWER	0.06
VFT	VFT	0.43

13.6.3 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
1594474	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	single	167.0	115.86	125.05	DC	15.36

Bus #	Bus	MW Impact
246843	05SMG1	0.8
246844	05SMG2	2.09
246845	05SMG3	1.23
246846	05SMG4	2.16
246847	05SMG5	0.82
247284	05LEESVG	1.31
315156	1HALLBR1	2.25
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.31
919841	AA2-070	0.4
925661	AC1-042 C	5.45
925991	AC1-075 C	6.8
926021	AC1-080 C	2.27
926051	AC1-083 C O1	2.77
926271	AC1-105 C O1	1.87
926641	AC1-145 C	6.49
927261	AC1-222 C	1.98
933941	AD1-017 C	0.55
934311	AD1-055 C	1.37
936331	AD2-043 C	2.69
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
941801	AE2-185 C	15.36
941821	AE2-187 C	15.36
942331	AE2-246	4.76
942671	AE2-283 C	13.52
942751	AE2-291 C O1	13.24
942761	AE2-292 C O1	16.49
BLUEG	BLUEG	1.34
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.03
CPLE	CPLE	0.79
DUCKCREEK	DUCKCREEK	0.26
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.3
PRAIRIE	PRAIRIE	0.43
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.06

13.6.4 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
1594425	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#6213	single	277.0	120.34	122.91	DC	7.11

Bus #	Bus	MW Impact
242889	05REUSENS	0.04
246843	05SMG1	2.5
246844	05SMG2	6.59
246845	05SMG3	3.86
246846	05SMG4	6.81
246847	05SMG5	2.58
247284	05LEESVG	1.42
315156	1HALLBR1	1.07
315165	1HURT 1	6.09
315166	1HURT 2	6.09
919841	AA2-070	1.25
924571	AB2-109 C	0.03
925661	AC1-042 C	2.52
925991	AC1-075 C	3.44
926021	AC1-080 C	1.15
926051	AC1-083 C O1	8.46
926521	AC1-123 C O1	11.72
926641	AC1-145 C	3.0
927261	AC1-222 C	1.15
933621	AC2-180 C	0.24
933941	AD1-017 C	1.69
934311	AD1-055 C	0.8
934921	AD1-124 C	0.5
935241	AD1-161 C	1.83
936331	AD2-043 C	1.55
938451	AE1-064 C	33.46
939011	AE1-130 C O1	42.66
939941	AE1-230 C1	1.14
940081	AE1-250 C	14.73
941801	AE2-185 C	7.11
941821	AE2-187 C	7.11
942331	AE2-246	2.21
942671	AE2-283 C	6.26
942751	AE2-291 C O1	6.53
942761	AE2-292 C O1	8.13
BLUEG	BLUEG	1.57
CANNELTON	CANNELTON	0.07
CARR	CARR	0.05
CBM-S2	CBM-S2	1.78
COFFEEN	COFFEEN	0.12
CPLE	CPLE	1.14
DUCKCREEK	DUCKCREEK	0.29

Bus #	Bus	MW Impact
EDWARDS	EDWARDS	0.14
ELMERSMITH	ELMERSMITH	0.12
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.06
NEWTON	NEWTON	0.33
PRAIRIE	PRAIRIE	0.43
RENSSELAER	RENSSELAER	0.04
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.13
TILTON	TILTON	0.18
TRIMBLE	TRIMBLE	0.18

13.6.5 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
7968531	314670	2ALTVSTA	DVP	314667	4ALTVSTA	DVP	1	Base Case	single	128.78	5.33	40.27	DC	45.0

Bus #	Bus	MW Impact
925661	AC1-042 C	15.96
926641	AC1-145 C	19.0
939941	AE1-230 C1	7.2
941801	AE2-185 C	45.0
941821	AE2-187 C	45.0
942331	AE2-246	13.95
942671	AE2-283 C	39.6

13.6.6 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
1941089	314730	2STONE MIL	DVP	314670	2ALTVSTA	DVP	1	Base Case	single	101.52	6.76	51.08	DC	45.0

Bus #	Bus	MW Impact
925661	AC1-042 C	15.96
926641	AC1-145 C	19.0
939941	AE1-230 C1	7.2
941801	AE2-185 C	45.0
941821	AE2-187 C	45.0
942331	AE2-246	13.95
942671	AE2-283 C	39.6

13.6.7 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
1594883	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	1	AEP_SUBT_P1-3_#2109_3SKIMMER 115_2	single	55.0	99.77	105.17	DC	2.97

Bus #	Bus	MW Impact
315156	1HALLBR1	0.64
315165	1HURT 1	3.62
315166	1HURT 2	3.62
925661	AC1-042 C	1.05
925991	AC1-075 C	1.92
926021	AC1-080 C	0.64
926641	AC1-145 C	1.25
939941	AE1-230 C1	0.48
941801	AE2-185 C	2.97
941821	AE2-187 C	2.97
942331	AE2-246	0.92
942671	AE2-283 C	2.61
942751	AE2-291 C O1	3.74
942761	AE2-292 C O1	4.66
BLUEG	BLUEG	0.33
CANNELTON	CANNELTON	0.02
CARR	CARR	0.0
CBM-S2	CBM-S2	0.29
COFFEEN	COFFEEN	0.03
COTTONWOOD	COTTONWOOD	0.01
CPLE	CPLE	0.19
DUCKCREEK	DUCKCREEK	0.06
EDWARDS	EDWARDS	0.03
ELMERSMITH	ELMERSMITH	0.03
FARMERCITY	FARMERCITY	0.01
GIBSON	GIBSON	0.01
NEWTON	NEWTON	0.07
PRAIRIE	PRAIRIE	0.1
RENSSELAER	RENSSELAER	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.03
TILTON	TILTON	0.04
TRIMBLE	TRIMBLE	0.04
TVA	TVA	0.01

13.6.8 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
1594946	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	2	AEP_SUBT_P1-3_#146_3SKIMMER 115_1	single	55.0	94.41	99.77	DC	2.95

Bus #	Bus	MW Impact
315156	1HALLBR1	0.63
315165	1HURT 1	3.59
315166	1HURT 2	3.59
925661	AC1-042 C	1.04
926641	AC1-145 C	1.24
939941	AE1-230 C1	0.47
941801	AE2-185 C	2.95
941821	AE2-187 C	2.95
942331	AE2-246	0.91
942671	AE2-283 C	2.59
942751	AE2-291 C O1	3.71
942761	AE2-292 C O1	4.62
BLUEG	BLUEG	0.33
CANNELTON	CANNELTON	0.02
CARR	CARR	0.0
CBM-S2	CBM-S2	0.29
COFFEEN	COFFEEN	0.03
COTTONWOOD	COTTONWOOD	0.01
CPLE	CPLE	0.19
DUCKCREEK	DUCKCREEK	0.06
EDWARDS	EDWARDS	0.03
ELMERSMITH	ELMERSMITH	0.03
FARMERCITY	FARMERCITY	0.01
GIBSON	GIBSON	0.01
NEWTON	NEWTON	0.07
PRAIRIE	PRAIRIE	0.1
RENSSELAER	RENSSELAER	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.03
TILTON	TILTON	0.04
TRIMBLE	TRIMBLE	0.04
TVA	TVA	0.01

13.6.9 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
7968886	942670	AE2-283 TAP	DVP	314730	2STONE MIL	DVP	1	Base Case	single	66.74	5.24	67.09	DC	45.0

Bus #	Bus	MW Impact
941801	AE2-185 C	45.0
942671	AE2-283 C	39.6

13.6.10 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
1594267	242550	05BEARSK	AEP	940080	AE1-250 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	392.0	94.02	96.67	DC	10.41

Bus #	Bus	MW Impact
246843	05SMG1	2.65
246844	05SMG2	6.98
246845	05SMG3	4.09
246846	05SMG4	7.21
246847	05SMG5	2.73
247284	05LEESVG	1.52
315156	1HALLBR1	1.16
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.33
924572	AB2-109 E	0.76
925661	AC1-042 C	2.77
925662	AC1-042 E	4.52
925991	AC1-075 C	2.96
925992	AC1-075 E	1.68
926021	AC1-080 C	0.99
926022	AC1-080 E	0.56
926051	AC1-083 C O1	19.07
926052	AC1-083 E O1	31.12
926521	AC1-123 C O1	12.93
926522	AC1-123 E O1	6.08
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
933621	AC2-180 C	0.37
933622	AC2-180 E	0.73
933941	AD1-017 C	3.81
933942	AD1-017 E	6.22
934921	AD1-124 C	0.7
934922	AD1-124 E	0.35
935241	AD1-161 C	2.76
935242	AD1-161 E	2.27
938451	AE1-064 C	25.38
938452	AE1-064 E	13.01
939011	AE1-130 C O1	20.81
939012	AE1-130 E O1	10.2
939841	AE1-220 C O1	4.05
939842	AE1-220 E O1	2.02
939941	AE1-230 C1	1.25
939942	AE1-230 E1	0.83
939943	AE1-230 E2	1.39
940083	AE1-250 EBAT	54.45

Bus #	Bus	MW Impact
941801	AE2-185 C	7.81
941802	AE2-185 E	2.6
941821	AE2-187 C	7.81
941822	AE2-187 E	2.6
942331	AE2-246	2.42
942671	AE2-283 C	6.87
942672	AE2-283 E	3.61
942751	AE2-291 C O1	6.22
942752	AE2-291 E O1	4.15
942761	AE2-292 C O1	7.75
942762	AE2-292 E O1	5.16
BLUEG	BLUEG	0.31
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	1.18
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.09
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	1.23
NEWTON	NEWTON	0.22
O-066	O-066	0.7
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.03
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.06
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.95
UNIONPOWER	UNIONPOWER	0.58

13.6.11 Index 11

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
7138601	247701	05LEESVI	AEP	247499	05SMITHMTN2	AEP	1	AEP_P4_#10294_05NEWLDN 138_D	breaker	284.0	47.24	59.27	DC	34.16

Bus #	Bus	MW Impact
247284	05LEESVG	4.36
315156	1HALLBR1	3.79
315165	1HURT 1	21.51
315166	1HURT 2	21.51
925661	AC1-042 C	9.09
925662	AC1-042 E	14.83
925991	AC1-075 C	11.22
925992	AC1-075 E	6.36
926021	AC1-080 C	3.75
926022	AC1-080 E	2.11
926641	AC1-145 C	10.82
926642	AC1-145 E	17.65
927261	AC1-222 C	3.11
927262	AC1-222 E	2.96
934311	AD1-055 C	2.16
934312	AD1-055 E	0.56
936331	AD2-043 C	4.25
936332	AD2-043 E	5.03
939941	AE1-230 C1	4.1
939942	AE1-230 E1	2.73
939943	AE1-230 E2	4.55
941801	AE2-185 C	25.62
941802	AE2-185 E	8.54
941821	AE2-187 C	25.62
941822	AE2-187 E	8.54
942331	AE2-246	7.94
942671	AE2-283 C	22.55
942672	AE2-283 E	11.84
942751	AE2-291 C O1	22.05
942752	AE2-291 E O1	14.7
942761	AE2-292 C O1	27.45
942762	AE2-292 E O1	18.3
BLUEG	BLUEG	1.66
CALDERWOOD	CALDERWOOD	0.09
CANNELTON	CANNELTON	0.09
CBM-N	CBM-N	0.04
CBM-S2	CBM-S2	0.37
CHEOAH	CHEOAH	0.08
CHILHOWEE	CHILHOWEE	0.03
COFFEEN	COFFEEN	0.15
COTTONWOOD	COTTONWOOD	0.41
CPLE	CPLE	0.36

Bus #	Bus	MW Impact
DUCKCREEK	DUCKCREEK	0.34
EDWARDS	EDWARDS	0.16
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.09
G-007A	G-007A	0.22
GIBSON	GIBSON	0.06
NEWTON	NEWTON	0.41
NYISO	NYISO	0.17
PRAIRIE	PRAIRIE	0.7
SANTEETLA	SANTEETLA	0.02
SMITHLAND	SMITHLAND	0.05
TATANKA	TATANKA	0.18
TILTON	TILTON	0.19
TRIMBLE	TRIMBLE	0.19
TVA	TVA	0.37
UNIONPOWER	UNIONPOWER	0.11
VFT	VFT	0.58

13.6.12 Index 12

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
7138817	247734	05NEWLDN	AEP	242569	05BRUSHT	AEP	1	AEP_P4_#10317_05REUSEN 138_D	breaker	267.0	63.8	70.23	DC	17.19

Bus #	Bus	MW Impact
247284	05LEESVG	1.09
315156	1HALLBR1	1.91
315165	1HURT 1	10.83
315166	1HURT 2	10.83
925661	AC1-042 C	4.57
925662	AC1-042 E	7.46
925991	AC1-075 C	5.75
925992	AC1-075 E	3.26
926021	AC1-080 C	1.92
926022	AC1-080 E	1.08
926051	AC1-083 C O1	2.25
926052	AC1-083 E O1	3.68
926641	AC1-145 C	5.44
926642	AC1-145 E	8.88
927261	AC1-222 C	1.67
927262	AC1-222 E	1.59
933941	AD1-017 C	0.45
933942	AD1-017 E	0.74
934311	AD1-055 C	1.16
934312	AD1-055 E	0.3
936331	AD2-043 C	2.28
936332	AD2-043 E	2.69
938451	AE1-064 C	4.97
938452	AE1-064 E	2.55
939941	AE1-230 C1	2.06
939942	AE1-230 E1	1.38
939943	AE1-230 E2	2.29
941801	AE2-185 C	12.89
941802	AE2-185 E	4.3
941821	AE2-187 C	12.89
941822	AE2-187 E	4.3
942331	AE2-246	4.0
942671	AE2-283 C	11.35
942672	AE2-283 E	5.96
942751	AE2-291 C O1	11.22
942752	AE2-291 E O1	7.48
942761	AE2-292 C O1	13.97
942762	AE2-292 E O1	9.31
BLUEG	BLUEG	1.06
CANNELTON	CANNELTON	0.05
CARR	CARR	0.02
CBM-S2	CBM-S2	1.0

Bus #	Bus	MW Impact
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	0.01
CPLE	CPLE	0.67
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.09
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.05
G-007	G-007	0.02
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.23
O-066	O-066	0.15
PRAIRIE	PRAIRIE	0.33
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.09
TILTON	TILTON	0.12
TRIMBLE	TRIMBLE	0.12
TVA	TVA	0.03

13.6.13 Index 13

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
7657792	314688	3CRSTL HILL	DVP	927260	AC1-222 TAP	DVP	1	AEP_P4_#10294_05NEWLDN 138_D	breaker	350.0	50.91	55.95	DC	17.64

Bus #	Bus	MW Impact
246843	05SMG1	0.89
246844	05SMG2	2.35
246845	05SMG3	1.38
246846	05SMG4	2.43
246847	05SMG5	0.92
247284	05LEESVG	1.21
315156	1HALLBR1	2.39
315165	1HURT 1	13.58
315166	1HURT 2	13.58
919841	AA2-070	0.45
925661	AC1-042 C	4.69
925662	AC1-042 E	7.65
925991	AC1-075 C	23.67
925992	AC1-075 E	13.41
926021	AC1-080 C	7.91
926022	AC1-080 E	4.45
926051	AC1-083 C O1	2.86
926052	AC1-083 E O1	4.67
926521	AC1-123 C O1	4.65
926522	AC1-123 E O1	2.19
926641	AC1-145 C	5.58
926642	AC1-145 E	9.11
933941	AD1-017 C	0.57
933942	AD1-017 E	0.93
936331	AD2-043 C	24.4
936332	AD2-043 E	28.87
938451	AE1-064 C	7.3
938452	AE1-064 E	3.74
939941	AE1-230 C1	2.12
939942	AE1-230 E1	1.41
939943	AE1-230 E2	2.35
941801	AE2-185 C	13.23
941802	AE2-185 E	4.41
941821	AE2-187 C	13.23
941822	AE2-187 E	4.41
942331	AE2-246	4.1
942671	AE2-283 C	11.64
942672	AE2-283 E	6.11
942751	AE2-291 C O1	32.51
942752	AE2-291 E O1	21.68
942761	AE2-292 C O1	40.48

Bus #	Bus	MW Impact
942762	AE2-292 E O1	26.99
CARR	CARR	0.03
CATAWBA	CATAWBA	0.16
CBM-S1	CBM-S1	0.68
CBM-W1	CBM-W1	1.92
CBM-W2	CBM-W2	5.42
CIN	CIN	0.89
G-007	G-007	0.15
HAMLET	HAMLET	0.48
IPL	IPL	0.58
LGEE	LGEE	0.27
MEC	MEC	1.4
MECS	MECS	1.19
O-066	O-066	0.96
RENSSELAER	RENSSELAER	0.03
WEC	WEC	0.23

13.6.14 Index 14

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
7657612	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	1	DVP_P4-2: H2T2068	breaker	264.5	88.18	89.33	DC	6.74

Bus #	Bus	MW Impact
315150	1BUGGS 1	16.56
315151	1BUGGS 2	16.56
315156	1HALLBR1	1.0
315165	1HURT 1	5.69
315166	1HURT 2	5.69
315266	1PLYWOOD A	2.43
924021	AB2-043 C O1	0.44
924022	AB2-043 E O1	5.94
924161	AB2-060 C O1	1.25
924162	AB2-060 E O1	4.84
924301	AB2-077 C O1	0.29
924302	AB2-077 E O1	1.58
924311	AB2-078 C O1	0.29
924312	AB2-078 E O1	1.58
924321	AB2-079 C O1	0.29
924322	AB2-079 E O1	1.58
924401	AB2-089 C	1.56
924402	AB2-089 E	0.8
925611	AC1-036 C	0.1
925612	AC1-036 E	0.78
925661	AC1-042 C	1.79
925662	AC1-042 E	2.92
925781	AC1-054 C O1	4.84
925782	AC1-054 E O1	2.23
925991	AC1-075 C	12.59
925992	AC1-075 E	7.13
926021	AC1-080 C	4.21
926022	AC1-080 E	2.37
926271	AC1-105 C O1	14.84
926272	AC1-105 E O1	7.39
926641	AC1-145 C	2.13
926642	AC1-145 E	3.48
927261	AC1-222 C	10.59
927262	AC1-222 E	10.08
934231	AD1-050 C	3.43
934232	AD1-050 E	1.88
934311	AD1-055 C	7.35
934312	AD1-055 E	1.9
935222	AD1-157 E	0.63
935231	AD1-160 C	0.69
935232	AD1-160 E	0.95

Bus #	Bus	MW Impact
936261	AD2-033 C	12.4
936262	AD2-033 E	8.26
936331	AD2-043 C	13.72
936332	AD2-043 E	16.24
936361	AD2-046 C O1	7.81
936362	AD2-046 E O1	3.59
936481	AD2-063 C O1	15.84
936482	AD2-063 E O1	10.56
938371	AE1-056 C	4.05
938372	AE1-056 E	2.21
939181	AE1-148 C O1	7.86
939182	AE1-148 E O1	5.24
939371	AE1-168 C	11.58
939372	AE1-168 E	7.72
939941	AE1-230 C1	0.81
939942	AE1-230 E1	0.54
939943	AE1-230 E2	0.48
940241	AE2-006	0.44
940661	AE2-053	2.92
941801	AE2-185 C	5.05
941802	AE2-185 E	1.68
941821	AE2-187 C	5.05
941822	AE2-187 E	1.68
942331	AE2-246	1.57
942451	AE2-258	2.7
942461	AE2-259 C O1	4.29
942462	AE2-259 E O1	2.86
942671	AE2-283 C	4.45
942672	AE2-283 E	2.34
942711	AE2-287 C O1	7.77
942712	AE2-287 E O1	5.18
942751	AE2-291 C O1	16.62
942752	AE2-291 E O1	11.08
942761	AE2-292 C O1	20.69
942762	AE2-292 E O1	13.79
BLUEG	BLUEG	2.18
CALDERWOOD	CALDERWOOD	0.66
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.78
CBM-N	CBM-N	0.03
CHEOAH	CHEOAH	0.62
CHILHOWEE	CHILHOWEE	0.21
COFFEEN	COFFEEN	0.29
COTTONWOOD	COTTONWOOD	2.09
DUCKCREEK	DUCKCREEK	0.57
EDWARDS	EDWARDS	0.25
ELMERSMITH	ELMERSMITH	0.3
FARMERCITY	FARMERCITY	0.22
G-007A	G-007A	0.16
GIBSON	GIBSON	0.1
HAMLET	HAMLET	1.48
NEWTON	NEWTON	0.74

Bus #	Bus	MW Impact
NYISO	NYISO	0.14
PRAIRIE	PRAIRIE	1.67
SANTEETLA	SANTEETLA	0.19
SMITHLAND	SMITHLAND	0.16
TATANKA	TATANKA	0.36
TILTON	TILTON	0.29
TRIMBLE	TRIMBLE	0.24
TVA	TVA	1.73
UNIONPOWER	UNIONPOWER	0.93
VFT	VFT	0.43

13.6.15 Index 15

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
7657653	314696	3SEDGE HILL	DVP	314697	6SEDGE HILL	DVP	2	DVP_P4-2: 3202	breaker	279.1	85.06	86.37	DC	8.15

Bus #	Bus	MW Impact
315150	1BUGGS 1	18.94
315151	1BUGGS 2	18.94
315156	1HALLBR1	1.2
315165	1HURT 1	6.78
315166	1HURT 2	6.78
315266	1PLYWOOD A	2.78
924021	AB2-043 C O1	0.5
924022	AB2-043 E O1	6.68
924161	AB2-060 C O1	1.41
924162	AB2-060 E O1	5.44
924301	AB2-077 C O1	0.33
924302	AB2-077 E O1	1.78
924311	AB2-078 C O1	0.33
924312	AB2-078 E O1	1.78
924321	AB2-079 C O1	0.33
924322	AB2-079 E O1	1.78
924401	AB2-089 C	1.83
924402	AB2-089 E	0.94
925611	AC1-036 C	0.11
925612	AC1-036 E	0.84
925661	AC1-042 C	2.17
925662	AC1-042 E	3.54
925781	AC1-054 C O1	5.69
925782	AC1-054 E O1	2.62
925991	AC1-075 C	14.49
925992	AC1-075 E	8.21
926021	AC1-080 C	4.84
926022	AC1-080 E	2.72
926271	AC1-105 C O1	16.91
926272	AC1-105 E O1	8.42
926641	AC1-145 C	2.58
926642	AC1-145 E	4.21
927261	AC1-222 C	12.1
927262	AC1-222 E	11.52
934231	AD1-050 C	4.03
934232	AD1-050 E	2.2
934311	AD1-055 C	8.4
934312	AD1-055 E	2.17
935222	AD1-157 E	0.61
935231	AD1-160 C	0.67
935232	AD1-160 E	0.92
936261	AD2-033 C	13.5

Bus #	Bus	MW Impact
936262	AD2-033 E	9.0
936331	AD2-043 C	15.68
936332	AD2-043 E	18.56
936361	AD2-046 C O1	9.1
936362	AD2-046 E O1	4.18
936481	AD2-063 C O1	17.58
936482	AD2-063 E O1	11.72
938371	AE1-056 C	3.94
938372	AE1-056 E	2.15
939181	AE1-148 C O1	9.12
939182	AE1-148 E O1	6.08
939371	AE1-168 C	12.01
939372	AE1-168 E	8.01
939941	AE1-230 C1	0.98
939942	AE1-230 E1	0.65
939943	AE1-230 E2	0.58
940241	AE2-006	0.47
940661	AE2-053	3.4
941801	AE2-185 C	6.11
941802	AE2-185 E	2.04
941821	AE2-187 C	6.11
941822	AE2-187 E	2.04
942331	AE2-246	1.89
942451	AE2-258	3.04
942671	AE2-283 C	5.38
942672	AE2-283 E	2.82
942711	AE2-287 C O1	8.68
942712	AE2-287 E O1	5.79
942751	AE2-291 C O1	19.24
942752	AE2-291 E O1	12.82
942761	AE2-292 C O1	23.95
942762	AE2-292 E O1	15.97
CALDERWOOD	CALDERWOOD	0.15
CARR	CARR	0.03
CATAWBA	CATAWBA	0.3
CBM-W1	CBM-W1	0.38
CHEOAH	CHEOAH	0.14
CHILHOWEE	CHILHOWEE	0.05
CIN	CIN	0.21
COTTONWOOD	COTTONWOOD	0.39
FARMERCITY	FARMERCITY	0.0
G-007	G-007	0.12
HAMLET	HAMLET	0.67
IPL	IPL	0.14
LGEE	LGEE	0.07
MEC	MEC	0.07
MECS	MECS	0.37
O-066	O-066	0.74
PRAIRIE	PRAIRIE	0.02
RENSSELAER	RENSSELAER	0.02
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.01

Bus #	Bus	MW Impact
TVA	TVA	0.29
UNIONPOWER	UNIONPOWER	0.23
WEC	WEC	0.05

13.6.16 Index 16

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
1594441	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	single	167.0	121.31	130.5	DC	15.36

Bus #	Bus	MW Impact
246843	05SMG1	0.8
246844	05SMG2	2.09
246845	05SMG3	1.23
246846	05SMG4	2.16
246847	05SMG5	0.82
247284	05LEESVG	1.31
315156	1HALLBR1	2.25
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.31
919841	AA2-070	0.4
925661	AC1-042 C	5.45
925991	AC1-075 C	6.8
926021	AC1-080 C	2.27
926051	AC1-083 C O1	2.77
926271	AC1-105 C O1	1.87
926641	AC1-145 C	6.49
927261	AC1-222 C	1.98
933941	AD1-017 C	0.55
934311	AD1-055 C	1.37
936331	AD2-043 C	2.69
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
941801	AE2-185 C	15.36
941821	AE2-187 C	15.36
942331	AE2-246	4.76
942671	AE2-283 C	13.52
942751	AE2-291 C O1	13.24
942761	AE2-292 C O1	16.49
BLUEG	BLUEG	1.34
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.03
CPLE	CPLE	0.79
DUCKCREEK	DUCKCREEK	0.26
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.3
PRAIRIE	PRAIRIE	0.43
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.06

13.6.17 Index 17

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
1594107	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	104.2	107.71	DC	10.41

Bus #	Bus	MW Impact
246843	05SMG1	2.65
246844	05SMG2	6.98
246845	05SMG3	4.09
246846	05SMG4	7.21
246847	05SMG5	2.73
247284	05LEESVG	1.52
315156	1HALLBR1	1.16
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.33
924572	AB2-109 E	0.76
925661	AC1-042 C	2.77
925662	AC1-042 E	4.52
925991	AC1-075 C	2.96
925992	AC1-075 E	1.68
926021	AC1-080 C	0.99
926022	AC1-080 E	0.56
926521	AC1-123 C O1	12.93
926522	AC1-123 E O1	6.08
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
933621	AC2-180 C	0.37
933622	AC2-180 E	0.73
934921	AD1-124 C	0.7
934922	AD1-124 E	0.35
935241	AD1-161 C	2.76
935242	AD1-161 E	2.27
938451	AE1-064 C	25.38
938452	AE1-064 E	13.01
939011	AE1-130 C O1	20.81
939012	AE1-130 E O1	10.2
939841	AE1-220 C O1	4.05
939842	AE1-220 E O1	2.02
939941	AE1-230 C1	1.25
939942	AE1-230 E1	0.83
939943	AE1-230 E2	1.39
940083	AE1-250 EBAT	54.45
941801	AE2-185 C	7.81
941802	AE2-185 E	2.6
941821	AE2-187 C	7.81
941822	AE2-187 E	2.6

Bus #	Bus	MW Impact
942331	AE2-246	2.42
942671	AE2-283 C	6.87
942672	AE2-283 E	3.61
942751	AE2-291 C O1	6.22
942752	AE2-291 E O1	4.15
942761	AE2-292 C O1	7.75
942762	AE2-292 E O1	5.16
BLUEG	BLUEG	0.31
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	1.18
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.09
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	1.23
NEWTON	NEWTON	0.22
O-066	O-066	0.7
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.03
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.06
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.95
UNIONPOWER	UNIONPOWER	0.58

13.6.18 Index 18

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
1594547	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#6213	single	277.0	109.65	112.22	DC	7.11

Bus #	Bus	MW Impact
242889	05REUSENS	0.04
246843	05SMG1	2.5
246844	05SMG2	6.59
246845	05SMG3	3.86
246846	05SMG4	6.81
246847	05SMG5	2.58
247284	05LEESVG	1.42
315156	1HALLBR1	1.07
315165	1HURT 1	6.09
315166	1HURT 2	6.09
919841	AA2-070	1.25
924571	AB2-109 C	0.03
925661	AC1-042 C	2.52
925991	AC1-075 C	3.44
926021	AC1-080 C	1.15
926051	AC1-083 C O1	8.46
926521	AC1-123 C O1	11.72
926641	AC1-145 C	3.0
927261	AC1-222 C	1.15
933621	AC2-180 C	0.24
933941	AD1-017 C	1.69
934311	AD1-055 C	0.8
934921	AD1-124 C	0.5
935241	AD1-161 C	1.83
936331	AD2-043 C	1.55
939941	AE1-230 C1	1.14
940081	AE1-250 C	14.73
941801	AE2-185 C	7.11
941821	AE2-187 C	7.11
942331	AE2-246	2.21
942671	AE2-283 C	6.26
942751	AE2-291 C O1	6.53
942761	AE2-292 C O1	8.13
BLUEG	BLUEG	1.57
CANNELTON	CANNELTON	0.07
CARR	CARR	0.05
CBM-S2	CBM-S2	1.78
COFFEEN	COFFEEN	0.12
CPLE	CPLE	1.14
DUCKCREEK	DUCKCREEK	0.29
EDWARDS	EDWARDS	0.14
ELMERSMITH	ELMERSMITH	0.12

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.06
NEWTON	NEWTON	0.33
PRAIRIE	PRAIRIE	0.43
RENSSELAER	RENSSELAER	0.04
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.13
TILTON	TILTON	0.18
TRIMBLE	TRIMBLE	0.18

13.6.19 Index 19

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
1594431	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	124.06	133.26	DC	15.36

Bus #	Bus	MW Impact
246843	05SMG1	0.8
246844	05SMG2	2.09
246845	05SMG3	1.23
246846	05SMG4	2.16
246847	05SMG5	0.82
247284	05LEESVG	1.31
315156	1HALLBR1	2.25
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.31
919841	AA2-070	0.4
925661	AC1-042 C	5.45
925991	AC1-075 C	6.8
926021	AC1-080 C	2.27
926051	AC1-083 C O1	2.77
926271	AC1-105 C O1	1.87
926641	AC1-145 C	6.49
927261	AC1-222 C	1.98
933941	AD1-017 C	0.55
934311	AD1-055 C	1.37
936331	AD2-043 C	2.69
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
941801	AE2-185 C	15.36
941821	AE2-187 C	15.36
942331	AE2-246	4.76
942671	AE2-283 C	13.52
942751	AE2-291 C O1	13.24
942761	AE2-292 C O1	16.49
BLUEG	BLUEG	1.34
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.03
CPLE	CPLE	0.79
DUCKCREEK	DUCKCREEK	0.26
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.3
PRAIRIE	PRAIRIE	0.43
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.06

13.6.20 Index 20

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
1593868	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	124.54	128.06	DC	10.41

Bus #	Bus	MW Impact
246843	05SMG1	2.65
246844	05SMG2	6.98
246845	05SMG3	4.09
246846	05SMG4	7.21
246847	05SMG5	2.73
247284	05LEESVG	1.52
315156	1HALLBR1	1.16
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.33
924572	AB2-109 E	0.76
925661	AC1-042 C	2.77
925662	AC1-042 E	4.52
925991	AC1-075 C	2.96
925992	AC1-075 E	1.68
926021	AC1-080 C	0.99
926022	AC1-080 E	0.56
926051	AC1-083 C O1	19.07
926052	AC1-083 E O1	31.12
926521	AC1-123 C O1	12.93
926522	AC1-123 E O1	6.08
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
933621	AC2-180 C	0.37
933622	AC2-180 E	0.73
933941	AD1-017 C	3.81
933942	AD1-017 E	6.22
934921	AD1-124 C	0.7
934922	AD1-124 E	0.35
935241	AD1-161 C	2.76
935242	AD1-161 E	2.27
938451	AE1-064 C	25.38
938452	AE1-064 E	13.01
939011	AE1-130 C O1	20.81
939012	AE1-130 E O1	10.2
939841	AE1-220 C O1	4.05
939842	AE1-220 E O1	2.02
939941	AE1-230 C1	1.25
939942	AE1-230 E1	0.83
939943	AE1-230 E2	1.39
940083	AE1-250 EBAT	54.45

Bus #	Bus	MW Impact
941801	AE2-185 C	7.81
941802	AE2-185 E	2.6
941821	AE2-187 C	7.81
941822	AE2-187 E	2.6
942331	AE2-246	2.42
942671	AE2-283 C	6.87
942672	AE2-283 E	3.61
942751	AE2-291 C O1	6.22
942752	AE2-291 E O1	4.15
942761	AE2-292 C O1	7.75
942762	AE2-292 E O1	5.16
BLUEG	BLUEG	0.31
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	1.18
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.09
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	1.23
NEWTON	NEWTON	0.22
O-066	O-066	0.7
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.03
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.06
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.95
UNIONPOWER	UNIONPOWER	0.58

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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
1594138	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10213_05CLOV4 EQ 999_A	breaker	392.0	103.59	106.2	DC	10.2

Bus #	Bus	MW Impact
246843	05SMG1	2.63
246844	05SMG2	6.94
246845	05SMG3	4.07
246846	05SMG4	7.17
246847	05SMG5	2.71
247284	05LEESVG	1.5
315156	1HALLBR1	1.14
315165	1HURT 1	6.46
315166	1HURT 2	6.46
919841	AA2-070	1.32
924572	AB2-109 E	0.7
925661	AC1-042 C	2.71
925662	AC1-042 E	4.43
925991	AC1-075 C	2.88
925992	AC1-075 E	1.63
926021	AC1-080 C	0.96
926022	AC1-080 E	0.54
926051	AC1-083 C O1	19.02
926052	AC1-083 E O1	31.02
926521	AC1-123 C O1	12.77
926522	AC1-123 E O1	6.01
926641	AC1-145 C	3.23
926642	AC1-145 E	5.27
933621	AC2-180 C	0.35
933622	AC2-180 E	0.69
933941	AD1-017 C	3.8
933942	AD1-017 E	6.21
934921	AD1-124 C	0.67
934922	AD1-124 E	0.33
935241	AD1-161 C	2.62
935242	AD1-161 E	2.15
938451	AE1-064 C	25.22
938452	AE1-064 E	12.93
939011	AE1-130 C O1	20.68
939012	AE1-130 E O1	10.13
939941	AE1-230 C1	1.22
939942	AE1-230 E1	0.82
939943	AE1-230 E2	1.36
940081	AE1-250 C	57.24
940082	AE1-250 E	38.16
941801	AE2-185 C	7.65

Bus #	Bus	MW Impact
941802	AE2-185 E	2.55
941821	AE2-187 C	7.65
941822	AE2-187 E	2.55
942331	AE2-246	2.37
942671	AE2-283 C	6.73
942672	AE2-283 E	3.54
942751	AE2-291 C O1	6.07
942752	AE2-291 E O1	4.05
942761	AE2-292 C O1	7.56
942762	AE2-292 E O1	5.04
BLUEG	BLUEG	0.27
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	1.18
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.08
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	1.24
NEWTON	NEWTON	0.21
O-066	O-066	0.71
PRAIRIE	PRAIRIE	0.65
RENSSELAER	RENSSELAER	0.03
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.06
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.95
UNIONPOWER	UNIONPOWER	0.58

Affected Systems

13.7 Affected Systems

13.7.1 LG&E

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

13.7.2 MISO

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

13.7.3 TVA

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

13.7.4 Duke Energy Progress

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

13.7.5 NYISO

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

13.8 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_SUBT_P1-3_#146_3SKIMMER 115_1	CONTINGENCY 'AEP_SUBT_P1-3_#146_3SKIMMER 115_1' OPEN BRANCH FROM BUS 314861 TO BUS 242886 CKT 1 / 314861 3SKIMMER 115 242886 05SKIMMR 69.0 1 END
DVP_P1-3: 6SEDGE HILL-TX#1	CONTINGENCY 'DVP_P1-3: 6SEDGE HILL-TX#1' OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 1 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END
AEP_P1-2_#5366-B	CONTINGENCY 'AEP_P1-2_#5366-B' OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1 / 242549 05BANSTR 138 940080 AE1-250 TAP 138 1 OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242549 TO BUS 314668 CKT Z1 / 242549 05BANSTR 138 314668 4BANISTR 138 Z1 END
AEP_SUBT_P1-3_#2109_3SKIMMER 115_2	CONTINGENCY 'AEP_SUBT_P1-3_#2109_3SKIMMER 115_2' OPEN BRANCH FROM BUS 314861 TO BUS 242886 CKT 2 / 314861 3SKIMMER 115 242886 05SKIMMR 69.0 2 END
AEP_P1-2_#8677	CONTINGENCY 'AEP_P1-2_#8677' OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242770 CKT 1 / 242629 05E.MONU 138 242770 05RIGIS 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 243948 CKT 1 / 242629 05E.MONU 138 243948 05BRANTLY 69.0 1 REMOVE SWSHUNT FROM BUS 242629 / 242629 05E.MONU 138 END
AEP_P1-2_#5419-A	CONTINGENCY 'AEP_P1-2_#5419-A' OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END

Contingency Name	Contingency Definition
AEP_P4_#10213_05CLOV4 EQ 999_A	CONTINGENCY 'AEP_P4_#10213_05CLOV4 EQ 999_A' OPEN BRANCH FROM BUS 242560 TO BUS 242607 CKT 1 / 242560 05BONSCK 138 242607 05CLOVRD 138 1 OPEN BRANCH FROM BUS 242560 TO BUS 242840 CKT 1 / 242560 05BONSCK 138 242840 05VINTON 138 1 OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 242773 TO BUS 242840 CKT 1 / 242773 05ROANO1 138 242840 05VINTON 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END
DVP_P4-2: H2T2068	CONTINGENCY 'DVP_P4-2: H2T2068' /* SEDGE HILL 230 KV OPEN BRANCH FROM BUS 934610 TO BUS 314697 CKT 1 /* AD1-087 TAP 230.00 - 6SEDGE HILL 230.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 2 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END
AEP_P4_#10317_05REUSEN 138_D	CONTINGENCY 'AEP_P4_#10317_05REUSEN 138_D' OPEN BRANCH FROM BUS 242561 TO BUS 242641 CKT 1 / 242561 05BOONSBORO 138 242641 05FOREST 138 1 OPEN BRANCH FROM BUS 242561 TO BUS 242765 CKT 1 / 242561 05BOONSBORO 138 242765 05REUSEN 138 1 OPEN BRANCH FROM BUS 242591 TO BUS 242765 CKT 1 / 242591 05CENTRR 138 242765 05REUSEN 138 1 OPEN BRANCH FROM BUS 242641 TO BUS 242734 CKT 1 / 242641 05FOREST 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242719 TO BUS 242765 CKT 1 / 242719 05MONEL 138 242765 05REUSEN 138 1 OPEN BRANCH FROM BUS 242765 TO BUS 242882 CKT 4 / 242765 05REUSEN 138 242882 05REUSENS 69.0 4 OPEN BRANCH FROM BUS 242765 TO BUS 242889 CKT 1 / 242765 05REUSEN 138 242889 05REUSENS 34.5 1 REMOVE SWSHUNT FROM BUS 242765 / 242765 05REUSEN 138 OPEN BRANCH FROM BUS 242860 TO BUS 242882 CKT 1 / 242860 05ABERT 69.0 242882 05REUSENS 69.0 1 OPEN BRANCH FROM BUS 242876 TO BUS 242882 CKT 1 / 242876 05MONROE A 69.0 242882 05REUSENS 69.0 1 OPEN BRANCH FROM BUS 247360 TO BUS 242882 CKT 1 / 247360 05PEAKLANDSS69.0 242882 05REUSENS 69.0 1 REMOVE SWSHUNT FROM BUS 242882 / 242882 05REUSENS 69.0 OPEN BRANCH FROM BUS 247866 TO BUS 242889 CKT 1 / 247866 05GLAMORGNSS34.5 242889 05REUSENS 34.5 1 REMOVE UNIT 1 FROM BUS 242889 / 242889 05REUSENS 34.5 END

Contingency Name	Contingency Definition
AEP_P4_#10294_05NEWLDN 138_D	CONTINGENCY 'AEP_P4_#10294_05NEWLDN 138_D' OPEN BRANCH FROM BUS 242569 TO BUS 242734 CKT 1 / 242569 05BRUSHT 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242641 TO BUS 242734 CKT 1 / 242641 05FOREST 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242687 TO BUS 242734 CKT 1 / 242687 05JOHNMT 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242687 TO BUS 242741 CKT 1 / 242687 05JOHNMT 138 242741 05OTTER 138 1 OPEN BRANCH FROM BUS 242741 TO BUS 314667 CKT 1 / 242741 05OTTER 138 314667 4ALTVSTA 138 1 END
AEP_P1-2_#5479	CONTINGENCY 'AEP_P1-2_#5479' OPEN BRANCH FROM BUS 242569 TO BUS 243945 CKT 1 / 242569 05BRUSHT 138 243945 05LYNBROOK 138 1 OPEN BRANCH FROM BUS 242569 TO BUS 242734 CKT 1 / 242569 05BRUSHT 138 242734 05NEWLDN 138 1 END
AEP_P1-2_#375	CONTINGENCY 'AEP_P1-2_#375' OPEN BRANCH FROM BUS 242687 TO BUS 242734 CKT 1 / 242687 05JOHNMT 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242687 TO BUS 242741 CKT 1 / 242687 05JOHNMT 138 242741 05OTTER 138 1 OPEN BRANCH FROM BUS 242741 TO BUS 314667 CKT 1 / 242741 05OTTER 138 314667 4ALTVSTA 138 1 END
DVP_P4-2: H1T2068	CONTINGENCY 'DVP_P4-2: H1T2068' /* SEDGE HILL 230 KV OPEN BRANCH FROM BUS 934610 TO BUS 314697 CKT 1 /* AD1-087 TAP 230.00 - 6SEDGE HILL 230.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 1 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END
AEP_P1-2_#6213	CONTINGENCY 'AEP_P1-2_#6213' OPEN BRANCH FROM BUS 242748 TO BUS 243951 CKT 1 / 242748 05PENHOK 138 243951 05REDWOOD 138 1 OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138 242802 05SMITHMTN1 138 1 OPEN BRANCH FROM BUS 243951 TO BUS 242843 CKT 1 / 243951 05REDWOOD 138 242843 05WLAKE 138 1 END
Base Case	
DVP_P1-3: 6SEDGE HILL-TX#2	CONTINGENCY 'DVP_P1-3: 6SEDGE HILL-TX#2' OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 2 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END

Contingency Name	Contingency Definition
AEP_P4_#10210_05CLOVRD 138_A2	CONTINGENCY 'AEP_P4_#10210_05CLOVRD 138_A2' OPEN BRANCH FROM BUS 244044 TO BUS 242607 CKT 1 / 244044 05CLOV4 EQ 999 242607 05CLOVRD 138 1 OPEN BRANCH FROM BUS 244044 TO BUS 244041 CKT 1 / 244044 05CLOV4 EQ 999 244041 05CLOV 4 69.0 1 OPEN BRANCH FROM BUS 244044 TO BUS 244043 CKT 1 / 244044 05CLOV4 EQ 999 244043 05CLOV4 34.5 1 OPEN BRANCH FROM BUS 242607 TO BUS 243883 CKT 1 / 242607 05CLOVRD 138 243883 05LAKEFR 138 1 OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END
DVP_P4-2: 3202	CONTINGENCY 'DVP_P4-2: 3202' /* SEDGE HILL 115 KV OPEN BRANCH FROM BUS 313852 TO BUS 314716 CKT 1 /* 3WELCOTAP 115.00 - 3REEDY C 115.00 OPEN BRANCH FROM BUS 313852 TO BUS 314718 CKT 1 /* 3WELCOTAP 115.00 - 3S BOSTN 115.00 OPEN BRANCH FROM BUS 313852 TO BUS 314724 CKT 1 /* 3WELCOTAP 115.00 - 3WELCO 115.00 OPEN BRANCH FROM BUS 314696 TO BUS 314717 CKT 1 /* 3SEDGE HILL 115.00 - 3SINAI 115.00 OPEN BRANCH FROM BUS 314717 TO BUS 314718 CKT 1 /* 3SINAI 115.00 - 3S BOSTN 115.00 OPEN BUS 313852 /* ISLAND: 3WELCOTAP 115.00 OPEN BUS 314717 /* ISLAND: 3SINAI 115.00 OPEN BUS 314718 /* ISLAND: 3S BOSTN 115.00 OPEN BUS 314724 /* ISLAND: 3WELCO 115.00 OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 1 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END

Short Circuit

13.9 Short Circuit

The following Breakers are overduty:

None

14 Attachment 1 – One Line Diagram