Generation Interconnection

Feasibility Study Report

for

Queue Project AE1-250

BEARSKIN- BANISTER 138 KV

90 MW Capacity / 150 MW Energy

June, 2019

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 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.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer has proposed a Solar; Storage generating facility located in Pittsylvania County, Virginia. The installed facilities will have a total capability of 150 MW with 90 MW of this output being recognized by PJM as Capacity. The project includes both solar and battery storage, with separate inverters, fed through a single main transformer. The project will employ a controller to limit the output as measured at the high side of the main transformer to 150 MW, but the output could consist of all solar, all storage, or a mix. In addition, the Interconnection Customer has indicated that at times they will charge the batteries from the grid. The solar and storage will need to be metered separately. The proposed in-service date for this project is September, 2021. This study does not imply a TO commitment to this in-service date.

The Feasibility Study includes Short Circuit and Peak Load steady state power flow analyses. The conduct of power flow studies at other load levels, stability analysis, and coordination with non-PJM Transmission Planners, as required under the PJM planning process, is not performed during the Generation Interconnection Feasibility Study phase of the PJM study process. Additional reinforcement requirements for this Interconnection Request may be defined during the conduct of these additional analyses which shall be performed following execution of the System Impact Study agreement.

Due to the existence of pumped hydro facilities in the vicinity of the POI, additional analyses will be performed in the System Impact Study phase for the different operating modes.

The objective of this Feasibility Study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required maintaining the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Queue Number	AE1-250
Project Name	BEARSKIN – BANISTER 138 KV
State	Virginia
County	Pittsylvania
Transmission Owner	AEP
MFO	150
MWE	150
MWC	90
Fuel	Solar; Storage
Basecase Study Year	2022

Point of Interconnection

AE1-250 will interconnect with the AEP transmission system at the Bearskin to Banister 138 kV section of Smith Mountain to East Danville section of 138kV Circuit (See figure 1).

To accommodate the interconnection on the Bearskin – Banister 138kV section of Smith Mountain – East Danville 138kV Circuit, a new three (3) circuit breaker 138kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed (see Figure 1). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

Cost Summary

The AE1-250 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 6,000,000
Direct Connection Network Upgrade	$ 1,250,000
Non Direct Connection Network Upgrades	$ 500,000
Total Costs	$ 7,750,000

In addition, the AE1-250 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 193,562,100

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

Transmission Owner Scope of Work

Attachment Facilities

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
▪ Construct a new three (3) circuit breaker 138 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus (See Figure 1). Installation of associated protection and control equipment, 138 kV line risers and SCADA will also be required.	$ 6,000,000
Total Attachment Facility Costs	$ 6,000,000

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
Bearskin – Banister 138kV 138 kV T-Line Cut In	$ 1,000,000
138kV Revenue Metering	$ 250,000
Total Direct Connection Facility Costs	$ 1,250,000

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
Upgrade line protections & Controls at the Smith Mountain 138kV Substation	$ 250,000
Upgrade line protections & Controls at the East Danville 138kV Substation	$ 250,000
Total Non-Direct Connection Facility Costs	$ 500,000

Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

Schedule

It is anticipated that the time between receipt of executed Agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would generally be between 24 to 36 months after Agreement execution.

Transmission Owner Analysis

As indicated in the upgrade descriptions, portions of several of the identified constraints will be mitigated by approved baseline project b2697.

Interconnection Customer Requirements

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of RE Giles LLC's generating plant and the costs for the line connecting the generating plant to the Bearskin – Banister 138kV section of Smith Mountain – East Danville 138kV Circuit are not included in this report; these are assumed to be RE Giles LLC's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 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.
2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

Revenue Metering and SCADA Requirements

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.

AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link:

http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

Network Impacts

The Queue Project AE1-250 was evaluated as a 150 MW (Capacity 90 MW) injection via a new station cut into Bearskin to Banister 138 kV section of Smith Mountain – East Danville 138kV circuit in the AEP area. Project AE1-250 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-250 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

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
920429	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#8677	single	296.0	91.12	102.85	DC	34.72
591033	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P1-2_#5419-A	single	284.0	102.05	106.59	DC	12.89
920324	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P1-2_#5419-A	single	284.0	102.05	106.59	DC	12.89
920122	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#5366-B	single	277.0	111.8	122.67	DC	30.1
920126	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	Base Case	single	277.0	96.77	101.35	DC	12.68
920277	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#5366-B	single	277.0	99.76	110.63	DC	30.1
591186	938490	AE1-068 TAP	DVP	314902	8CARSON	DVP	1	DVP_P1-2: LN 511	single	4070.2	99.73	100.07	DC	13.51

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
919596	242544	05AXTON	AEP	242620	05DANVL2	AEP	1	AEP_P4_#10171_05AXTON 138_G	breaker	382.0	121.0	122.03	DC	11.36
919452	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	103.02	135.3	DC	95.56
919453	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	102.83	135.05	DC	95.4
921160	242620	05DANVL2	AEP	242631	05EDAN 1	AEP	1	AEP_P7-1_#10880	tower	402.0	98.14	101.79	DC	21.12
919891	242631	05EDAN 1	AEP	242632	05EDAN 2	AEP	Z1	AEP_P4_#2916_05J.FERR765_A	breaker	296.0	91.91	101.23	DC	49.74
921151	242631	05EDAN 1	AEP	242632	05EDAN 2	AEP	Z1	AEP_P7-1_#10880	tower	296.0	87.42	103.55	DC	54.68
921176	242720	05MONETA	AEP	939010	AE1-130 TAP	AEP	1	AEP_P7-1_#10817-A	tower	409.0	92.28	100.31	DC	32.85
921138	242775	05ROCKCA	AEP	242720	05MONETA	AEP	1	AEP_P7-1_#10817-A	tower	409.0	96.22	104.25	DC	32.85
919817	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	85.53	103.93	DC	54.44
919818	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	84.46	102.91	DC	54.6
919761	247499	05SMITHMTN2	AEP	242701	05LEESVI	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	284.0	101.69	109.19	DC	21.31
919566	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	105.88	124.28	DC	54.44
919567	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10213_05CLOV4EQ 999_A	breaker	296.0	104.75	123.2	DC	54.6
921024	939010	AE1-130 TAP	AEP	243892	05MEADS8	AEP	1	AEP_P7-1_#10817-A	tower	409.0	108.99	117.02	DC	32.85
921025	939010	AE1-130 TAP	AEP	243892	05MEADS8	AEP	1	AEP_P7-1_#10808-A	tower	409.0	104.34	112.37	DC	32.87
919827	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	392.0	79.19	103.57	DC	95.56

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
919828	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10213_05CLOV4 EQ 999_A	breaker	392.0	79.07	103.41	DC	95.4

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
919354	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	AEP_P4_#11112_05J.FERR 765_A1	breaker	402.0	142.17	147.95	DC	23.24
919355	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	AEP_P4_#11111_05J.FERR 765_B1	breaker	402.0	134.75	140.76	DC	24.14
920245	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	Base Case	single	275.0	120.39	125.47	DC	13.98
920246	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	AEP_P1-2_#1377	single	402.0	119.82	123.42	DC	14.48
920426	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#344-A	single	296.0	109.18	115.77	DC	19.52
920236	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	single	167.0	120.8	123.81	DC	5.02
920238	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	AEP_P1-2_#5471-A	single	240.0	103.81	106.72	DC	6.98
590081	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	284.0	116.67	124.16	DC	21.27
591032	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	Base Case	single	205.0	110.53	115.16	DC	9.49
919571	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	284.0	116.67	124.16	DC	21.27
920323	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	Base Case	single	205.0	110.53	115.16	DC	9.49
920204	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	single	167.0	126.25	129.26	DC	5.02
920207	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	AEP_P1-2_#5471-A	single	245.0	105.36	108.21	DC	6.98
920121	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#6213	single	277.0	119.31	124.63	DC	14.73
920849	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P7-1_#10817-A	tower	277.0	158.51	170.37	DC	32.85
920850	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P7-1_#10808-A	tower	277.0	151.64	163.5	DC	32.87
920276	247499	05SMITHMTN 2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#6213	single	277.0	108.61	113.93	DC	14.73
920898	247499	05SMITHMTN 2	AEP	242775	05ROCKCA	AEP	1	AEP_P7-1_#10817-A	tower	277.0	128.73	140.59	DC	32.85
590768	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	128.94	131.95	DC	5.02
590771	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	AEP_P1-2_#5471-A	single	245.0	107.24	110.09	DC	6.98
920171	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	128.94	131.95	DC	5.02
920174	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	AEP_P1-2_#5471-A	single	245.0	107.24	110.09	DC	6.98

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
920287	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P1-2_#5419-A	operation	296.0	102.66	134.87	DC	95.35
920243	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	Base Case	operation	275.0	132.54	141.01	DC	23.29
920244	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	AEP_P1-2_#1377	operation	402.0	134.73	140.73	DC	24.14
920738	242631	05EDAN 1	AEP	242632	05EDAN 2	AEP	Z1	AEP_P1-2_#1370	operation	296.0	91.8	101.07	DC	49.72
920423	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#344-A	operation	296.0	110.53	121.52	DC	32.53
920232	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	operation	167.0	139.49	141.75	DC	8.37
920233	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	DVP_P1-2: LN 1016-B	operation	240.0	137.76	139.76	DC	10.64
591027	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	Base Case	operation	205.0	120.79	128.52	DC	15.82
591028	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P1-2_#5419-A	operation	284.0	116.38	123.94	DC	21.48
920318	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	Base Case	operation	205.0	120.79	128.52	DC	15.82
920319	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P1-2_#5419-A	operation	284.0	116.38	123.94	DC	21.48
920201	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	operation	167.0	144.94	147.2	DC	8.37
920202	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	DVP_P1-2: LN 1016-B	operation	245.0	138.66	140.62	DC	10.64
920725	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P1-2_#5419-A	operation	296.0	84.28	102.74	DC	54.65
920115	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P1-2_#5366-B	operation	277.0	143.78	161.89	DC	50.16
920120	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	Base Case	operation	277.0	121.27	128.9	DC	21.14
920271	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P1-2_#5366-B	operation	277.0	117.33	135.44	DC	50.16
920281	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	Base Case	operation	277.0	99.14	106.78	DC	21.14

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
920617	247499	05SMITHMTN2	AEP	242701	05LEESVI	AEP	1	AEP_P1-2_#5419-A	operation	284.0	101.4	108.97	DC	21.51
920618	247499	05SMITHMTN2	AEP	242701	05LEESVI	AEP	1	Base Case	operation	205.0	100.25	107.99	DC	15.86
590765	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	operation	167.0	147.63	149.89	DC	8.37
590766	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	DVP_P1-2: LN 1016-B	operation	245.0	140.54	142.5	DC	10.64
920168	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	operation	167.0	147.63	149.89	DC	8.37
920169	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	DVP_P1-2: LN 1016-B	operation	245.0	140.54	142.5	DC	10.64
920396	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P1-2_#5419-A	operation	296.0	104.55	123.01	DC	54.65
920726	926520	AC1-123 TAP	AEP	242575	05CAMDLM	AEP	1	AEP_P1-2_#5419-A	operation	284.0	96.12	102.22	DC	17.32
920562	939010	AE1-130 TAP	AEP	243892	05MEADS8	AEP	1	AEP_P1-2_#5366-B	operation	409.0	99.04	111.31	DC	50.16
920718	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P1-2_#5419-A	operation	392.0	78.92	103.24	DC	95.35

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
919891,921151	9	05EDAN 1 138.0 kV - 05EDAN 2 138.0 kV Ckt Z1	**AEP** Description : 1) Replace Relay Thermal Limit 1795 Amps - East Danville - An engineering study will need to be conducted to determine if the Relay Thermal limits settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000. Time Estimate : 12-18 Months Cost : $25,000 **Note:** PJM baseline project b2697 will address the upgrade identified above.	$0
920426,920429	1	05EDAN 2 138.0 kV - 05EDAN 1 138.0 kV Ckt Z1		
920121,920122,92085 0,920126,920849	3	05MEADS8 138.0 kV - 05CLOVRD 138.0 kV Ckt 1	**AEP** Description : Current Ratings: S/N: 348 MVA, S/E: 407 MVA 1) Replace 2 Cloverdale Sub cond 1700 kcm AAC 61 Str- $200k 2) Sag study will be required on the 14 mile section of Cloverdale - Meads Conductor Section 1, ACSR ~ 556.5 ~ 26/7 ~ DOVE, to mitigate the overload. The New ratings after the sag study will be S/N : 420 MVA S/E: 568 MVA. Depending on the sag study results , the cost of the upgrade is expected to be between $56,000 (no remediation required, just sag study) and $21 million (complete line reconductor/rebuild required). Time Estimate : 18-24 Months Cost : $256,000	$256,000

ID	Index	Facility	Upgrade Description	Cost
919354,919355,920245,920246	17	05EDAN 1 138.0 kV - 05DANVL2 138.0 kV Ckt 1	**AEP** Description : Current AEP End Ratings: S/N: 287 MVA, S/E: 337 MVA. 1) Replace Danville, "Bus 1.5"" AL Tubular", $300k 2) Replace Danville, 2 x Switch (1200A), $300K 3) Replace Danville and East Danville, 6 x Sub cond 1590 AAC 61 Str., $600k. **Note** : PJM baseline project b2697 will all replace the limiting elements (Danville Bus, switches, Risers) mentioned above . The projected ISD for b2697 is 4/30/2021. 4) Rebuild / Reconductor ACSR ~ 336/556 Six Wire ~ (Danville - East Dan), 2.85 Miles. $4.275M 5) Replace Danville and East Danville, 2 x Relay Thermal Limit 1795 Amps. An engineering study will need to be conducted to determine if the Relay Thermal limit setting can be adjusted to mitigate the overload, Estimated Cost for Study: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000. **Note:** PJM baseline project b2697 will increase the Danville and East Danville relay thermal limits. The projected ISD for b2697 is 4/30/2021. 6) Replace Danville and East Danville 2 x Relay Compliance Trip Limit 1916 Amps, An engineering study will need to be conducted to determine if the Relay Compliance limit setting can be adjusted to mitigate the overload, Estimated Cost for Study: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000. **Note:** PJM baseline project b2697 will increase the Danville and East Danville relay compliance limits. The projected ISD for b2697 is 4/30/2021. 7) Rebuild / reconductor Conductor Section 3, ACSR ~ 1351.5 ~ 45/7 ~ DIPPER, 1.43 Miles. $2.14M 8) Rebuild / reconductor Conductor Section 1, ACSR ~ 1351.5 ~ 45/7 ~ DIPPER,1.43 Miles. $2.14M 9) Replace East Danville, Breaker (2000A) Non Oil, $150k 10) Replace East Danville, 5 x Sub cond 2-795 AAC 37 Str., $500k 11) Replace Danville, 2 x Sub cond 2156 ACSR 84/19 STD, $200K Time Estimate : 18-24 Months Cost : $9,405,000	$9,405,000

ID	Index	Facility	Upgrade Description	Cost
919761	13	**05SMITHMTN2 138.0 kV - 05LEESVI 138.0 kV Ckt 1**	**AEP** Description : Current End Ratings: S/N: 219 MVA, S/E: 255 MVA 1) Smith Mountain and Leesville, Replace 4 Risers, Sub cond 795 AAC 37 Str., $500k 2) Replace the 8.1 mile section of line, ACSR ~ 556.5 ~ 26/7 ~ DOVE, to mitigate the overload , $12.15M (complete line reconductor/rebuild required) 3) Leesville, CT Thermal Limit - An engineering study will need to be conducted to determine if the CT Thermal limits settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000 4) Smith Mountain, Relay Thermal Limit - An engineering study will need to be conducted to determine if the Relay Thermal limits settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000 Time Estimate : 18-24 Months Cost : $12,700,000	$12,700,000
919452,919453	7	**05BANSTR 138.0 kV - 05EDAN 2 138.0 kV Ckt 1**	**AEP** Description : Current End Ratings: S/N: 296 MVA, S/E: 296 MVA 1) Replace Banister - East Danville ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN, Conductor Section 2. 196 feet, $55,700. 2) Replace Banister Sub cond 1590 AAC 61 Str., $100k 3) Replace EDAN2 Sub cond 1590 AAC 61 Str., $100k. **Note** : PJM baseline project b2697 will address the East Danville Riser. The projected ISD for b2697 is 4/30/2021. 4) Replace EDAN2 thermal relay, An engineering study will need to be conducted to determine if the relay trip limits settings can be adjusted to mitigate the overload, Estimated Cost: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost:$600,000. Time Estimate : 18-24 Months Cost : $180,700	$180,700
919566,919567	14	**AC1-083 TAP 138.0 kV - 05BEARSK 138.0 kV Ckt 1**	**AEP** AEP ratings are sufficient to mitigate the AC1-083 tap to Bearskin , hence No mitigation required.	$0

ID	Index	Facility	Upgrade Description	Cost
590081,920323,920324,919571,591032,591033	2	**05LEESVI 138.0 kV - 4ALTVSTA 138.0 kV Ckt 1**	**DVP** Description : APCO Tie Line - Upgrade Terminal Equipment Time Estimate : 16-20 Months Cost : $2,000,000 **AEP** Description : Current AEP Ratings: S/N: 219 MVA, S/E: 255 MVA 1) Replace Leesville 5 Sub cond 795 AAC 37 Str, $175k, $875k. 2) Replace Leesville - Altvista ACSR ~ 556.5 ~ 26/7 ~ DOVE, Conductor Section 1. 8.5 mile section. $12.75 M. 3) Leesville, Relay Thermal Limit 1197 Amps. An engineering study will need to be conducted to determine if the Relay Thermal limits settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000. 4) Leesville, CT Thermal Limit 1197 Amps. An engineering study will need to be conducted to determine if the CT Thermal limits settings can be adjusted to mitigate the overload. Estimated Cost: $25,000. New relay package will be required if the settings cannot be adjusted, Estimated Cost: $600,000. 5) Leesville, Relay Compliance Trip Limit 1330 Amps. An engineering study will need to be conducted to determine if the Relay compliance limits settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000 Time Estimate : 18-24 Months Cost : $15,700,000	$15,700,000
920898,920276,920277	4	**05SMITHMTN2 138.0 kV - 05ROCKCA 138.0 kV Ckt 1**	**AEP** Description :AEP ratings are sufficient to mitigate the overload. Current AEP Rating: S/N: 409 MVA, S/E: 409 MVA	$0

ID	Index	Facility	Upgrade Description	Cost
919596	6	**05AXTON 138.0 kV - 05DANVL2 138.0 kV Ckt 1**	**AEP** Description : Current AEP Ratings : S/N : 296 MVA S/E: 392 MVA. 1)Replace 2 Danville Risers Sub cond 1590 AAC 61 Str, $200k. 2)Replace 17.3 miles of ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 4, $25.95M. 3)Replace 0.02 miles of ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 1, $30k. 4) Replace 0.33 miles of ACSR ~ 336.4 ~ 30/7 ~ ORIOLE ~ Fe Clamps 1 Conductor Section 2, $50k. 5) Sag Study required on ACSR/SSAC ~ 795 ~ 26/7 ~ DRAKE/SSAC @ 401 °F conductor section 3, 0.85 Miles 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:439, S/E: 492) and $1.27M (complete line reconductor/rebuild required). Time Estimate: a) Sag Study: 6-12 months. 6)Replace Danville RCTL 1916 Amps- An engineering study will need to be conducted to determine if the Relay Compliance Trip limits settings can be adjusted to mitigate the overload. Estimated Cost: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000 7) Replace Danville RCTL 1925 Amps - An engineering study will need to be conducted to determine if the Relay Compliance Trip limits settings can be adjusted to mitigate the overload. Estimated Cost: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000. Time Estimate : 18-24 Months Cost : $27,500,000.	$27,500,000
919817,919818	12	**05SMITHMTN1 138.0 kV - AC1-083 TAP 138.0 kV Ckt 1**	**AEP** Description : 1) A Sag Study will be required on the 0.3 mile section of ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN 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 $450,000 (complete line reconductor/rebuild required). Time Estimate: a) Sag Study: 12-18 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. Time Estimate : 12-18 Months Cost : $20,000.	$20,000

ID	Index	Facility	Upgrade Description	Cost
921176	10	05MONETA 138.0 kV - AE1-130 TAP 138.0 kV Ckt 1	**AEP** Description : Current End Ratings: S/N: 409, S/E: 409 MVA 1) ACSR ~ 556.5 ~ 26/7 ~ DOVE Conductor Section 1. A Sag Study will be required on the 5.85 miles of ACSR ~ 556.5 ~ 26/7 ~ DOVE Conductor Section 1 to mitigate the overload . Depending on the sag study results, cost for this upgrade is expected to be between $23,400 (no remediations required just sag study, new ratings after the sag study : S/N: 409 MVA, S/E: 527 MVA and $8.78 million (complete line reconductor/rebuild required). 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. Time Estimate : 6-12 Months Cost : $23,400	$23,400
921024,921025	15	AE1-130 TAP 138.0 kV - 05MEADS8 138.0 kV Ckt 1		
921138	11	05ROCKCA 138.0 kV - 05MONETA 138.0 kV Ckt 1	**AEP** Description : Current Ratings: S/N: 409 MVA, S/E: 409 MVA 1) Sag Study: A Sag Study will be required on the 5 mile 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: 409, S/E: 527) and $7.5 million (complete line reconductor/rebuild required). 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. Cost : $20,000.	$20,000
591186	5	AE1-068 TAP 500.0 kV - 8CARSON 500.0 kV Ckt 1	**DVP** Description : New Line Greenfield; Build new 29 mi line to AE1068/Roger Rd Time Estimate : 46-52 Months Cost : $90,000,000	$90,000,000
920236,920238	18	05JOHNMT 138.0 kV - 05NEWLDN 138.0 kV Ckt 1	**AEP** Description : Current Station Rating: S/N: 167 MVA, S/E: 240 MVA 1) Replace ACSR ~ 397.5 ~ 30/7 ~ LARK ~ Fe Clamps 9 d, Conductor Section 1, 14.43 miles Time Estimate : 12-18 Months Cost : $21,650,000	$21,650,000
919827,919828	16	AE1-250 TAP 138.0 kV - 05BANSTR 138.0 kV Ckt 1	**AEP** Description : Current End Ratings: S/N: 335 MVA, S/E: 392 MVA 2) Replace Banister riser: Sub cond 1590 AAC 61 Str., $100k Time Estimate : 18-24 Months Cost : $100,000	$100,000

ID	Index	Facility	Upgrade Description	Cost
920204,920207	19	05OTTER 138.0 kV - 05JOHNMT 138.0 kV Ckt 1	**AEP** Description : Current AEP End Rating: S/N: 164 MVA, S/E: 205 MVA 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 Time Estimate : 18-24 Months Cost : $10,675,000	$10,675,000
590768,920171,590771,920174	20	4ALTVSTA 138.0 kV - 05OTTER 138.0 kV Ckt 1	**DVP** Description : Replace Terminal Equipment Time Estimate : 20-24 Months Cost : $300,000 **AEP** Description : Current End Ratings: S/N: 164 MVA, S/E: 205 MVA 1) Replace Otter, Sub cond 477 ACSR 26/7 STD, $175k 2) Replace ACSR ~ 397.5 ~ 30/7 ~ LARK Conductor Section 1, 1 mile, $1.5M Time Estimate : 18-24 Months Cost : $1,975,000	$1,975,000
921160	8	05DANVL2 138.0 kV - 05EDAN 1 138.0 kV Ckt 1	**AEP** Description : 1) Replace Danville, "Bus 1.5"" AL Tubular", $150k 2) Replace Danville, 2 x Switch (1200A), $300k 3) Replace Danville and East Danville, 6 x Sub cond 1590 AAC 61 Str., $600k Time Estimate : 18-24 Months Cost : $1,050,000 **Note** : PJM baseline project b2697 will address all the limiting elements mentioned above , projected ISD is 4/30/2021.	$0
			TOTAL COST	**$193,562,100**

Flow Gate Details

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

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
920426	242632	05EDAN 2	AEP	242631	05EDAN 1	AEP	Z1	AEP_P1-2_#344-A	single	296.0	109.18	115.77	DC	19.52

Bus #	Bus	MW Impact
246843	05SMG1	0.7
246844	05SMG2	1.84
246845	05SMG3	1.08
246846	05SMG4	1.9
246847	05SMG5	0.72
247284	05LEESVG	0.41
315150	1BUGGS 1	3.49
315151	1BUGGS 2	3.49
315158	1KERR 1	0.1
315159	1KERR 2	0.42
315160	1KERR 3	0.41
315161	1KERR 4	0.41
315162	1KERR 5	0.41
315163	1KERR 6	0.41
315164	1KERR 7	0.41
315266	1PLYWOOD A	0.38
919841	AA2-070	0.35
926051	AC1-083 C O1	5.81
926271	AC1-105 C O1	1.81
927251	AC1-221 C	1.17
927261	AC1-222 C	1.22
932761	AC2-100 C	2.69
933941	AD1-017 C	1.16
934311	AD1-055 C	0.85
934341	AD1-058 C	2.93
934611	AD1-087 C O1	2.47
934991	AD1-131 C	0.96
935171	AD1-152 C O1	2.46
936161	AD2-022 C O1	5.42
936171	AD2-023 C O1	6.64
936331	AD2-043 C	1.59
936361	AD2-046 C O1	2.78
937481	AD2-202 C O1	0.68
938451	AE1-064 C	4.06
939181	AE1-148 C O1	2.73
940081	AE1-250 C	19.52
AA2-074	AA2-074	2.44
BLUEG	BLUEG	4.8
CANNELTON	CANNELTON	0.24
CBM-N	CBM-N	0.08

Bus #	Bus	MW Impact
CBM-S2	CBM-S2	5.19
COFFEEN	COFFEEN	0.38
CPLE	CPLE	3.59
DEARBORN	DEARBORN	0.75
DUCKCREEK	DUCKCREEK	0.88
EDWARDS	EDWARDS	0.41
ELMERSMITH	ELMERSMITH	0.39
FARMERCITY	FARMERCITY	0.19
G-007A	G-007A	0.56
GIBSON	GIBSON	0.17
NEWTON	NEWTON	1.02
NYISO	NYISO	0.36
O-066A	O-066A	0.25
PRAIRIE	PRAIRIE	1.41
SMITHLAND	SMITHLAND	0.08
TATANKA	TATANKA	0.4
TILTON	TILTON	0.54
TRIMBLE	TRIMBLE	0.54
TVA	TVA	0.05
VFT	VFT	1.47

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
919571	242701	05LEESVI	AEP	314667	4ALTVSTA	DVP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	284.0	116.67	124.16	DC	21.27

Bus #	Bus	MW Impact
246843	05SMG1	2.77
246844	05SMG2	7.29
246845	05SMG3	4.28
246846	05SMG4	7.54
246847	05SMG5	2.85
247284	05LEESVG	3.49
919841	AA2-070	1.38
926051	AC1-083 C O1	7.39
926052	AC1-083 E O1	12.07
926521	AC1-123 C O1	8.43
926522	AC1-123 E O1	3.97
932823	AC2-107 BAT	17.41
933941	AD1-017 C	1.48
933942	AD1-017 E	2.41
938451	AE1-064 C	21.12
938452	AE1-064 E	10.83
939011	AE1-130 C O1	17.32
939012	AE1-130 E O1	8.49
939943	AE1-230 E2	2.75
940081	AE1-250 C	12.76
940082	AE1-250 E	8.51
CARR	CARR	0.05
CBM-S1	CBM-S1	0.55
CBM-S2	CBM-S2	0.68
CBM-W1	CBM-W1	0.47
CBM-W2	CBM-W2	3.51
CIN	CIN	0.23
CPLE	CPLE	0.34
G-007	G-007	0.16
IPL	IPL	0.14
LGEE	LGEE	0.07
MEC	MEC	0.51
MECS	MECS	0.16
O-066	O-066	0.54
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.06

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
920849	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P7-1_#10817-A	tower	277.0	158.51	170.37	DC	32.85

Bus #	Bus	MW Impact
244012	05PINNACLE	0.79
246843	05SMG1	4.19
246844	05SMG2	11.01
246845	05SMG3	6.46
246846	05SMG4	11.37
246847	05SMG5	4.31
247284	05LEESVG	3.08
919841	AA2-070	2.09
926051	AC1-083 C O1	11.27
926052	AC1-083 E O1	18.39
933941	AD1-017 C	2.25
933942	AD1-017 E	3.68
938451	AE1-064 C	40.02
938452	AE1-064 E	20.52
939011	AE1-130 C O1	45.92
939012	AE1-130 E O1	22.5
940081	AE1-250 C	19.71
940082	AE1-250 E	13.14
BLUEG	BLUEG	1.17
CANNELTON	CANNELTON	0.05
CARR	CARR	0.07
CBM-S1	CBM-S1	0.29
CBM-S2	CBM-S2	2.15
CBM-W2	CBM-W2	0.71
COFFEEN	COFFEEN	0.08
CPLE	CPLE	1.3
DEARBORN	DEARBORN	0.24
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.1
ELMERSMITH	ELMERSMITH	0.07
FARMERCITY	FARMERCITY	0.03
G-007	G-007	0.17
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.21
O-066	O-066	0.59
PRAIRIE	PRAIRIE	0.19
RENSSELAER	RENSSELAER	0.05
TATANKA	TATANKA	0.08
TILTON	TILTON	0.13
TRIMBLE	TRIMBLE	0.13

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
920898	247499	05SMITHMTN2	AEP	242775	05ROCKCA	AEP	1	AEP_P7-1_#10817-A	tower	277.0	128.73	140.59	DC	32.85

Bus #	Bus	MW Impact
244012	05PINNACLE	0.79
246843	05SMG1	4.19
246844	05SMG2	11.01
246845	05SMG3	6.46
246846	05SMG4	11.37
246847	05SMG5	4.31
247284	05LEESVG	3.08
919841	AA2-070	2.09
926051	AC1-083 C O1	11.27
926052	AC1-083 E O1	18.39
933941	AD1-017 C	2.25
933942	AD1-017 E	3.68
940081	AE1-250 C	19.71
940082	AE1-250 E	13.14
BLUEG	BLUEG	1.17
CANNELTON	CANNELTON	0.05
CARR	CARR	0.07
CBM-S1	CBM-S1	0.29
CBM-S2	CBM-S2	2.15
CBM-W2	CBM-W2	0.71
COFFEEN	COFFEEN	0.08
CPLE	CPLE	1.3
DEARBORN	DEARBORN	0.24
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.1
ELMERSMITH	ELMERSMITH	0.07
FARMERCITY	FARMERCITY	0.03
G-007	G-007	0.17
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.21
O-066	O-066	0.59
PRAIRIE	PRAIRIE	0.19
RENSSELAER	RENSSELAER	0.05
TATANKA	TATANKA	0.08
TILTON	TILTON	0.13
TRIMBLE	TRIMBLE	0.13

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
591186	938490	AE1-068 TAP	DVP	314902	8CARSON	DVP	1	DVP_P1-2: LN 511	single	4070.2	99.73	100.07	DC	13.51

Bus #	Bus	MW Impact
314429	3JTRSVLE	0.33
315102	1BRUNSWICKG1	24.65
315103	1BRUNSWICKG2	24.65
315104	1BRUNSWICKG3	24.65
315105	1BRUNSWICKS1	51.21
315150	1BUGGS 1	12.26
315151	1BUGGS 2	12.26
315153	1CLOVER1	28.08
315154	1CLOVER2	27.71
315159	1KERR 2	1.17
315163	1KERR 6	1.15
315164	1KERR 7	1.15
315266	1PLYWOOD A	1.73
916301	Z1-086 C	154.88
924021	AB2-043 C O1	0.45
924161	AB2-060 C O1	1.31
924301	AB2-077 C O1	0.29
924311	AB2-078 C O1	0.29
924321	AB2-079 C O1	0.29
925611	AC1-036 C	0.14
925831	AC1-062	0.05
925991	AC1-075 C	7.78
926021	AC1-080 C	2.6
926271	AC1-105 C O1	8.39
926761	AC1-162 C	40.87
927251	AC1-221 C	3.8
927261	AC1-222 C	5.85
932761	AC2-100 C	8.74
932821	AC2-107 C	13.83
934311	AD1-055 C	4.06
934341	AD1-058 C	9.52
934611	AD1-087 C O1	17.71
934621	AD1-088 C	24.44
934991	AD1-131 C	3.12
935171	AD1-152 C O1	17.6
935221	AD1-157 C	0.22
935231	AD1-160 C	1.03
936161	AD2-022 C O1	12.83
936171	AD2-023 C O1	7.51
936261	AD2-033 C	12.2

Bus #	Bus	MW Impact
936331	AD2-043 C	7.6
936361	AD2-046 C O1	7.97
936391	AD2-049 C	1.55
936481	AD2-063 C O1	14.08
936651	AD2-082 C	1.57
937481	AD2-202 C O1	4.88
938371	AE1-056 C	6.05
938491	AE1-068 C O1	206.22
938501	AE1-069 C O1	157.71
939181	AE1-148 C O1	7.89
939201	AE1-150 C O1	9.33
939371	AE1-168 C	14.05
939421	AE1-174 C	0.3
940081	AE1-250 C	13.51
AA2-074	AA2-074	9.71
AB2-013	AB2-013	7.3
AE1-033	AE1-033	7.62
AE1-042	AE1-042	17.03
CARR	CARR	1.23
CBM-S1	CBM-S1	26.28
CBM-S2	CBM-S2	29.11
CBM-W1	CBM-W1	26.18
CBM-W2	CBM-W2	172.25
CIN	CIN	11.88
CPLE	CPLE	14.27
IPL	IPL	7.45
LGEE	LGEE	3.44
MEC	MEC	26.42
MECS	MECS	10.96
RENSSELAER	RENSSELAER	0.97
WEC	WEC	3.17
Z1-043	Z1-043	12.49

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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
919596	242544	05AXTON	AEP	242620	05DANVL2	AEP	1	AEP_P4_#10171_05AXTON 138_G	breaker	382.0	121.0	122.03	DC	11.36

Bus #	Bus	MW Impact
247723	05PHILPOTT	0.61
926461	AC1-117 C	0.57
926462	AC1-117 E	6.03
934751	AD1-102 C	1.21
934752	AD1-102 E	8.09
937471	AD2-201AC O1	1.75
937472	AD2-201AE O1	1.07
938741	AE1-100 C O1	22.65
938742	AE1-100 E O1	13.03
938931	AE1-121 O1	261.94
938941	AE1-122 O1	261.94
939441	AE1-176	0.14
940083	AE1-250 EBAT	6.02
BAYOU	BAYOU	0.27
BIG_CAJUN1	BIG_CAJUN1	0.49
BIG_CAJUN2	BIG_CAJUN2	0.97
CALDERWOOD	CALDERWOOD	0.23
CARR	CARR	0.01
CATAWBA	CATAWBA	0.57
CBM-W1	CBM-W1	1.73
CHEOAH	CHEOAH	0.23
CHILHOWEE	CHILHOWEE	0.07
CHOCTAW	CHOCTAW	0.35
CIN	CIN	0.83
COTTONWOOD	COTTONWOOD	1.0
G-007	G-007	0.09
HAMLET	HAMLET	2.77
IPL	IPL	0.56
LGEE	LGEE	0.26
MEC	MEC	0.87
MECS	MECS	1.34
O-066	O-066	0.3
RENSSELAER	RENSSELAER	0.01
SANTEETLA	SANTEETLA	0.07
TVA	TVA	0.36
UNIONPOWER	UNIONPOWER	0.36
WEC	WEC	0.2

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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
919453	242549	05BANSTR	AEP	242632	05EDAN 2	AEP	1	AEP_P4_#10213_05CLOV4 EQ 999_A	breaker	296.0	102.83	135.05	DC	95.4

Bus #	Bus	MW Impact
246843	05SMG1	3.31
246844	05SMG2	8.73
246845	05SMG3	5.12
246846	05SMG4	9.02
246847	05SMG5	3.41
247284	05LEESVG	1.89
315156	1HALLBR1	1.43
315165	1HURT 1	6.46
315166	1HURT 2	6.46
919841	AA2-070	1.66
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	31.03
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
932821	AC2-107 C	5.13
932822	AC2-107 E	2.4
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

Bus #	Bus	MW Impact
940082	AE1-250 E	38.16
BAYOU	BAYOU	0.6
BIG_CAJUN1	BIG_CAJUN1	0.98
BIG_CAJUN2	BIG_CAJUN2	1.98
BLUEG	BLUEG	0.26
CALDERWOOD	CALDERWOOD	0.39
CANNELTON	CANNELTON	0.04
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
CHOCTAW	CHOCTAW	0.68
COFFEEN	COFFEEN	0.08
COTTONWOOD	COTTONWOOD	2.33
DUCKCREEK	DUCKCREEK	0.14
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.08
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	2.48
NEWTON	NEWTON	0.21
O-066	O-066	0.36
PRAIRIE	PRAIRIE	0.65
RENSSELAER	RENSSELAER	0.02
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.05
TRIMBLE	TRIMBLE	0.02
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
921160	242620	05DANVL2	AEP	242631	05EDAN 1	AEP	1	AEP_P7-1_#10880	tower	402.0	98.14	101.79	DC	21.12

Bus #	Bus	MW Impact
244012	05PINNACLE	2.62
934233	AD1-050 BAT	2.26
938741	AE1-100 C O1	18.7
938742	AE1-100 E O1	10.76
938931	AE1-121 O1	216.22
938941	AE1-122 O1	216.22
940083	AE1-250 EBAT	21.12
AC1-133	AC1-133	16.49
BAYOU	BAYOU	0.03
BIG_CAJUN1	BIG_CAJUN1	0.16
BIG_CAJUN2	BIG_CAJUN2	0.31
CALDERWOOD	CALDERWOOD	0.13
CARR	CARR	0.05
CATAWBA	CATAWBA	0.88
CBM-S1	CBM-S1	0.94
CBM-W1	CBM-W1	4.94
CBM-W2	CBM-W2	8.87
CHEOAH	CHEOAH	0.16
CHILHOWEE	CHILHOWEE	0.04
CHOCTAW	CHOCTAW	0.14
CIN	CIN	2.34
G-007	G-007	0.29
HAMLET	HAMLET	4.49
IPL	IPL	1.55
LGEE	LGEE	0.73
MEC	MEC	3.24
MECS	MECS	3.3
O-066	O-066	0.94
RENSSELAER	RENSSELAER	0.04
SANTEETLA	SANTEETLA	0.05
UNIONPOWER	UNIONPOWER	0.31
WEC	WEC	0.59

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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
921151	242631	05EDAN 1	AEP	242632	05EDAN 2	AEP	Z1	AEP_P7-1_#10880	tower	296.0	87.42	103.55	DC	54.68

Bus #	Bus	MW Impact
244012	05PINNACLE	1.97
936161	AD2-022 C O1	11.06
936162	AD2-022 E O1	6.64
938741	AE1-100 C O1	11.02
938742	AE1-100 E O1	6.34
938931	AE1-121 O1	127.45
938941	AE1-122 O1	127.45
939943	AE1-230 E2	0.35
940083	AE1-250 EBAT	54.68
CARR	CARR	0.02
CATAWBA	CATAWBA	0.07
CBM-S1	CBM-S1	1.26
CBM-W1	CBM-W1	2.54
CBM-W2	CBM-W2	9.08
CIN	CIN	1.18
G-007	G-007	0.1
HAMLET	HAMLET	0.64
IPL	IPL	0.76
LGEE	LGEE	0.36
MEC	MEC	2.0
MECS	MECS	1.48
O-066	O-066	0.34
RENSSELAER	RENSSELAER	0.01
WEC	WEC	0.3

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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
921176	242720	05MONETA	AEP	939010	AE1-130 TAP	AEP	1	AEP_P7-1_#10817-A	tower	409.0	92.28	100.31	DC	32.85

Bus #	Bus	MW Impact
244012	05PINNACLE	0.79
246843	05SMG1	4.19
246844	05SMG2	11.01
246845	05SMG3	6.46
246846	05SMG4	11.37
246847	05SMG5	4.31
247284	05LEESVG	3.08
919841	AA2-070	2.09
926051	AC1-083 C O1	11.27
926052	AC1-083 E O1	18.39
933941	AD1-017 C	2.25
933942	AD1-017 E	3.68
938451	AE1-064 C	40.02
938452	AE1-064 E	20.52
940081	AE1-250 C	19.71
940082	AE1-250 E	13.14
BLUEG	BLUEG	1.17
CANNELTON	CANNELTON	0.05
CARR	CARR	0.07
CBM-S1	CBM-S1	0.29
CBM-S2	CBM-S2	2.15
CBM-W2	CBM-W2	0.71
COFFEEN	COFFEEN	0.08
CPLE	CPLE	1.3
DEARBORN	DEARBORN	0.24
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.1
ELMERSMITH	ELMERSMITH	0.07
FARMERCITY	FARMERCITY	0.03
G-007	G-007	0.17
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.21
O-066	O-066	0.59
PRAIRIE	PRAIRIE	0.19
RENSSELAER	RENSSELAER	0.05
TATANKA	TATANKA	0.08
TILTON	TILTON	0.13
TRIMBLE	TRIMBLE	0.13

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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
921138	242775	05ROCKCA	AEP	242720	05MONETA	AEP	1	AEP_P7-1_#10817-A	tower	409.0	96.22	104.25	DC	32.85

Bus #	Bus	MW Impact
244012	05PINNACLE	0.79
246843	05SMG1	4.19
246844	05SMG2	11.01
246845	05SMG3	6.46
246846	05SMG4	11.37
246847	05SMG5	4.31
247284	05LEESVG	3.08
919841	AA2-070	2.09
926051	AC1-083 C O1	11.27
926052	AC1-083 E O1	18.39
933941	AD1-017 C	2.25
933942	AD1-017 E	3.68
938451	AE1-064 C	40.02
938452	AE1-064 E	20.52
940081	AE1-250 C	19.71
940082	AE1-250 E	13.14
BLUEG	BLUEG	1.17
CANNELTON	CANNELTON	0.05
CARR	CARR	0.07
CBM-S1	CBM-S1	0.29
CBM-S2	CBM-S2	2.15
CBM-W2	CBM-W2	0.71
COFFEEN	COFFEEN	0.08
CPLE	CPLE	1.3
DEARBORN	DEARBORN	0.24
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.1
ELMERSMITH	ELMERSMITH	0.07
FARMERCITY	FARMERCITY	0.03
G-007	G-007	0.17
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.21
O-066	O-066	0.59
PRAIRIE	PRAIRIE	0.19
RENSSELAER	RENSSELAER	0.05
TATANKA	TATANKA	0.08
TILTON	TILTON	0.13
TRIMBLE	TRIMBLE	0.13

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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
919817	242802	05SMITHMTN1	AEP	926050	AC1-083 TAP	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	85.53	103.93	DC	54.44

Bus #	Bus	MW Impact
246843	05SMG1	3.33
246844	05SMG2	8.78
246845	05SMG3	5.15
246846	05SMG4	9.08
246847	05SMG5	3.43
247284	05LEESVG	1.91
315156	1HALLBR1	1.46
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.67
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	6.09
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
932821	AC2-107 C	5.26
932822	AC2-107 E	2.46
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	54.44
BAYOU	BAYOU	0.61

Bus #	Bus	MW Impact
BIG_CAJUN1	BIG_CAJUN1	0.99
BIG_CAJUN2	BIG_CAJUN2	1.98
BLUEG	BLUEG	0.3
CALDERWOOD	CALDERWOOD	0.39
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
CHOCTAW	CHOCTAW	0.68
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	2.34
DEARBORN	DEARBORN	0.0
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	2.47
NEWTON	NEWTON	0.22
O-066	O-066	0.36
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.02
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
919761	247499	05SMITHMTN 2	AEP	242701	05LEESVI	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	284.0	101.69	109.19	DC	21.31

Bus #	Bus	MW Impact
246843	05SMG1	2.78
246844	05SMG2	7.3
246845	05SMG3	4.28
246846	05SMG4	7.54
246847	05SMG5	2.86
919841	AA2-070	1.39
926051	AC1-083 C O1	7.41
926052	AC1-083 E O1	12.08
926521	AC1-123 C O1	8.45
926522	AC1-123 E O1	3.97
932823	AC2-107 BAT	17.38
933941	AD1-017 C	1.48
933942	AD1-017 E	2.42
938451	AE1-064 C	21.14
938452	AE1-064 E	10.84
939011	AE1-130 C O1	17.33
939012	AE1-130 E O1	8.49
939943	AE1-230 E2	2.75
940081	AE1-250 C	12.79
940082	AE1-250 E	8.52
CARR	CARR	0.04
CBM-S1	CBM-S1	0.63
CBM-S2	CBM-S2	0.72
CBM-W1	CBM-W1	0.63
CBM-W2	CBM-W2	4.15
CIN	CIN	0.29
CPLE	CPLE	0.36
G-007	G-007	0.13
IPL	IPL	0.18
LGEE	LGEE	0.09
MEC	MEC	0.64
MECS	MECS	0.26
O-066	O-066	0.44
RENSSELAER	RENSSELAER	0.03
WEC	WEC	0.08

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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
919566	926050	AC1-083 TAP	AEP	242550	05BEARSK	AEP	1	AEP_P4_#10210_05CLOVRD 138_A2	breaker	296.0	105.88	124.28	DC	54.44

Bus #	Bus	MW Impact
246843	05SMG1	3.33
246844	05SMG2	8.78
246845	05SMG3	5.15
246846	05SMG4	9.08
246847	05SMG5	3.43
247284	05LEESVG	1.91
315156	1HALLBR1	1.46
315165	1HURT 1	6.6
315166	1HURT 2	6.6
919841	AA2-070	1.67
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	6.09
926641	AC1-145 C	3.3
926642	AC1-145 E	5.38
932821	AC2-107 C	5.26
932822	AC2-107 E	2.46
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

Bus #	Bus	MW Impact
939942	AE1-230 E1	0.83
939943	AE1-230 E2	1.39
940083	AE1-250 EBAT	54.44
BAYOU	BAYOU	0.61
BIG_CAJUN1	BIG_CAJUN1	0.99
BIG_CAJUN2	BIG_CAJUN2	1.98
BLUEG	BLUEG	0.3
CALDERWOOD	CALDERWOOD	0.39
CANNELTON	CANNELTON	0.05
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
CHOCTAW	CHOCTAW	0.68
COFFEEN	COFFEEN	0.09
COTTONWOOD	COTTONWOOD	2.34
DEARBORN	DEARBORN	0.0
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	2.47
NEWTON	NEWTON	0.22
O-066	O-066	0.36
PRAIRIE	PRAIRIE	0.66
RENSSELAER	RENSSELAER	0.02
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
921024	939010	AE1-130 TAP	AEP	243892	05MEADS8	AEP	1	AEP_P7-1_#10817-A	tower	409.0	108.99	117.02	DC	32.85

Bus #	Bus	MW Impact
244012	05PINNACLE	0.79
246843	05SMG1	4.19
246844	05SMG2	11.01
246845	05SMG3	6.46
246846	05SMG4	11.37
246847	05SMG5	4.31
247284	05LEESVG	3.08
919841	AA2-070	2.09
926051	AC1-083 C O1	11.27
926052	AC1-083 E O1	18.39
933941	AD1-017 C	2.25
933942	AD1-017 E	3.68
938451	AE1-064 C	40.02
938452	AE1-064 E	20.52
939011	AE1-130 C O1	45.92
939012	AE1-130 E O1	22.5
940081	AE1-250 C	19.71
940082	AE1-250 E	13.14
BLUEG	BLUEG	1.17
CANNELTON	CANNELTON	0.05
CARR	CARR	0.07
CBM-S1	CBM-S1	0.29
CBM-S2	CBM-S2	2.15
CBM-W2	CBM-W2	0.71
COFFEEN	COFFEEN	0.08
CPLE	CPLE	1.3
DEARBORN	DEARBORN	0.24
DUCKCREEK	DUCKCREEK	0.2
EDWARDS	EDWARDS	0.1
ELMERSMITH	ELMERSMITH	0.07
FARMERCITY	FARMERCITY	0.03
G-007	G-007	0.17
GIBSON	GIBSON	0.04
NEWTON	NEWTON	0.21
O-066	O-066	0.59
PRAIRIE	PRAIRIE	0.19
RENSSELAER	RENSSELAER	0.05
TATANKA	TATANKA	0.08
TILTON	TILTON	0.13
TRIMBLE	TRIMBLE	0.13

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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
919828	940080	AE1-250 TAP	AEP	242549	05BANSTR	AEP	1	AEP_P4_#10213_05CLOV4 EQ 999_A	breaker	392.0	79.07	103.41	DC	95.4

Bus #	Bus	MW Impact
246843	05SMG1	3.31
246844	05SMG2	8.73
246845	05SMG3	5.12
246846	05SMG4	9.02
246847	05SMG5	3.41
247284	05LEESVG	1.89
315156	1HALLBR1	1.43
315165	1HURT 1	6.46
315166	1HURT 2	6.46
919841	AA2-070	1.66
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	31.03
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
932821	AC2-107 C	5.13
932822	AC2-107 E	2.4
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

Bus #	Bus	MW Impact
940081	AE1-250 C	57.24
940082	AE1-250 E	38.16
BAYOU	BAYOU	0.6
BIG_CAJUN1	BIG_CAJUN1	0.98
BIG_CAJUN2	BIG_CAJUN2	1.98
BLUEG	BLUEG	0.26
CALDERWOOD	CALDERWOOD	0.39
CANNELTON	CANNELTON	0.04
CARR	CARR	0.03
CATAWBA	CATAWBA	0.59
CHEOAH	CHEOAH	0.38
CHILHOWEE	CHILHOWEE	0.13
CHOCTAW	CHOCTAW	0.68
COFFEEN	COFFEEN	0.08
COTTONWOOD	COTTONWOOD	2.33
DUCKCREEK	DUCKCREEK	0.14
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.09
FARMERCITY	FARMERCITY	0.08
G-007	G-007	0.11
GIBSON	GIBSON	0.02
HAMLET	HAMLET	2.48
NEWTON	NEWTON	0.21
O-066	O-066	0.36
PRAIRIE	PRAIRIE	0.65
RENSSELAER	RENSSELAER	0.02
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.12
TILTON	TILTON	0.05
TRIMBLE	TRIMBLE	0.02
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
919354	242631	05EDAN 1	AEP	242620	05DANVL2	AEP	1	AEP_P4_#11112_05J.FERR 765_A1	breaker	402.0	142.17	147.95	DC	23.24

Bus #	Bus	MW Impact
314554	3BTLEBRO	0.35
314557	3BETHELC	0.33
314572	3EMPORIA	0.13
314574	6EVERETS	1.54
314578	3HORNRTN	1.17
314582	3KELFORD	1.21
314603	3SCOT NK	1.2
314617	3TUNIS	0.27
314623	3WITAKRS	0.57
315131	1EDGECMA	4.09
315132	1EDGECMB	4.09
315150	1BUGGS 1	4.52
315151	1BUGGS 2	4.52
917332	Z2-043 E	0.34
917342	Z2-044 E	0.25
917512	Z2-088 E OP1	1.53
918492	AA1-063AE OP	1.36
918512	AA1-065 E OP	1.43
918532	AA1-067 E	0.27
918562	AA1-072 E	0.06
919692	AA2-053 E	1.28
919701	AA2-057 C	2.91
919702	AA2-057 E	1.46
920592	AA2-165 E	0.19
920672	AA2-174 E	0.15
923911	AB2-031 C O1	0.73
923912	AB2-031 E O1	0.36
923941	AB2-035 C	0.14
923942	AB2-035 E	0.06
923992	AB2-040 E O1	1.97
924022	AB2-043 E O1	1.89
924152	AB2-059 E O1	2.4
924162	AB2-060 E O1	1.55
924302	AB2-077 E O1	0.49
924312	AB2-078 E O1	0.49
924322	AB2-079 E O1	0.49
924391	AB2-088 C	0.18
924392	AB2-088 E	0.09
924401	AB2-089 C	0.87
924402	AB2-089 E	0.45
924491	AB2-098 C	0.21

Bus #	Bus	MW Impact
924492	AB2-098 E	0.09
924501	AB2-099 C	0.19
924502	AB2-099 E	0.08
925122	AB2-169 E	1.93
925171	AB2-174 C O1	2.27
925172	AB2-174 E O1	2.06
925591	AC1-034 C	3.01
925592	AC1-034 E	2.27
925612	AC1-036 E	0.51
925781	AC1-054 C O1	2.91
925782	AC1-054 E O1	1.34
926051	AC1-083 C O1	3.91
926052	AC1-083 E O1	6.38
926071	AC1-086 C	6.98
926072	AC1-086 E	3.18
926201	AC1-098 C	2.32
926202	AC1-098 E	1.38
926211	AC1-099 C	0.78
926212	AC1-099 E	0.46
926271	AC1-105 C O1	2.27
926272	AC1-105 E O1	1.13
927021	AC1-189 C	3.35
927022	AC1-189 E	1.67
927141	AC1-208 C	3.47
927142	AC1-208 E	1.54
927251	AC1-221 C	1.55
927252	AC1-221 E	1.55
927261	AC1-222 C	1.45
927262	AC1-222 E	1.38
930402	AB1-081 E O1	1.69
930862	AB1-132 E O1	2.03
931232	AB1-173 E	0.34
931242	AB1-173AE	0.34
932631	AC2-084 C	3.3
932632	AC2-084 E	1.63
932761	AC2-100 C	3.57
932762	AC2-100 E	1.74
933941	AD1-017 C	0.78
933942	AD1-017 E	1.28
934201	AD1-047 C	2.63
934202	AD1-047 E	1.75
934231	AD1-050 C	1.93
934232	AD1-050 E	1.05
934311	AD1-055 C	1.01
934312	AD1-055 E	0.26
934331	AD1-057 C O1	3.95
934332	AD1-057 E O1	2.11
934341	AD1-058 C	3.89
934342	AD1-058 E	0.99
934611	AD1-087 C O1	3.23
934612	AD1-087 E O1	1.52
934991	AD1-131 C	1.27

Bus #	Bus	MW Impact
934992	AD1-131 E	0.85
935171	AD1-152 C O1	3.21
935172	AD1-152 E O1	2.14
936161	AD2-022 C O1	10.55
936162	AD2-022 E O1	6.33
936171	AD2-023 C O1	6.07
936172	AD2-023 E O1	3.29
936261	AD2-033 C	4.35
936262	AD2-033 E	2.9
936331	AD2-043 C	1.88
936332	AD2-043 E	2.22
936361	AD2-046 C O1	3.66
936362	AD2-046 E O1	1.68
936401	AD2-051 C O1	2.88
936402	AD2-051 E O1	1.24
936481	AD2-063 C O1	5.26
936482	AD2-063 E O1	3.51
936531	AD2-068 C	2.24
936532	AD2-068 E	1.15
936701	AD2-089 C	3.01
936702	AD2-089 E	2.01
937481	AD2-202 C O1	0.89
937482	AD2-202 E O1	0.45
937571	AD2-169 C	3.32
937572	AD2-169 E	2.22
938221	AE1-035 C	0.73
938222	AE1-035 E	0.36
938661	AE1-088	0.59
939181	AE1-148 C O1	3.59
939182	AE1-148 E O1	2.39
940081	AE1-250 C	13.95
940082	AE1-250 E	9.3
AA2-074	AA2-074	3.74
BLUEG	BLUEG	4.14
CANNELTON	CANNELTON	0.12
CBM-N	CBM-N	0.02
CBM-S1	CBM-S1	2.87
CBM-S2	CBM-S2	10.47
CBM-W2	CBM-W2	13.16
COFFEEN	COFFEEN	0.19
CPLE	CPLE	5.5
DEARBORN	DEARBORN	0.83
DUCKCREEK	DUCKCREEK	0.58
EDWARDS	EDWARDS	0.3
ELMERSMITH	ELMERSMITH	0.17
FARMERCITY	FARMERCITY	0.0
G-007A	G-007A	0.4
GIBSON	GIBSON	0.13
NEWTON	NEWTON	0.56
NYISO	NYISO	0.08
O-066A	O-066A	0.18
TATANKA	TATANKA	0.14

Bus #	Bus	MW Impact
TILTON	TILTON	0.42
TRIMBLE	TRIMBLE	0.48
VFT	VFT	1.04

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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
920236	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	Base Case	single	167.0	120.8	123.81	DC	5.02

Bus #	Bus	MW Impact
246843	05SMG1	1.0
246844	05SMG2	2.63
246845	05SMG3	1.54
246846	05SMG4	2.72
246847	05SMG5	1.03
247284	05LEESVG	1.65
315156	1HALLBR1	2.83
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.39
919841	AA2-070	0.5
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
932821	AC2-107 C	12.09
933941	AD1-017 C	0.55
934311	AD1-055 C	1.38
936331	AD2-043 C	2.7
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
BAYOU	BAYOU	0.0
BLUEG	BLUEG	1.33
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.05
CPLE	CPLE	0.79
DEARBORN	DEARBORN	0.22
DUCKCREEK	DUCKCREEK	0.25
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05
NEWTON	NEWTON	0.29
PRAIRIE	PRAIRIE	0.42

Bus #	Bus	MW Impact
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.05

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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
920204	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	Base Case	single	167.0	126.25	129.26	DC	5.02

Bus #	Bus	MW Impact
246843	05SMG1	1.0
246844	05SMG2	2.63
246845	05SMG3	1.54
246846	05SMG4	2.72
246847	05SMG5	1.03
247284	05LEESVG	1.65
315156	1HALLBR1	2.83
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.39
919841	AA2-070	0.5
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
932821	AC2-107 C	12.09
933941	AD1-017 C	0.55
934311	AD1-055 C	1.38
936331	AD2-043 C	2.7
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
BAYOU	BAYOU	0.0
BLUEG	BLUEG	1.33
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.05
CPLE	CPLE	0.79
DEARBORN	DEARBORN	0.22
DUCKCREEK	DUCKCREEK	0.25
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05
NEWTON	NEWTON	0.29
PRAIRIE	PRAIRIE	0.42

Bus #	Bus	MW Impact
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.05

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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
920171	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	128.94	131.95	DC	5.02

Bus #	Bus	MW Impact
246843	05SMG1	1.0
246844	05SMG2	2.63
246845	05SMG3	1.54
246846	05SMG4	2.72
246847	05SMG5	1.03
247284	05LEESVG	1.65
315156	1HALLBR1	2.83
315165	1HURT 1	12.78
315166	1HURT 2	12.78
315266	1PLYWOOD A	0.39
919841	AA2-070	0.5
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
932821	AC2-107 C	12.09
933941	AD1-017 C	0.55
934311	AD1-055 C	1.38
936331	AD2-043 C	2.7
938451	AE1-064 C	6.11
939941	AE1-230 C1	2.46
940081	AE1-250 C	5.02
BAYOU	BAYOU	0.0
BLUEG	BLUEG	1.33
CANNELTON	CANNELTON	0.07
CARR	CARR	0.02
CBM-S2	CBM-S2	1.18
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.05
CPLE	CPLE	0.79
DEARBORN	DEARBORN	0.22
DUCKCREEK	DUCKCREEK	0.25
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.06
GIBSON	GIBSON	0.05
NEWTON	NEWTON	0.29
PRAIRIE	PRAIRIE	0.42

Bus #	Bus	MW Impact
RENSSELAER	RENSSELAER	0.01
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.12
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.15
TVA	TVA	0.05

Affected Systems

LG&E

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

MISO

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

TVA

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

Duke Energy Progress

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

NYISO

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

Contingency Name	Contingency Definition
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_P1-2_#1377	CONTINGENCY 'AEP_P1-2_#1377' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 END
AEP_P4_#10171_05AXTON 138_G	CONTINGENCY 'AEP_P4_#10171_05AXTON 138_G' OPEN BRANCH FROM BUS 242509 TO BUS 242514 CKT 1 / 242509 05AXTON 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242509 TO BUS 242545 CKT 1 / 242509 05AXTON 765 242545 05AXTONX 138 1 OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT SR / 242544 05AXTON 138 242545 05AXTONX 138 SR OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT ZB / 242544 05AXTON 138 242545 05AXTONX 138 ZB OPEN BRANCH FROM BUS 242544 TO BUS 242619 CKT 2 / 242544 05AXTON 138 242619 05DANVL1 138 2 END
AEP_P4_#11111_05J.FERR 765_B1	CONTINGENCY 'AEP_P4_#11111_05J.FERR 765_B1' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242514 TO BUS 242684 CKT 2 / 242514 05J.FERR 765 242684 05J.FERR 138 2 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 END
AEP_P4_#2916_05J.FERR 765_A	CONTINGENCY 'AEP_P4_#2916_05J.FERR 765_A' OPEN BRANCH FROM BUS 242509 TO BUS 242514 CKT 1 / 242509 05AXTON 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242511 TO BUS 242514 CKT 1 / 242511 05BROADF 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242509 TO BUS 242545 CKT 1 / 242509 05AXTON 765 242545 05AXTONX 138 1 OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT SR / 242544 05AXTON 138 242545 05AXTONX 138 SR OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT ZB / 242544 05AXTON 138 242545 05AXTONX 138 ZB OPEN BRANCH FROM BUS 242566 TO BUS 242567 CKT ZB / 242566 05BROADF 138 242567 05BROADX 138 ZB END

Contingency Name	Contingency Definition
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
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
AEP_P7-1_#10880	CONTINGENCY 'AEP_P7-1_#10880' OPEN BRANCH FROM BUS 242544 TO BUS 242712 CKT 1 / 242544 05AXTON 138 242712 05MARTN2 138 1 OPEN BRANCH FROM BUS 242544 TO BUS 242816 CKT 1 / 242544 05AXTON 138 242816 05STOCKT 138 1 OPEN BRANCH FROM BUS 242614 TO BUS 242638 CKT 1 / 242614 05COLLIN 138 242638 05FIELDALE1 138 1 OPEN BRANCH FROM BUS 242614 TO BUS 242712 CKT 1 / 242614 05COLLIN 138 242712 05MARTN2 138 1 OPEN BRANCH FROM BUS 242711 TO BUS 242816 CKT 1 / 242711 05MARTN1 138 242816 05STOCKT 138 1 OPEN BRANCH FROM BUS 242712 TO BUS 243977 CKT 1 / 242712 05MARTN2 138 243977 05MART 115 34.5 1 OPEN BRANCH FROM BUS 243977 TO BUS 243979 CKT Z1 / 243977 05MART 115 34.5 243979 05MART2-30 34.5 Z1 OPEN BRANCH FROM BUS 243977 TO BUS 243980 CKT 1 / 243977 05MART 115 34.5 243980 05MORRIS-N 34.5 1 END
AEP_P1-2_#1370	CONTINGENCY 'AEP_P1-2_#1370' OPEN BRANCH FROM BUS 242509 TO BUS 242514 CKT 1 / 242509 05AXTON 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242509 TO BUS 242545 CKT 1 / 242509 05AXTON 765 242545 05AXTONX 138 1 OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT SR / 242544 05AXTON 138 242545 05AXTONX 138 SR OPEN BRANCH FROM BUS 242544 TO BUS 242545 CKT ZB / 242544 05AXTON 138 242545 05AXTONX 138 ZB END

Contingency Name	Contingency Definition
AEP_P1-2_#5471-A	CONTINGENCY 'AEP_P1-2_#5471-A' OPEN BRANCH FROM BUS 242575 TO BUS 242737 CKT 1 / 242575 05CAMDLM 138 242737 05OPOSSUMCK 138 1 OPEN BRANCH FROM BUS 242575 TO BUS 242781 CKT 1 / 242575 05CAMDLM 138 242781 05RUSTBR 138 1 OPEN BRANCH FROM BUS 242575 TO BUS 926520 CKT 1 / 242575 05CAMDLM 138 926520 AC1-123 TAP 138 1 END
DVP_P1-2: LN 511	CONTINGENCY 'DVP_P1-2: LN 511' OPEN BRANCH FROM BUS 314902 TO BUS 314936 CKT 1 /* 8CARSON 500.00 - 8RAWLINGS 500.00 END
AEP_P4_#11112_05J.FERR 765_A1	CONTINGENCY 'AEP_P4_#11112_05J.FERR 765_A1' OPEN BRANCH FROM BUS 242511 TO BUS 242514 CKT 1 / 242511 05BROADF 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 OPEN BRANCH FROM BUS 242566 TO BUS 242567 CKT ZB / 242566 05BROADF 138 242567 05BROADX 138 ZB 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_P7-1_#10817-A	CONTINGENCY 'AEP_P7-1_#10817-A' OPEN BRANCH FROM BUS 926520 TO BUS 247499 CKT 1 / 926520 AC1-123 TAP 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 314667 CKT 1 / 242701 05LEESVI 138 314667 4ALTVSTA 138 1 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	

Contingency Name	Contingency Definition
AEP_P7-1_#10808-A	CONTINGENCY 'AEP_P7-1_#10808-A' OPEN BRANCH FROM BUS 926520 TO BUS 247499 CKT 1 / 926520 AC1-123 TAP 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 247499 CKT 1 / 242701 05LEESVI 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 314667 CKT 1 / 242701 05LEESVI 138 314667 4ALTVSTA 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 247284 CKT 1 / 242701 05LEESVI 138 247284 05LEESVG 13.8 1 END
AEP_P1-2_#344-A	CONTINGENCY 'AEP_P1-2_#344-A' OPEN BRANCH FROM BUS 242530 TO BUS 936160 CKT 1 / 242530 05EDANV1 230 936160 AD2-022 TAP 230 1 END
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_P1-2: LN 1016-B	CONTINGENCY 'DVP_P1-2: LN 1016-B' OPEN BRANCH FROM BUS 927260 TO BUS 314696 CKT 1 /* AC1-222 TAP 115.00 - 3SEDGE HILL 115.00 END

Short Circuit

Short Circuit

Due to the planned capability to operate with both PV and Storage Inverters energized at the same time, the Short Circuit studies were conducted with both systems modeled on-line (i.e., at 300 MW) although the steady-state output will be limited to a maximum of 150 MW.

The following Breakers are overduty

None