



**Generation Interconnection
Feasibility Study Report
for
Queue Project AE1-146
EBERSOLE -FOSTORIA CENTRAL #2 138 KV
81.3 MW Capacity / 120 MW Energy**

June, 2019

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Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a \$10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model.

The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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

General

The Interconnection Customer has proposed to install PJM project # AE1-146, a Solar generating facility located in Hancock County, Ohio (See Figure 2). The installed facilities will have a total capability of 120 MW with 81.3 MW of this output being recognized by PJM as Capacity. The Primary Point of Interconnection will be to AEP's Ebersole – Fostoria Central #2 138kV circuit (See Figure 1). The secondary Point of Interconnection will be at the Ebersole 138 kV substation (See Figure 3).

The proposed in-service date for this project is May 1, 2020. This study does not imply AEP's commitment to this in-service date.

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 for maintaining the reliability of the AEP transmission system.

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.

Queue Number	AE1-146
Project Name	EBERSOLE-FOSTORIA CENTRAL #2 138 KV
State	Ohio
County	Hancock
Transmission Owner	AEP
MFO	120
MWE	120
MWC	81.3
Fuel	Solar
Base case Study Year	2022

Primary Point of Interconnection

AE1-146 will interconnect with the AEP transmission system via a new station cut into the Ebersole to Fostoria Central 138 kV Ckt 2.

To accommodate the interconnection on the Ebersole – Fostoria Central #2 138 kV circuit, 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 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 AE1-146 project will be responsible for the following costs:

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

In addition, the AE1-146 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$68,311,400

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
Ebersole – Fostoria Central circuit #2 138 kV T-Line Cut In	\$1,000,000
Total Direct Connection Facility Costs	\$1,000,000

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
138 kV Revenue Metering	\$250,000
Upgrade line protection and controls at the Ebersole 138 kV substation	\$250,000
Upgrade line protection and controls at the Fostoria Central 138 kV substation	\$250,000
Total Non-Direct Connection Facility Costs	\$750,000

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 signing Agreement execution.

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 the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the new station cut into the Ebersole- Fostoria Central 138 kV circuit #2 are not included in this report; these are assumed to be the Interconnection Customer'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 – Option 1

The Queue Project AE1-146 was evaluated as a 120 MW (Capacity 81.3 MW) injection tapping the Ebersole to Fostoria Central 138 kV Ckt. 2 in the AEP area. Project AE1-146 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-146 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
122510	238569	02BEAVER	ATSI	238607	02CARLIL	ATSI	1	ATSI-P7-1-OEC-345-001	tower	1243.0	116.94	117.42	DC	13.17
121388	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P2-3-TE-345-010T	breaker	223.0	109.73	115.7	DC	13.31
121389	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	AEP_P4_#3141_05FOSTOR 345_B2	breaker	223.0	100.47	111.63	DC	24.89
122589	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P7-1-TE-138-026	tower	223.0	103.38	108.99	DC	12.53
122541	239728	02BLKRVR	ATSI	239734	02USSTEEL	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	659.0	114.54	115.03	DC	7.22
122489	239734	02USSTEEL	ATSI	238915	02LRN Q2	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	593.0	122.85	123.4	DC	7.22
723026	242984	05CHATFL	AEP	932050	AC2-015 TAP	AEP	1	AEP_SUBT_P4_#1208_05HOWA RD 69.0_U	breaker	167.0	121.87	123.55	DC	6.21
722396	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1	bus	251.0	134.3	135.67	DC	7.62
722869	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#1176_05FREMNT C 69.0_L	breaker	251.0	135.02	136.38	DC	7.62
722870	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#2200_05FREMNT C 69.0_E	breaker	251.0	134.3	135.67	DC	7.62
724411	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_P7-1_#10933	tower	251.0	123.51	124.88	DC	7.66
122439	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.66	DC	6.51
122440	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10926	tower	245.0	129.79	130.99	DC	6.51
724399	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.66	DC	6.51
724400	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10926	tower	245.0	129.79	130.99	DC	6.51
722452	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P2-2_#9521_05CHATFL 138_2	bus	167.0	123.81	125.46	DC	6.11
722997	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P4_#9521_05CHATFL 138_F	breaker	167.0	123.81	125.46	DC	6.11
722729	932050	AC2-015 TAP	AEP	243024	05HOWARD	AEP	1	AEP_SUBT_P4_#1208_05HOWA RD 69.0_U	breaker	167.0	153.64	155.32	DC	6.21

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
122181	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	AEP_P1-3_#744_05FOSTOR 345_1	operation	223.0	96.53	107.66	DC	24.82
724038	242984	05CHATFL	AEP	932050	AC2-015 TAP	AEP	1	AEP_P1-2_#7105	operation	167.0	107.83	109.45	DC	6.0
723829	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	ATSI-P2-2-OES-138-052T	operation	251.0	122.66	124.04	DC	7.66
723833	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	Base Case	operation	251.0	101.92	103.15	DC	6.83
723671	243039	05MELMOR	AEP	242984	05CHATFL	AEP	1	AEP_P1-2_#7105	operation	167.0	140.72	142.49	DC	6.53
723825	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P1-2_#7709	operation	167.0	123.78	125.42	DC	6.09
723670	932050	AC2-015 TAP	AEP	243024	05HOWARD	AEP	1	AEP_P1-2_#7105	operation	167.0	141.29	142.91	DC	6.0

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
122541	3	02BLKRVR 138.0 kV - 02USSTEEL 138.0 kV Ckt 1	ATSI Description : FE will propose as part of the FE 2018 reliability project to build approximately 8 miles new 138kV line from Black River to Astor substation, Black River-Astor Q11 138kV line, with 795Kcmil ACSS conductor by reconfiguring the Black River-Republic Vine 138kV line. The line reconfiguration will cut open the existing Black River-Republic Vine 138kV line and extend the Black River section to Astor substation to create Black River -Astor Q11 138kV line and the Republic Vine section to Charleston substation to create Charleston-Republic Vine 138kV line. A high-level project scope is listed below. Build a new 138kV four circuit breaker ring bus switching substation adjacent to the exiting Astor substation; Expand the Charleston 138kV substation into five (6) circuit breaker ring bus.; Disconnect the Black River-Republic Vine 138kV line from Republic Vine substation at Republic Vine and reroute the line to extend to the new AstorQ11 138kV substation by building a new ~7.1 miles 138kV line with 795Kcmil ACSS conductor with fiber optics and rebuild the cut opened section of the Black River-Republic Vine 138kV line (~0.8 miles) with 795Kcmil ACSS conductor with fiber optics as part of the new Black River-Aster Q11 138kV line.; Loop/Terminate the existing Avon - Fox Q11 138kv line into the new AstorQ11 ring bus, switching substation.; Build a new ~1.9 miles 138kV line to connect the Republic Vine sub to Charleston substation with 795Kcmil ACSR (require negotiation with Republic steel/US Steel to obtain ROW) ; Protection Per FE Standard, Adjust relay at terminal as require; The project changes the existing ATSI 138kV system configuration. After the completion of the project, FE doesn't expect a violation on Black River-Charleston, Charleston-Lorain Q2, Admiral-Lorain Q2 and Avon-Admiral Q2 138kV line. Time Estimate : 30.0 Months Cost : \$20,152,700	\$20,152,700
122489	4	02USSTEEL 138.0 kV - 02LRN Q2 138.0 kV Ckt 1	AEP Description : 1) 8 miles of ACSR ~ 397.5 ~ 30/7 ~ LARK - Conductor Section 1 will need to be rebuilt/reconductored. Estimated cost: \$12 million. 2) Replace five Sub cond 795 AAC 37 Str at Howard. Estimated cost: \$100,000. Time Estimate : 24-36 Months Cost : \$12,100,000 ATSI Description: Replace 750 CU Substation Circular Conductor and 336 ACSS Transmission Line owned by FE with 795 ACSR conductor. An external component also needs replaced by AEP. Time Estimate : 22.0 Months Cost : \$24,415,700	\$36,515,700
122440,724400,724399,122439	7	05HOWARD 138.0 kV - 02BRKSID 138.0 kV Ckt 1		

ID	Index	Facility	Upgrade Description	Cost
722729	9	AC2-015 TAP 138.0 kV - 05HOWARD 138.0 kV Ckt 1	AEP Description : 1) A Sag Study will be required on the 10.5 miles of ACSR ~ 397.5 ~ 30/7 ~ LARK - Conductor Section 1 to mitigate the overload. The sag study is estimated to take 6-12 months. Depending on the sag study results, the cost for this upgrade is expected to be between \$42,000 (no remediation required, just sag study) and \$15.75 million (complete line reconductor/rebuild). New rating after sag study: S/N: 167 S/E: 245 2) Replace riser/jumper (Sub cond 300 MCM CU 37 Str - Howard) at Howard. Estimated cost \$100,000. 3) An Engineering study will need to be conducted to determine if the CT Thermal Limit settings at Howard can be adjusted to mitigate the overload. Estimated Cost: \$25,000. 4) An Engineering study will need to be conducted to determine if the Relay Thermal Limit settings at Howard 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) Replace riser/ jumper (Sub cond 397.5 ACSR 26/7 - Howard) at Howard. Estimated cost: \$100,000. 6) An Engineering study will need to be conducted to determine if the Relay Compliance Trip Limit at Howard 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. 7) Replace five risers/jumpers (Five Sub cond 795 AAC 37 Str.) at Howard. Estimated cost: \$100,000. Time Estimate : 24-36 Months Cost : \$417,000	\$417,000
722452,722997	8	05MELMOR 138.0 kV - 05HOWARD 138.0 kV Ckt 1	AEP Description : 1) A Sag Study will be required on the 26.5 miles of ACSR ~ 397.5 ~ 30/7 ~ LARK - Conductor Section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between \$106,000 (no remediation required, just sag study) and \$39.75 million (complete line reconductor/rebuild). New rating after sag study: S/N: 167 S/E: 245. 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. 2) Replace two Howard Line risers. Estimated cost: \$100,000. Time Estimate : 18-24 Months Cost : \$206,000	\$206,000
724411,722396,722869,722870	6	05FREMCT 138.0 kV - 05FRMNT 138.0 kV Ckt 1	AEP Description: Rebuild / reconductor 7 miles of ACSR ~ 795 ~ 45/7 ~ TERN - Conductor Section 1. Estimated cost: \$10.5 million. Time Estimate : 24-36 Months Cost : \$10,500,000	\$10,500,000
121388,121389,122589	2	02WOOD+ 138.0 kV - 02LEMOYN 138.0 kV Ckt 1	ATSI Description: No Violation. Actual SE rating for 02LEMOYN - 02WOOD+ is 347 MVA.	\$0

ID	Index	Facility	Upgrade Description	Cost
122510	1	02BEAVER 345.0 kV - 02CARLIL 345.0 kV Ckt 1	<u>ATSI</u> Description: No Violation. Actual Rating is 1646 MVA SE.	\$0
723026	5	05CHATFL 138.0 kV - AC2- 015 TAP 138.0 kV Ckt 1	<u>AEP</u> Description : 1) A sag study will be required on the 4.5 miles of ACSR ~ 397.5 ~ 30/7 ~ LARK - Conductor Section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between \$20,000 (no remediation required, just sag study) and \$6.75 million (complete line reconductor/rebuild). New rating after sag study: S/N: 167 S/E: 245. 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. 2) Replace 600A Switch at Chatfield. Estimated cost: \$500,000. Time Estimate : 12-18 Months Cost : \$520,000	\$520,000
			TOTAL COST	\$68,311,400

Flow Gate Details

The following appendices contain additional information about each flow gate presented in the body of the report. For each appendix, a description of the flow gate 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 flow gate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gauge other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

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
122510	238569	02BEAVER	ATSI	238607	02CARLIL	ATSI	1	ATSI-P7-1-OEC-345-001	tower	1243.0	116.94	117.42	DC	13.17

Bus #	Bus	MW Impact
238572	02BEAVGB	1.52
238670	02DVBSG1	194.41
238979	02NAPMUN	5.29
239171	02WLORG-2	4.4
239172	02WLORG-3	4.47
239173	02WLORG-4	4.48
239174	02WLORG-5	4.49
239175	02WLORG-6	2.31
240968	02BG2 GEN	1.11
240969	02BG4 G1	0.28
240973	02BG6 AMPO	4.32
240975	02PGE GEN	5.7
247548	V4-010 C	3.18
247567	V2-006 C	1.74
247940	U4-028 E	9.83
247941	U4-029 E	9.83
247947	V4-010 E	21.25
247961	V2-006 E	11.63
900041	V4-011	0.34
925751	AC1-051 C	0.7
925752	AC1-051 E	4.66
931951	AB1-107 1	43.54
931961	AB1-107 2	100.57
932051	AC2-015 C	4.84
932052	AC2-015 E	5.73
932791	AC2-103 C	11.35
932792	AC2-103 E	75.98
934251	AD1-052 C1	1.87
934261	AD1-052 C2	1.87
934461	AD1-070 C O1	4.25
934462	AD1-070 E O1	19.95
934761	AD1-103 C O1	19.09
934762	AD1-103 E O1	127.74
934891	AD1-118	11.37
937021	AD2-136 C O1	5.29
937022	AD2-136 E O1	35.4
937081	AD2-143 C O1	2.7
937082	AD2-143 E O1	12.62
937381	AD2-191 C	2.94
937382	AD2-191 E	19.67

Bus #	Bus	MW Impact
938911	AE1-119	89.36
939161	AE1-146 C O1	8.98
939162	AE1-146 E O1	4.19
950241	J419	8.26
953321	J799	15.54
953781	J833	8.26
AB2-013	AB2-013	6.52
AE1-033	AE1-033	6.88
CARR	CARR	1.08
CBM-S1	CBM-S1	7.73
CBM-S2	CBM-S2	1.32
CBM-W1	CBM-W1	38.01
CBM-W2	CBM-W2	71.19
CIN	CIN	8.93
CPL	CPL	0.26
G-007	G-007	2.64
IPL	IPL	5.71
LGEE	LGEE	2.12
MEC	MEC	18.01
MECS	MECS	41.15
O-066	O-066	8.96
RENSSELAER	RENSSELAER	0.86
WEC	WEC	2.97
Z1-043	Z1-043	11.4

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
121388	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P2-3-TE-345-010T	breaker	223.0	109.73	115.7	DC	13.31

Bus #	Bus	MW Impact
238601	02FRMENG 1	2.77
238602	02FRMENG 2	2.77
238603	02FRMENG 3	5.01
247548	V4-010 C	2.62
247551	U4-028 C	0.2
247552	U4-029 C	0.2
247934	U4-001 E	10.0
247940	U4-028 E	8.79
247941	U4-029 E	8.79
247947	V4-010 E	17.56
900041	V4-011	0.33
925751	AC1-051 C	0.56
925752	AC1-051 E	3.73
932051	AC2-015 C	4.0
932052	AC2-015 E	4.74
934251	AD1-052 C1	1.22
934261	AD1-052 C2	1.22
934461	AD1-070 C O1	4.72
934462	AD1-070 E O1	22.17
937021	AD2-136 C O1	4.73
937022	AD2-136 E O1	31.64
937381	AD2-191 C	2.63
937382	AD2-191 E	17.58
939161	AE1-146 C O1	9.07
939162	AE1-146 E O1	4.24
BAYOU	BAYOU	0.1
BIG_CAJUN1	BIG_CAJUN1	0.14
BIG_CAJUN2	BIG_CAJUN2	0.28
BLUEG	BLUEG	0.01
CANNELTON	CANNELTON	0.02
CBM-N	CBM-N	0.03
CBM-S2	CBM-S2	0.12
CHOCTAW	CHOCTAW	0.07
COFFEEN	COFFEEN	0.15
COTTONWOOD	COTTONWOOD	0.44
CPL	CPL	0.06
DEARBORN	DEARBORN	4.0
DUCKCREEK	DUCKCREEK	0.5
EDWARDS	EDWARDS	0.24
ELMERSMITH	ELMERSMITH	0.03

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.17
GIBSON	GIBSON	0.03
LGEE	LGEE	0.01
NEWTON	NEWTON	0.34
NYISO	NYISO	0.13
O-066A	O-066A	0.08
PRAIRIE	PRAIRIE	0.6
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.24
TILTON	TILTON	0.2
TVA	TVA	0.07
UNIONPOWER	UNIONPOWER	0.06
VFT	VFT	0.46

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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
122541	239728	02BLKRVR	ATSI	239734	02USSTEEL	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	659.0	114.54	115.03	DC	7.22

Bus #	Bus	MW Impact
238571	02BEAVGA	1.5
238572	02BEAVGB	1.53
238670	02DVBSG1	89.73
238979	02NAPMUN	2.71
239174	02WLORG-5	1.8
239175	02WLORG-6	2.33
240968	02BG2 GEN	0.57
240969	02BG4 G1	0.14
240973	02BG6 AMPO	2.24
240975	02PGE GEN	2.96
241908	02LLF_W4-004	0.51
247548	V4-010 C	1.94
247934	U4-001 E	9.49
247940	U4-028 E	6.01
247941	U4-029 E	6.01
247947	V4-010 E	13.0
900041	V4-011	0.19
925751	AC1-051 C	0.47
925752	AC1-051 E	3.11
931951	AB1-107 1	22.46
931961	AB1-107 2	49.26
932051	AC2-015 C	3.23
932052	AC2-015 E	3.83
932791	AC2-103 C	4.81
932792	AC2-103 E	32.17
934251	AD1-052 C1	1.15
934261	AD1-052 C2	1.15
934461	AD1-070 C O1	2.33
934462	AD1-070 E O1	10.92
934761	AD1-103 C O1	8.08
934762	AD1-103 E O1	54.09
934891	AD1-118	5.63
937021	AD2-136 C O1	3.23
937022	AD2-136 E O1	21.63
937081	AD2-143 C O1	1.42
937082	AD2-143 E O1	6.67
937381	AD2-191 C	1.8
937382	AD2-191 E	12.01
938911	AE1-119	44.2
939161	AE1-146 C O1	4.92

Bus #	Bus	MW Impact
939162	AE1-146 E O1	2.3
CARR	CARR	0.77
CBM-S1	CBM-S1	4.97
CBM-S2	CBM-S2	1.11
CBM-W1	CBM-W1	20.52
CBM-W2	CBM-W2	43.65
CIN	CIN	5.35
CPL	CPL	0.29
G-007	G-007	1.57
IPL	IPL	3.43
LGEE	LGEE	1.32
MEC	MEC	10.58
MECS	MECS	20.89
O-066	O-066	5.35
RENSSELAER	RENSSELAER	0.6
WEC	WEC	1.71

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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
122489	239734	02USSTEEL	ATSI	238915	02LRN Q2	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	593.0	122.85	123.4	DC	7.22

Bus #	Bus	MW Impact
238571	02BEAVGA	1.5
238572	02BEAVGB	1.53
238670	02DVBSG1	89.73
238979	02NAPMUN	2.71
239174	02WLORG-5	1.8
239175	02WLORG-6	2.33
240968	02BG2 GEN	0.57
240969	02BG4 G1	0.14
240973	02BG6 AMPO	2.24
240975	02PGE GEN	2.96
241908	02LLF_W4-004	0.51
247548	V4-010 C	1.94
247934	U4-001 E	9.49
247940	U4-028 E	6.01
247941	U4-029 E	6.01
247947	V4-010 E	13.0
900041	V4-011	0.19
925751	AC1-051 C	0.47
925752	AC1-051 E	3.11
931951	AB1-107 1	22.46
931961	AB1-107 2	49.26
932051	AC2-015 C	3.23
932052	AC2-015 E	3.83
932791	AC2-103 C	4.81
932792	AC2-103 E	32.17
934251	AD1-052 C1	1.15
934261	AD1-052 C2	1.15
934461	AD1-070 C O1	2.33
934462	AD1-070 E O1	10.92
934761	AD1-103 C O1	8.08
934762	AD1-103 E O1	54.09
934891	AD1-118	5.63
937021	AD2-136 C O1	3.23
937022	AD2-136 E O1	21.63
937081	AD2-143 C O1	1.42
937082	AD2-143 E O1	6.67
937381	AD2-191 C	1.8
937382	AD2-191 E	12.01
938911	AE1-119	44.2
939161	AE1-146 C O1	4.92

Bus #	Bus	MW Impact
939162	AE1-146 E O1	2.3
CARR	CARR	0.77
CBM-S1	CBM-S1	4.97
CBM-S2	CBM-S2	1.11
CBM-W1	CBM-W1	20.52
CBM-W2	CBM-W2	43.65
CIN	CIN	5.35
CPL	CPL	0.29
G-007	G-007	1.57
IPL	IPL	3.43
LGEE	LGEE	1.32
MEC	MEC	10.58
MECS	MECS	20.89
O-066	O-066	5.35
RENSSELAER	RENSSELAER	0.6
WEC	WEC	1.71

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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
723026	242984	05CHATFL	AEP	932050	AC2-015 TAP	AEP	1	AEP_SUBT_P4_#1208_05HOWARD 69.0_U	breaker	167.0	121.87	123.55	DC	6.21

Bus #	Bus	MW Impact
247548	V4-010 C	3.75
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247940	U4-028 E	14.88
247941	U4-029 E	14.88
247947	V4-010 E	25.07
925751	AC1-051 C	2.41
925752	AC1-051 E	16.14
934251	AD1-052 C1	0.64
934261	AD1-052 C2	0.64
934461	AD1-070 C O1	2.18
934462	AD1-070 E O1	10.22
937021	AD2-136 C O1	8.0
937022	AD2-136 E O1	53.56
937381	AD2-191 C	4.45
937382	AD2-191 E	29.76
939161	AE1-146 C O1	4.23
939162	AE1-146 E O1	1.98
CARR	CARR	0.07
CATAWBA	CATAWBA	0.0
CBM-S1	CBM-S1	0.45
CBM-W1	CBM-W1	4.3
CBM-W2	CBM-W2	5.45
CIN	CIN	0.73
G-007	G-007	0.2
HAMLET	HAMLET	0.04
IPL	IPL	0.46
LGEE	LGEE	0.13
MEC	MEC	1.64
MECS	MECS	5.26
O-066	O-066	0.66
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.29

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
722869	243008	05FREMC T	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#1176_05FREMN T C 69.0_L	breaker	251.0	135.02	136.38	DC	7.62

Bus #	Bus	MW Impact
247542	U4-001 C	0.57
247548	V4-010 C	9.8
247551	U4-028 C	0.54
247552	U4-029 C	0.54
247934	U4-001 E	25.05
247940	U4-028 E	23.52
247941	U4-029 E	23.52
247947	V4-010 E	65.56
900041	V4-011	0.19
925751	AC1-051 C	1.46
925752	AC1-051 E	9.75
932051	AC2-015 C	10.42
932052	AC2-015 E	12.35
934461	AD1-070 C O1	2.68
934462	AD1-070 E O1	12.58
937021	AD2-136 C O1	12.65
937022	AD2-136 E O1	84.67
937381	AD2-191 C	7.03
937382	AD2-191 E	47.04
939161	AE1-146 C O1	5.2
939162	AE1-146 E O1	2.43
CARR	CARR	0.05
CBM-S1	CBM-S1	0.94
CBM-S2	CBM-S2	0.4
CBM-W2	CBM-W2	6.08
CIN	CIN	0.7
CPL	CPL	0.15
DEARBORN	DEARBORN	1.4
G-007	G-007	0.05
IPL	IPL	0.47
LGEE	LGEE	0.25
MEC	MEC	0.91
O-066	O-066	0.17
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.11

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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
724399	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.66	DC	6.51

Bus #	Bus	MW Impact
247542	U4-001 C	1.57
247548	V4-010 C	3.66
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247926	U1-059 E	2.63
247934	U4-001 E	68.35
247940	U4-028 E	14.64
247941	U4-029 E	14.64
247942	W1-056 E	0.97
247947	V4-010 E	24.51
900041	V4-011	0.16
925751	AC1-051 C	2.34
925752	AC1-051 E	15.63
932051	AC2-015 C	16.16
932052	AC2-015 E	19.15
934251	AD1-052 C1	0.6
934261	AD1-052 C2	0.6
934461	AD1-070 C O1	2.23
934462	AD1-070 E O1	10.48
937021	AD2-136 C O1	7.87
937022	AD2-136 E O1	52.7
937381	AD2-191 C	4.37
937382	AD2-191 E	29.28
939161	AE1-146 C O1	4.44
939162	AE1-146 E O1	2.07
CARR	CARR	0.12
CBM-S1	CBM-S1	0.93
CBM-S2	CBM-S2	0.1
CBM-W1	CBM-W1	5.04
CBM-W2	CBM-W2	9.1
CIN	CIN	1.18
CPL	CPL	0.01
G-007	G-007	0.33
IPL	IPL	0.76
LGEE	LGEE	0.26
MEC	MEC	2.41
MECS	MECS	5.4
O-066	O-066	1.11
RENSSELAER	RENSSELAER	0.1
WEC	WEC	0.41

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
722997	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P4_#9521_05CHATF L 138_F	breaker	167.0	123.81	125.46	DC	6.11

Bus #	Bus	MW Impact
247548	V4-010 C	3.56
247551	U4-028 C	0.35
247552	U4-029 C	0.35
247940	U4-028 E	15.23
247941	U4-029 E	15.23
247947	V4-010 E	23.8
934251	AD1-052 C1	0.61
934261	AD1-052 C2	0.61
934461	AD1-070 C O1	2.15
934462	AD1-070 E O1	10.12
937021	AD2-136 C O1	8.19
937022	AD2-136 E O1	54.84
937381	AD2-191 C	4.55
937382	AD2-191 E	30.47
939161	AE1-146 C O1	4.17
939162	AE1-146 E O1	1.95
CARR	CARR	0.05
CATAWBA	CATAWBA	0.02
CBM-S1	CBM-S1	0.28
CBM-W1	CBM-W1	4.0
CBM-W2	CBM-W2	4.1
CIN	CIN	0.57
G-007	G-007	0.15
HAMLET	HAMLET	0.07
IPL	IPL	0.36
LGEE	LGEE	0.08
MEC	MEC	1.37
MECS	MECS	5.15
O-066	O-066	0.52
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.25

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
722729	932050	AC2-015 TAP	AEP	243024	05HOWARD	AEP	1	AEP_SUBT_P4_#1208_05HOWARD 69.0_U	breaker	167.0	153.64	155.32	DC	6.21

Bus #	Bus	MW Impact
247548	V4-010 C	3.75
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247940	U4-028 E	14.88
247941	U4-029 E	14.88
247947	V4-010 E	25.07
925751	AC1-051 C	2.41
925752	AC1-051 E	16.14
932051	AC2-015 C	24.29
932052	AC2-015 E	28.78
934251	AD1-052 C1	0.64
934261	AD1-052 C2	0.64
934461	AD1-070 C O1	2.18
934462	AD1-070 E O1	10.22
937021	AD2-136 C O1	8.0
937022	AD2-136 E O1	53.56
937381	AD2-191 C	4.45
937382	AD2-191 E	29.76
939161	AE1-146 C O1	4.23
939162	AE1-146 E O1	1.98
CARR	CARR	0.07
CATAWBA	CATAWBA	0.0
CBM-S1	CBM-S1	0.45
CBM-W1	CBM-W1	4.3
CBM-W2	CBM-W2	5.45
CIN	CIN	0.73
G-007	G-007	0.2
HAMLET	HAMLET	0.04
IPL	IPL	0.46
LGEE	LGEE	0.13
MEC	MEC	1.64
MECS	MECS	5.26
O-066	O-066	0.66
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.29

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
ATSI-P2-3-TE-345-010T	CONTINGENCY 'ATSI-P2-3-TE-345-010T' /* LEMOYNE BK-B1 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 242936 CKT 1 /* 02LEMOYN 345 05FOSTOR 345 REMOVE MACHINE 1 FROM BUS 238885 /* 02LEMOG1 18 DISCONNECT BUS 238885 /* 02LEMOG1 18 REMOVE MACHINE 2 FROM BUS 238886 /* 02LEMOG2 18 DISCONNECT BUS 238886 /* 02LEMOG2 18 REMOVE MACHINE 3 FROM BUS 238887 /* 02LEMOG3 18 DISCONNECT BUS 238887 /* 02LEMOG3 18 REMOVE MACHINE 4 FROM BUS 238888 /* 02LEMOG4 18 DISCONNECT BUS 238888 /* 02LEMOG4 18 END
AEP_SUBT_P4_#1176_05FREMNT C 69.0_L	CONTINGENCY 'AEP_SUBT_P4_#1176_05FREMNT C 69.0_L' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245641 TO BUS 245614 CKT 1 / 245641 05BIRCHARDSS69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 OPEN BRANCH FROM BUS 245623 TO BUS 245625 CKT 1 / 245623 05HOLRAN 69.0 245625 05MAPLE GR 69.0 1 OPEN BRANCH FROM BUS 245625 TO BUS 245628 CKT 1 / 245625 05MAPLE GR 69.0 245628 05RIVERVIE 69.0 1 REMOVE SWSHUNT FROM BUS 245614 / 245614 05FREMNT C 69.0 END
ATSI-P2-2-OES-138-052T	CONTINGENCY 'ATSI-P2-2-OES-138-052T' /* BROOKSIDE 138 SOUTH BUS FAULT B-28 FAILURE TO TRIP B-5 FAILURE TO TRIP DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 3 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 4 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 5 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 243024 TO BUS 238586 CKT 1 /* 05HOWARD 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 238906 TO BUS 238586 CKT 1 /* 02LNGVEW 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 239076 TO BUS 238586 CKT 1 /* 02ROSS 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 239216 TO BUS 238586 CKT 1 /* 02TROY 138 02BRKSID 138 END
AEP_P2-2_#9521_05CHATFL 138_2	CONTINGENCY 'AEP_P2-2_#9521_05CHATFL 138_2' OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 242984 TO BUS 245656 CKT 1 / 242984 05CHATFL 138 245656 05CHATFIEL 69.0 1 END
AEP_P4_#9521_05CHATFL 138_F	CONTINGENCY 'AEP_P4_#9521_05CHATFL 138_F' OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 242984 TO BUS 245656 CKT 1 / 242984 05CHATFL 138 245656 05CHATFIEL 69.0 1 END

Contingency Name	Contingency Definition
AEP_P7-1_#10927	CONTINGENCY 'AEP_P7-1_#10927' OPEN BRANCH FROM BUS 242950 TO BUS 242955 CKT 1 / 242950 05ACADEM 138 242955 05APPLY 138 1 OPEN BRANCH FROM BUS 242950 TO BUS 246941 CKT 1 / 242950 05ACADEM 138 246941 05MILL2Z 138 1 OPEN BRANCH FROM BUS 242955 TO BUS 243061 CKT 1 / 242955 05APPLY 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247302 TO BUS 242962 CKT Z1 / 247302 05BLDBG8 138 242962 05BLDBGZ 138 Z1 OPEN BRANCH FROM BUS 242962 TO BUS 247278 CKT 1 / 242962 05BLDBGZ 138 247278 05MILL1Z 138 1 OPEN BRANCH FROM BUS 242962 TO BUS 243070 CKT 1 / 242962 05BLDBGZ 138 243070 05OHIOCT 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243050 CKT 1 / 243024 05HOWARD 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247278 TO BUS 243044 CKT Z1 / 247278 05MILL1Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 247278 TO BUS 243050 CKT 1 / 247278 05MILL1Z 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 246941 TO BUS 243044 CKT Z1 / 246941 05MILL2Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 246941 TO BUS 243160 CKT 1 / 246941 05MILL2Z 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243050 TO BUS 245567 CKT 1 / 243050 05NBELVL 138 245567 05NBELLVIL 69.0 1 OPEN BRANCH FROM BUS 243160 TO BUS 245425 CKT 1 / 243160 05WTRNWX 138 245425 05W TRINWX 12.0 1 END

Contingency Name	Contingency Definition
AEP_P7-1_#10926	CONTINGENCY 'AEP_P7-1_#10926' OPEN BRANCH FROM BUS 242950 TO BUS 242955 CKT 1 / 242950 05ACADEM 138 242955 05APPLY 138 1 OPEN BRANCH FROM BUS 242950 TO BUS 246941 CKT 1 / 242950 05ACADEM 138 246941 05MILL2Z 138 1 OPEN BRANCH FROM BUS 242955 TO BUS 243061 CKT 1 / 242955 05APPLY 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247302 TO BUS 242962 CKT Z1 / 247302 05BLDBG8 138 242962 05BLDBGZ 138 Z1 OPEN BRANCH FROM BUS 242962 TO BUS 247278 CKT 1 / 242962 05BLDBGZ 138 247278 05MILL1Z 138 1 OPEN BRANCH FROM BUS 242962 TO BUS 243070 CKT 1 / 242962 05BLDBGZ 138 243070 05OHIOCT 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247278 TO BUS 243044 CKT Z1 / 247278 05MILL1Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 247278 TO BUS 243050 CKT 1 / 247278 05MILL1Z 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 246941 TO BUS 243044 CKT Z1 / 246941 05MILL2Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 246941 TO BUS 243160 CKT 1 / 246941 05MILL2Z 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243160 TO BUS 245425 CKT 1 / 243160 05WTRNWX 138 245425 05W TRINWX 12.0 1 END
Base Case	
AEP_SUBT_P4_#2200_05FREMNT C 69.0_E	CONTINGENCY 'AEP_SUBT_P4_#2200_05FREMNT C 69.0_E' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 END
AEP_P7-1_#10933	CONTINGENCY 'AEP_P7-1_#10933' OPEN BRANCH FROM BUS 238586 TO BUS 243024 CKT 1 / 238586 02BRKSID 138 243024 05HOWARD 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243100 CKT 1 / 243024 05HOWARD 138 243100 05SHELGH 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243101 CKT 1 / 243024 05HOWARD 138 243101 05SHELNS 138 1 END

Contingency Name	Contingency Definition
AEP_SUBT_P4_#1208_05HOWARD 69.0_U	CONTINGENCY 'AEP_SUBT_P4_#1208_05HOWARD 69.0_U' OPEN BRANCH FROM BUS 245666 TO BUS 243024 CKT 1 / 245666 05HOWARD1EQ 999 243024 05HOWARD 138 1 OPEN BRANCH FROM BUS 245666 TO BUS 245663 CKT 1 / 245666 05HOWARD1EQ 999 245663 05HOWARD 69.0 1 OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243101 CKT 1 / 243024 05HOWARD 138 243101 05SHELNS 138 1 OPEN BRANCH FROM BUS 245659 TO BUS 245663 CKT 1 / 245659 05E BUCYRU 69.0 245663 05HOWARD 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245678 CKT 1 / 245663 05HOWARD 69.0 245678 05NGALIOSS 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245679 CKT 1 / 245663 05HOWARD 69.0 245679 05WILLARD 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245657 CKT 1 / 245663 05HOWARD 69.0 245657 05WSHELBY 69.0 1 REMOVE SWSHUNT FROM BUS 245663 / 245663 05HOWARD 69.0 END
ATSI-P7-1-CEI-345-001-A	CONTINGENCY 'ATSI-P7-1-CEI-345-001-A' /* AVON-BEAVER #1 AND #2 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 1 /* 02AVON 345 02LAKEAVE 345 DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 2 /* 02AVON 345 02LAKEAVE 345 END
AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1	CONTINGENCY 'AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 END
ATSI-P7-1-TE-138-026	CONTINGENCY 'ATSI-P7-1-TE-138-026' /* WEST FREMONT-OTTAWA & W.FREMONT-KH- OTTAWA DISCONNECT BRANCH FROM BUS 239030 TO BUS 239154 CKT 1 /* 02OTTAWA 138 02W.FREM 138 DISCONNECT BUS 238871 /* 02KY-HS 138 END
AEP_P1-2_#7105	CONTINGENCY 'AEP_P1-2_#7105' OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1 END
AEP_P1-3_#744_05FOSTOR 345_1	CONTINGENCY 'AEP_P1-3_#744_05FOSTOR 345_1' OPEN BRANCH FROM BUS 242936 TO BUS 243006 CKT 1 / 242936 05FOSTOR 345 243006 05FOSTOR 138 1 END

Contingency Name	Contingency Definition
ATSI-P7-1-OEC-345-001	CONTINGENCY 'ATSI-P7-1-OEC-345-001' /* BEAVER-LAKAVE 345 CK 1 & 2 DISCONNECT BRANCH FROM BUS 238569 TO BUS 239725 CKT 1 /* 02BEAVER 345 02LAKEAVE 345 DISCONNECT BRANCH FROM BUS 238569 TO BUS 239725 CKT 2 /* 02BEAVER 345 02LAKEAVE 345 END
AEP_P4_#3141_05FOSTOR 345_B2	CONTINGENCY 'AEP_P4_#3141_05FOSTOR 345_B2' OPEN BRANCH FROM BUS 242935 TO BUS 242936 CKT 1 / 242935 05E LIMA 345 242936 05FOSTOR 345 1 OPEN BRANCH FROM BUS 242936 TO BUS 243006 CKT 1 / 242936 05FOSTOR 345 243006 05FOSTOR 138 1 END
AEP_P1-2_#7709	CONTINGENCY 'AEP_P1-2_#7709' OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 END

Short Circuit

Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue

None

**Figure 1: AE1-146 Primary Point of Interconnection (Ebersole – Fostoria Central #2 138 kV)
Single-Line Diagram**

Figure 2: AE1-146 Primary Point of Interconnection (Ebersole – Fostoria Central #2 138 kV)

Secondary Point of Interconnection

AE1-146 will interconnect with the AEP transmission system at the Ebersole 138kV substation.

To accommodate the interconnection at the Ebersole 138 kV substation, the substation will have to be expanded requiring the installation of two (2) 138 kV circuit breakers (see Figure 3). 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.

Network Impacts – Option 2

The Queue Project AE1-146 was evaluated as a 120 MW (Capacity 81.3 MW) injection at the Ebersole 138 kV substation in the AEP area. Project AE1-146 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-146 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
100670	238569	02BEAVER	ATSI	238607	02CARLIL	ATSI	1	ATSI-P7-1-OEC-345-001	tower	1243.0	116.93	117.41	DC	13.09
99728	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P2-3-TE-345-010T	breaker	223.0	109.73	115.6	DC	13.1
99729	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	AEP_P4_#3141_05FOSTOR 345_B2	breaker	223.0	100.47	111.45	DC	24.49
100734	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P7-1-TE-138-026	tower	223.0	103.38	108.9	DC	12.32
100695	239728	02BLKRVR	ATSI	239734	02USSTEEL	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	659.0	114.55	115.04	DC	7.18
100639	239734	02USSTEEL	ATSI	238915	02LRN Q2	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	593.0	122.86	123.41	DC	7.18
710063	242984	05CHATFL	AEP	932050	AC2-015 TAP	AEP	1	AEP_SUBT_P4_#1208_05HOWA RD 69.0_U	breaker	167.0	121.87	123.52	DC	6.12
709505	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1	bus	251.0	134.3	135.65	DC	7.51
709925	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#1176_05FREMNT C 69.0_L	breaker	251.0	134.98	136.32	DC	7.51
709926	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#2200_05FREMNT C 69.0_E	breaker	251.0	134.3	135.65	DC	7.51
711351	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	AEP_P7-1_#10933	tower	251.0	123.51	124.87	DC	7.55
100586	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.65	DC	6.43
100587	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10926	tower	245.0	129.79	130.97	DC	6.43
711336	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.65	DC	6.43
711337	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10926	tower	245.0	129.79	130.97	DC	6.43
709557	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P2-2_#9521_05CHATFL 138_2	bus	167.0	123.81	125.43	DC	6.02
710041	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P4_#9521_05CHATFL 138_F	breaker	167.0	123.81	125.43	DC	6.02
710042	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P4_#10729_05CHATFL 138_E	breaker	167.0	123.73	125.39	DC	6.16
709804	932050	AC2-015 TAP	AEP	243024	05HOWARD	AEP	1	AEP_SUBT_P4_#1208_05HOWA RD 69.0_U	breaker	167.0	153.64	155.3	DC	6.12

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
100441	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	AEP_P1-3_#744_05FOSTOR345_1	operation	223.0	96.53	107.47	DC	24.4
710805	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	ATSI-P2-2-OES-138-052T	operation	251.0	122.66	124.02	DC	7.55
710809	243008	05FREMCT	AEP	243009	05FRMNT	AEP	1	Base Case	operation	251.0	101.94	103.14	DC	6.73
710672	243039	05MELMOR	AEP	242984	05CHATFL	AEP	1	AEP_P1-2_#7105	operation	167.0	140.72	142.46	DC	6.43

Flow Gate Details

The following appendices contain additional information about each flow gate presented in the body of the report. For each appendix, a description of the flow gate 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 flow gate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gauge other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

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
100670	238569	02BEAVER	ATSI	238607	02CARLIL	ATSI	1	ATSI-P7-1-OEC-345-001	tower	1243.0	116.93	117.41	DC	13.09

Bus #	Bus	MW Impact
238572	02BEAVGB	1.52
238670	02DVBSG1	194.42
238979	02NAPMUN	5.29
239171	02WLORG-2	4.4
239172	02WLORG-3	4.47
239173	02WLORG-4	4.48
239174	02WLORG-5	4.49
239175	02WLORG-6	2.31
240968	02BG2 GEN	1.11
240969	02BG4 G1	0.28
240973	02BG6 AMPO	4.32
240975	02PGE GEN	5.7
247548	V4-010 C	3.18
247567	V2-006 C	1.74
247940	U4-028 E	9.83
247941	U4-029 E	9.83
247947	V4-010 E	21.26
247961	V2-006 E	11.63
900041	V4-011	0.34
925751	AC1-051 C	0.7
925752	AC1-051 E	4.66
931951	AB1-107 1	43.54
931961	AB1-107 2	100.57
932051	AC2-015 C	4.84
932052	AC2-015 E	5.73
932791	AC2-103 C	11.35
932792	AC2-103 E	75.98
934251	AD1-052 C1	1.87
934261	AD1-052 C2	1.87
934461	AD1-070 C O1	4.25
934462	AD1-070 E O1	19.95
934761	AD1-103 C O1	19.09
934762	AD1-103 E O1	127.74
934891	AD1-118	11.37
937021	AD2-136 C O1	5.29
937022	AD2-136 E O1	35.4
937081	AD2-143 C O1	2.7
937082	AD2-143 E O1	12.62
937381	AD2-191 C	2.94
937382	AD2-191 E	19.67

Bus #	Bus	MW Impact
938911	AE1-119	89.37
939161	AE1-146 C O2	8.92
939162	AE1-146 E O2	4.17
950241	J419	8.26
953321	J799	15.54
953781	J833	8.26
AB2-013	AB2-013	6.52
AE1-033	AE1-033	6.89
CARR	CARR	1.08
CBM-S1	CBM-S1	7.74
CBM-S2	CBM-S2	1.32
CBM-W1	CBM-W1	38.02
CBM-W2	CBM-W2	71.21
CIN	CIN	8.93
CPL	CPL	0.26
G-007	G-007	2.64
IPL	IPL	5.71
LGEE	LGEE	2.12
MEC	MEC	18.01
MECS	MECS	41.15
O-066	O-066	8.96
RENSSELAER	RENSSELAER	0.86
WEC	WEC	2.97
Z1-043	Z1-043	11.41

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
99728	239176	02WOOD+	ATSI	238890	02LEMOYN	ATSI	1	ATSI-P2-3-TE-345-010T	breaker	223.0	109.73	115.6	DC	13.1

Bus #	Bus	MW Impact
238601	02FRMENG 1	2.77
238602	02FRMENG 2	2.77
238603	02FRMENG 3	5.01
247548	V4-010 C	2.62
247551	U4-028 C	0.2
247552	U4-029 C	0.2
247934	U4-001 E	10.0
247940	U4-028 E	8.79
247941	U4-029 E	8.79
247947	V4-010 E	17.56
900041	V4-011	0.33
925751	AC1-051 C	0.56
925752	AC1-051 E	3.73
932051	AC2-015 C	4.0
932052	AC2-015 E	4.74
934251	AD1-052 C1	1.22
934261	AD1-052 C2	1.22
934461	AD1-070 C O1	4.72
934462	AD1-070 E O1	22.17
937021	AD2-136 C O1	4.73
937022	AD2-136 E O1	31.64
937381	AD2-191 C	2.63
937382	AD2-191 E	17.58
939161	AE1-146 C O2	8.93
939162	AE1-146 E O2	4.17
BAYOU	BAYOU	0.1
BIG_CAJUN1	BIG_CAJUN1	0.14
BIG_CAJUN2	BIG_CAJUN2	0.28
BLUEG	BLUEG	0.01
CANNELTON	CANNELTON	0.02
CBM-N	CBM-N	0.03
CBM-S2	CBM-S2	0.12
CHOCTAW	CHOCTAW	0.07
COFFEEN	COFFEEN	0.15
COTTONWOOD	COTTONWOOD	0.44
CPL	CPL	0.06
DEARBORN	DEARBORN	4.0
DUCKCREEK	DUCKCREEK	0.5
EDWARDS	EDWARDS	0.24
ELMERSMITH	ELMERSMITH	0.03

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.17
GIBSON	GIBSON	0.03
LGEE	LGEE	0.01
NEWTON	NEWTON	0.34
NYISO	NYISO	0.13
O-066A	O-066A	0.08
PRAIRIE	PRAIRIE	0.6
SMITHLAND	SMITHLAND	0.03
TATANKA	TATANKA	0.24
TILTON	TILTON	0.2
TVA	TVA	0.07
UNIONPOWER	UNIONPOWER	0.06
VFT	VFT	0.46

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
100695	239728	02BLKRVR	ATSI	239734	02USSTEEL	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	659.0	114.55	115.04	DC	7.18

Bus #	Bus	MW Impact
238571	02BEAVGA	1.5
238572	02BEAVGB	1.53
238670	02DVBSG1	89.73
238979	02NAPMUN	2.71
239174	02WLORG-5	1.8
239175	02WLORG-6	2.33
240968	02BG2 GEN	0.57
240969	02BG4 G1	0.14
240973	02BG6 AMPO	2.24
240975	02PGE GEN	2.96
241908	02LLF_W4-004	0.51
247548	V4-010 C	1.94
247934	U4-001 E	9.49
247940	U4-028 E	6.01
247941	U4-029 E	6.01
247947	V4-010 E	13.0
900041	V4-011	0.19
925751	AC1-051 C	0.47
925752	AC1-051 E	3.11
931951	AB1-107 1	22.46
931961	AB1-107 2	49.27
932051	AC2-015 C	3.23
932052	AC2-015 E	3.83
932791	AC2-103 C	4.81
932792	AC2-103 E	32.18
934251	AD1-052 C1	1.15
934261	AD1-052 C2	1.15
934461	AD1-070 C O1	2.33
934462	AD1-070 E O1	10.92
934761	AD1-103 C O1	8.08
934762	AD1-103 E O1	54.09
934891	AD1-118	5.63
937021	AD2-136 C O1	3.23
937022	AD2-136 E O1	21.63
937081	AD2-143 C O1	1.42
937082	AD2-143 E O1	6.67
937381	AD2-191 C	1.8
937382	AD2-191 E	12.01
938911	AE1-119	44.2
939161	AE1-146 C O2	4.89

Bus #	Bus	MW Impact
939162	AE1-146 E O2	2.28
CARR	CARR	0.77
CBM-S1	CBM-S1	4.97
CBM-S2	CBM-S2	1.11
CBM-W1	CBM-W1	20.53
CBM-W2	CBM-W2	43.67
CIN	CIN	5.36
CPL	CPL	0.29
G-007	G-007	1.57
IPL	IPL	3.44
LGEE	LGEE	1.33
MEC	MEC	10.58
MECS	MECS	20.89
O-066	O-066	5.35
RENSSELAER	RENSSELAER	0.6
WEC	WEC	1.71

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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
100639	239734	02USSTEEL	ATSI	238915	02LRN Q2	ATSI	1	ATSI-P7-1-CEI-345-001-A	tower	593.0	122.86	123.41	DC	7.18

Bus #	Bus	MW Impact
238571	02BEAVGA	1.5
238572	02BEAVGB	1.53
238670	02DVBSG1	89.73
238979	02NAPMUN	2.71
239174	02WLORG-5	1.8
239175	02WLORG-6	2.33
240968	02BG2 GEN	0.57
240969	02BG4 G1	0.14
240973	02BG6 AMPO	2.24
240975	02PGE GEN	2.96
241908	02LLF_W4-004	0.51
247548	V4-010 C	1.94
247934	U4-001 E	9.49
247940	U4-028 E	6.01
247941	U4-029 E	6.01
247947	V4-010 E	13.0
900041	V4-011	0.19
925751	AC1-051 C	0.47
925752	AC1-051 E	3.11
931951	AB1-107 1	22.46
931961	AB1-107 2	49.27
932051	AC2-015 C	3.23
932052	AC2-015 E	3.83
932791	AC2-103 C	4.81
932792	AC2-103 E	32.18
934251	AD1-052 C1	1.15
934261	AD1-052 C2	1.15
934461	AD1-070 C O1	2.33
934462	AD1-070 E O1	10.92
934761	AD1-103 C O1	8.08
934762	AD1-103 E O1	54.09
934891	AD1-118	5.63
937021	AD2-136 C O1	3.23
937022	AD2-136 E O1	21.63
937081	AD2-143 C O1	1.42
937082	AD2-143 E O1	6.67
937381	AD2-191 C	1.8
937382	AD2-191 E	12.01
938911	AE1-119	44.2
939161	AE1-146 C O2	4.89

Bus #	Bus	MW Impact
939162	AE1-146 E O2	2.28
CARR	CARR	0.77
CBM-S1	CBM-S1	4.97
CBM-S2	CBM-S2	1.11
CBM-W1	CBM-W1	20.53
CBM-W2	CBM-W2	43.67
CIN	CIN	5.36
CPL	CPL	0.29
G-007	G-007	1.57
IPL	IPL	3.44
LGEE	LGEE	1.33
MEC	MEC	10.58
MECS	MECS	20.89
O-066	O-066	5.35
RENSSELAER	RENSSELAER	0.6
WEC	WEC	1.71

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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
710063	242984	05CHATFL	AEP	932050	AC2-015 TAP	AEP	1	AEP_SUBT_P4_#1208_05HOWARD 69.0_U	breaker	167.0	121.87	123.52	DC	6.12

Bus #	Bus	MW Impact
247548	V4-010 C	3.75
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247940	U4-028 E	14.88
247941	U4-029 E	14.88
247947	V4-010 E	25.07
925751	AC1-051 C	2.41
925752	AC1-051 E	16.14
934251	AD1-052 C1	0.64
934261	AD1-052 C2	0.64
934461	AD1-070 C O1	2.18
934462	AD1-070 E O1	10.22
937021	AD2-136 C O1	8.0
937022	AD2-136 E O1	53.56
937381	AD2-191 C	4.45
937382	AD2-191 E	29.76
939161	AE1-146 C O2	4.17
939162	AE1-146 E O2	1.95
CARR	CARR	0.07
CATAWBA	CATAWBA	0.0
CBM-S1	CBM-S1	0.45
CBM-W1	CBM-W1	4.3
CBM-W2	CBM-W2	5.45
CIN	CIN	0.73
G-007	G-007	0.2
HAMLET	HAMLET	0.04
IPL	IPL	0.46
LGEE	LGEE	0.13
MEC	MEC	1.64
MECS	MECS	5.26
O-066	O-066	0.66
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.29

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
709925	243008	05FREMC T	AEP	243009	05FRMNT	AEP	1	AEP_SUBT_P4_#1176_05FREMN T C 69.0_L	breaker	251.0	134.98	136.32	DC	7.51

Bus #	Bus	MW Impact
247542	U4-001 C	0.57
247548	V4-010 C	9.8
247551	U4-028 C	0.54
247552	U4-029 C	0.54
247934	U4-001 E	25.05
247940	U4-028 E	23.52
247941	U4-029 E	23.52
247947	V4-010 E	65.56
900041	V4-011	0.19
925751	AC1-051 C	1.46
925752	AC1-051 E	9.75
932051	AC2-015 C	10.42
932052	AC2-015 E	12.35
934461	AD1-070 C O1	2.68
934462	AD1-070 E O1	12.58
937021	AD2-136 C O1	12.65
937022	AD2-136 E O1	84.67
937381	AD2-191 C	7.03
937382	AD2-191 E	47.04
939161	AE1-146 C O2	5.12
939162	AE1-146 E O2	2.39
CARR	CARR	0.05
CBM-S1	CBM-S1	0.94
CBM-S2	CBM-S2	0.4
CBM-W2	CBM-W2	6.08
CIN	CIN	0.7
CPL	CPL	0.15
DEARBORN	DEARBORN	1.4
G-007	G-007	0.05
IPL	IPL	0.47
LGEE	LGEE	0.25
MEC	MEC	0.91
O-066	O-066	0.17
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.11

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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
711336	243024	05HOWARD	AEP	238586	02BRKSID	ATSI	1	AEP_P7-1_#10927	tower	245.0	131.46	132.65	DC	6.43

Bus #	Bus	MW Impact
247542	U4-001 C	1.57
247548	V4-010 C	3.66
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247926	U1-059 E	2.63
247934	U4-001 E	68.35
247940	U4-028 E	14.64
247941	U4-029 E	14.64
247942	W1-056 E	0.97
247947	V4-010 E	24.51
900041	V4-011	0.16
925751	AC1-051 C	2.34
925752	AC1-051 E	15.63
932051	AC2-015 C	16.16
932052	AC2-015 E	19.15
934251	AD1-052 C1	0.6
934261	AD1-052 C2	0.6
934461	AD1-070 C O1	2.23
934462	AD1-070 E O1	10.48
937021	AD2-136 C O1	7.87
937022	AD2-136 E O1	52.7
937381	AD2-191 C	4.37
937382	AD2-191 E	29.28
939161	AE1-146 C O2	4.38
939162	AE1-146 E O2	2.05
CARR	CARR	0.12
CBM-S1	CBM-S1	0.93
CBM-S2	CBM-S2	0.1
CBM-W1	CBM-W1	5.04
CBM-W2	CBM-W2	9.1
CIN	CIN	1.18
CPL	CPL	0.01
G-007	G-007	0.33
IPL	IPL	0.76
LGEE	LGEE	0.26
MEC	MEC	2.41
MECS	MECS	5.4
O-066	O-066	1.11
RENSSELAER	RENSSELAER	0.1
WEC	WEC	0.41

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
710042	243039	05MELMOR	AEP	243024	05HOWARD	AEP	1	AEP_P4_#10729_05CHATF L 138_E	breaker	167.0	123.73	125.39	DC	6.16

Bus #	Bus	MW Impact
247548	V4-010 C	3.65
247551	U4-028 C	0.35
247552	U4-029 C	0.35
247940	U4-028 E	15.46
247941	U4-029 E	15.46
247947	V4-010 E	24.45
934251	AD1-052 C1	0.63
934261	AD1-052 C2	0.63
934461	AD1-070 C O1	2.2
934462	AD1-070 E O1	10.34
937021	AD2-136 C O1	8.31
937022	AD2-136 E O1	55.65
937381	AD2-191 C	4.62
937382	AD2-191 E	30.91
939161	AE1-146 C O2	4.2
939162	AE1-146 E O2	1.96
CARR	CARR	0.05
CATAWBA	CATAWBA	0.02
CBM-S1	CBM-S1	0.29
CBM-W1	CBM-W1	4.11
CBM-W2	CBM-W2	4.22
CIN	CIN	0.58
G-007	G-007	0.16
HAMLET	HAMLET	0.07
IPL	IPL	0.37
LGEE	LGEE	0.08
MEC	MEC	1.4
MECS	MECS	5.29
O-066	O-066	0.54
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
709804	932050	AC2-015 TAP	AEP	243024	05HOWARD	AEP	1	AEP_SUBT_P4_#1208_05HOWARD 69.0_U	breaker	167.0	153.64	155.3	DC	6.12

Bus #	Bus	MW Impact
247548	V4-010 C	3.75
247551	U4-028 C	0.34
247552	U4-029 C	0.34
247940	U4-028 E	14.88
247941	U4-029 E	14.88
247947	V4-010 E	25.07
925751	AC1-051 C	2.41
925752	AC1-051 E	16.14
932051	AC2-015 C	24.29
932052	AC2-015 E	28.78
934251	AD1-052 C1	0.64
934261	AD1-052 C2	0.64
934461	AD1-070 C O1	2.18
934462	AD1-070 E O1	10.22
937021	AD2-136 C O1	8.0
937022	AD2-136 E O1	53.56
937381	AD2-191 C	4.45
937382	AD2-191 E	29.76
939161	AE1-146 C O2	4.17
939162	AE1-146 E O2	1.95
CARR	CARR	0.07
CATAWBA	CATAWBA	0.0
CBM-S1	CBM-S1	0.45
CBM-W1	CBM-W1	4.3
CBM-W2	CBM-W2	5.45
CIN	CIN	0.73
G-007	G-007	0.2
HAMLET	HAMLET	0.04
IPL	IPL	0.46
LGEE	LGEE	0.13
MEC	MEC	1.64
MECS	MECS	5.26
O-066	O-066	0.66
RENSSELAER	RENSSELAER	0.05
WEC	WEC	0.29

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
ATSI-P2-3-TE-345-010T	CONTINGENCY 'ATSI-P2-3-TE-345-010T' /* LEMOYNE BK-B1 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 242936 CKT 1 /* 02LEMOYN 345 05FOSTOR 345 REMOVE MACHINE 1 FROM BUS 238885 /* 02LEMOG1 18 DISCONNECT BUS 238885 /* 02LEMOG1 18 REMOVE MACHINE 2 FROM BUS 238886 /* 02LEMOG2 18 DISCONNECT BUS 238886 /* 02LEMOG2 18 REMOVE MACHINE 3 FROM BUS 238887 /* 02LEMOG3 18 DISCONNECT BUS 238887 /* 02LEMOG3 18 REMOVE MACHINE 4 FROM BUS 238888 /* 02LEMOG4 18 DISCONNECT BUS 238888 /* 02LEMOG4 18 END
AEP_SUBT_P4_#1176_05FREMNT C 69.0_L	CONTINGENCY 'AEP_SUBT_P4_#1176_05FREMNT C 69.0_L' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245641 TO BUS 245614 CKT 1 / 245641 05BIRCHARDSS69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 OPEN BRANCH FROM BUS 245623 TO BUS 245625 CKT 1 / 245623 05HOLRAN 69.0 245625 05MAPLE GR 69.0 1 OPEN BRANCH FROM BUS 245625 TO BUS 245628 CKT 1 / 245625 05MAPLE GR 69.0 245628 05RIVERVIE 69.0 1 REMOVE SWSHUNT FROM BUS 245614 / 245614 05FREMNT C 69.0 END
ATSI-P2-2-OES-138-052T	CONTINGENCY 'ATSI-P2-2-OES-138-052T' /* BROOKSIDE 138 SOUTH BUS FAULT B-28 FAILURE TO TRIP B-5 FAILURE TO TRIP DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 3 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 4 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 238586 TO BUS 238587 CKT 5 /* 02BRKSID 138 02BRKSID 69 DISCONNECT BRANCH FROM BUS 243024 TO BUS 238586 CKT 1 /* 05HOWARD 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 238906 TO BUS 238586 CKT 1 /* 02LNGVEW 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 239076 TO BUS 238586 CKT 1 /* 02ROSS 138 02BRKSID 138 DISCONNECT BRANCH FROM BUS 239216 TO BUS 238586 CKT 1 /* 02TROY 138 02BRKSID 138 END
AEP_P2-2_#9521_05CHATFL 138_2	CONTINGENCY 'AEP_P2-2_#9521_05CHATFL 138_2' OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 242984 TO BUS 245656 CKT 1 / 242984 05CHATFL 138 245656 05CHATFIEL 69.0 1 END
AEP_P4_#9521_05CHATFL 138_F	CONTINGENCY 'AEP_P4_#9521_05CHATFL 138_F' OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 242984 TO BUS 245656 CKT 1 / 242984 05CHATFL 138 245656 05CHATFIEL 69.0 1 END

Contingency Name	Contingency Definition
AEP_P1-2_#7105	CONTINGENCY 'AEP_P1-2_#7105' OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1 END
AEP_P7-1_#10927	CONTINGENCY 'AEP_P7-1_#10927' OPEN BRANCH FROM BUS 242950 TO BUS 242955 CKT 1 / 242950 05ACADEM 138 242955 05APPLY 138 1 OPEN BRANCH FROM BUS 242950 TO BUS 246941 CKT 1 / 242950 05ACADEM 138 246941 05MILL2Z 138 1 OPEN BRANCH FROM BUS 242955 TO BUS 243061 CKT 1 / 242955 05APPLY 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247302 TO BUS 242962 CKT Z1 / 247302 05BLDBG8 138 242962 05BLDBGZ 138 Z1 OPEN BRANCH FROM BUS 242962 TO BUS 247278 CKT 1 / 242962 05BLDBGZ 138 247278 05MILL1Z 138 1 OPEN BRANCH FROM BUS 242962 TO BUS 243070 CKT 1 / 242962 05BLDBGZ 138 243070 05OHIOCT 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243050 CKT 1 / 243024 05HOWARD 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247278 TO BUS 243044 CKT Z1 / 247278 05MILL1Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 247278 TO BUS 243050 CKT 1 / 247278 05MILL1Z 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 246941 TO BUS 243044 CKT Z1 / 246941 05MILL2Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 246941 TO BUS 243160 CKT 1 / 246941 05MILL2Z 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243050 TO BUS 245567 CKT 1 / 243050 05NBELVL 138 245567 05NBELLVIL 69.0 1 OPEN BRANCH FROM BUS 243160 TO BUS 245425 CKT 1 / 243160 05WTRNWX 138 245425 05W TRINWX 12.0 1 END

Contingency Name	Contingency Definition
AEP_P7-1_#10926	CONTINGENCY 'AEP_P7-1_#10926' OPEN BRANCH FROM BUS 242950 TO BUS 242955 CKT 1 / 242950 05ACADEM 138 242955 05APPLY 138 1 OPEN BRANCH FROM BUS 242950 TO BUS 246941 CKT 1 / 242950 05ACADEM 138 246941 05MILL2Z 138 1 OPEN BRANCH FROM BUS 242955 TO BUS 243061 CKT 1 / 242955 05APPLY 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247302 TO BUS 242962 CKT Z1 / 247302 05BLDBG8 138 242962 05BLDBGZ 138 Z1 OPEN BRANCH FROM BUS 242962 TO BUS 247278 CKT 1 / 242962 05BLDBGZ 138 247278 05MILL1Z 138 1 OPEN BRANCH FROM BUS 242962 TO BUS 243070 CKT 1 / 242962 05BLDBGZ 138 243070 05OHIOCT 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 247278 TO BUS 243044 CKT Z1 / 247278 05MILL1Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 247278 TO BUS 243050 CKT 1 / 247278 05MILL1Z 138 243050 05NBELVL 138 1 OPEN BRANCH FROM BUS 246941 TO BUS 243044 CKT Z1 / 246941 05MILL2Z 138 243044 05MILLWO 138 Z1 OPEN BRANCH FROM BUS 246941 TO BUS 243160 CKT 1 / 246941 05MILL2Z 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243070 TO BUS 243160 CKT 1 / 243070 05OHIOCT 138 243160 05WTRNWX 138 1 OPEN BRANCH FROM BUS 243160 TO BUS 245425 CKT 1 / 243160 05WTRNWX 138 245425 05W TRINWX 12.0 1 END
Base Case	
AEP_SUBT_P4_#2200_05FREMNT C 69.0_E	CONTINGENCY 'AEP_SUBT_P4_#2200_05FREMNT C 69.0_E' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 END
AEP_P7-1_#10933	CONTINGENCY 'AEP_P7-1_#10933' OPEN BRANCH FROM BUS 238586 TO BUS 243024 CKT 1 / 238586 02BRKSID 138 243024 05HOWARD 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243100 CKT 1 / 243024 05HOWARD 138 243100 05SHELGH 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243101 CKT 1 / 243024 05HOWARD 138 243101 05SHELNS 138 1 END

Contingency Name	Contingency Definition
AEP_SUBT_P4_#1208_05HOWARD 69.0_U	CONTINGENCY 'AEP_SUBT_P4_#1208_05HOWARD 69.0_U' OPEN BRANCH FROM BUS 245666 TO BUS 243024 CKT 1 / 245666 05HOWARD1EQ 999 243024 05HOWARD 138 1 OPEN BRANCH FROM BUS 245666 TO BUS 245663 CKT 1 / 245666 05HOWARD1EQ 999 245663 05HOWARD 69.0 1 OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243061 CKT 1 / 243024 05HOWARD 138 243061 05NLEXTN 138 1 OPEN BRANCH FROM BUS 243024 TO BUS 243101 CKT 1 / 243024 05HOWARD 138 243101 05SHELNS 138 1 OPEN BRANCH FROM BUS 245659 TO BUS 245663 CKT 1 / 245659 05E BUCYRU 69.0 245663 05HOWARD 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245678 CKT 1 / 245663 05HOWARD 69.0 245678 05NGALIOSS 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245679 CKT 1 / 245663 05HOWARD 69.0 245679 05WILLARD 69.0 1 OPEN BRANCH FROM BUS 245663 TO BUS 245657 CKT 1 / 245663 05HOWARD 69.0 245657 05WSHELBY 69.0 1 REMOVE SWSHUNT FROM BUS 245663 / 245663 05HOWARD 69.0 END
ATSI-P7-1-CEI-345-001-A	CONTINGENCY 'ATSI-P7-1-CEI-345-001-A' /* AVON-BEAVER #1 AND #2 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 1 /* 02AVON 345 02LAKEAVE 345 DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 2 /* 02AVON 345 02LAKEAVE 345 END
AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1	CONTINGENCY 'AEP_SUBT_P2-2_#1175_05FREMNT C 69.0_1' OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3 OPEN BRANCH FROM BUS 245645 TO BUS 245614 CKT 1 / 245645 05CLYDE 69.0 245614 05FREMNT C 69.0 1 OPEN BRANCH FROM BUS 245611 TO BUS 245614 CKT 2 / 245611 05E FREMON 69.0 245614 05FREMNT C 69.0 2 OPEN BRANCH FROM BUS 245614 TO BUS 245623 CKT 1 / 245614 05FREMNT C 69.0 245623 05HOLRAN 69.0 1 END
ATSI-P7-1-TE-138-026	CONTINGENCY 'ATSI-P7-1-TE-138-026' /* WEST FREMONT-OTTAWA & W.FREMONT-KH- OTTAWA DISCONNECT BRANCH FROM BUS 239030 TO BUS 239154 CKT 1 /* 02OTTAWA 138 02W.FREM 138 DISCONNECT BUS 238871 /* 02KY-HS 138 END
AEP_P4_#10729_05CHATFL 138_E	CONTINGENCY 'AEP_P4_#10729_05CHATFL 138_E' OPEN BRANCH FROM BUS 242984 TO BUS 932050 CKT 1 / 242984 05CHATFL 138 932050 AC2- 015 TAP 138 1 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1 OPEN BRANCH FROM BUS 242984 TO BUS 245656 CKT 1 / 242984 05CHATFL 138 245656 05CHATFIEL 69.0 1 END

Contingency Name	Contingency Definition
AEP_P1-3_#744_05FOSTOR 345_1	CONTINGENCY 'AEP_P1-3_#744_05FOSTOR 345_1' OPEN BRANCH FROM BUS 242936 TO BUS 243006 CKT 1 / 242936 05FOSTOR 345 243006 05FOSTOR 138 1 END
ATSI-P7-1-OEC-345-001	CONTINGENCY 'ATSI-P7-1-OEC-345-001' /* BEAVER-LAKAVE 345 CK 1 & 2 DISCONNECT BRANCH FROM BUS 238569 TO BUS 239725 CKT 1 /* 02BEAVER 345 02LAKEAVE 345 DISCONNECT BRANCH FROM BUS 238569 TO BUS 239725 CKT 2 /* 02BEAVER 345 02LAKEAVE 345 END
AEP_P4_#3141_05FOSTOR 345_B2	CONTINGENCY 'AEP_P4_#3141_05FOSTOR 345_B2' OPEN BRANCH FROM BUS 242935 TO BUS 242936 CKT 1 / 242935 05E LIMA 345 242936 05FOSTOR 345 1 OPEN BRANCH FROM BUS 242936 TO BUS 243006 CKT 1 / 242936 05FOSTOR 345 243006 05FOSTOR 138 1 END

Short Circuit

Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue

None

**Figure 3: Secondary Point of Interconnection (Ebersole 138 kV)
Single-Line Diagram**

Figure 4: Secondary Point of Interconnection (Ebersole 138 kV)