



**Generation Interconnection
Feasibility Study Report
for
Queue Project AE2-045
OLIVE-REYNOLDS (NIPSCO) 345 KV Circuit
118 MW Capacity / 280 MW Energy**

July, 2019

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1 Preface

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

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

The Interconnection Customer seeking to interconnect a 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.

2 General

The Interconnection Customer has proposed a Solar generating facility located in White County, Indiana. The installed facilities will have a total capability of 280 MW with 118 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December, 2022. 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.

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	AE2-045
Project Name	OLIVE-REYNOLDS 345 KV
State	Indiana
County	White
Transmission Owner	AEP
MFO	280
MWE	280
MWC	118
Fuel	Solar
Basecase Study Year	2022

2.1 Primary Point of Interconnection

AE2-045 will interconnect with the AEP transmission system via a new station cut into the proposed AC2-080 345kV switching station to Reynolds (NIPSCO) 345kV section of Olive – Reynolds (NIPSCO) 345kV circuit.

To accommodate the interconnection on the proposed AC2-080 switching station – Reynolds (NIPSCO) 345kV section of Olive – Reynolds (NIPSCO) circuit, a new three (3) circuit breaker 345kV 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, 345 kV line risers, SCADA, and 345 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.

2.2 Cost Summary

The AE2-045 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 8,000,000
Direct Connection Network Upgrade	\$ 1,550,000
Non Direct Connection Network Upgrades	\$350,000
Total Costs	\$ 9,900,000

In addition, the AE2-045 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$443,716,000

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

3 Transmission Owner Scope of Work

4 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 345 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, 345 kV line risers and SCADA will also be required.	\$ 8,000,000
Total Attachment Facility Costs	\$ 8,000,000

5 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
AC2-080 proposed switching station – Reynolds (NIPSCO) T-Line Cut In	\$ 1,200,000
345 kV Revenue Metering	\$ 350,000
Total Direct Connection Facility Costs	\$ 1,550,000

6 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Upgrade line protection and controls at the Olive 345 kV substation	\$ 350,000
Upgrade line protection and controls at the Reynolds (NIPSCO)345 kV substation	NIPSCO to provide cost estimates
Total Non-Direct Connection Facility Costs	\$ 350,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

8 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.

9 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 Dumont – Elderberry 345 kV line 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.

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

10.2 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>

11 Option – 1 Network Impacts

The Queue Project AE2-045 was evaluated as a 280 MW (Capacity 118 MW) injection via a new station cut into AC2-080 proposed switching station to Reynolds (NIPSCO) 345kV section of Olive to Reynolds (NIPSCO) 345kV circuit in the AEP area. Project AE2-045 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-045 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

12 Generation Deliverability

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

None

13 Multiple Facility Contingency

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

None

14 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
1335121	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	2354.0	103.47	104.35	DC	39.31
1335444	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	120.7	121.17	DC	30.04
1335445	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	COMED_P4_112-65-BT4-5	breaker	1409.0	110.81	111.14	DC	23.86
1335446	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	COMED_P4_112-65-BT3-4	breaker	1409.0	110.81	111.14	DC	23.86
1335447	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	COMED_P4_023-65-BT2-3	breaker	1409.0	110.81	111.14	DC	23.86
6839533	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	120.26	121.23	DC	30.04

15 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
1336293	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P1-2_#709	operation	2354.0	102.09	102.95	DC	39.38

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
1336312	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P1-2_#695A	operation	1409.0	110.81	111.14	DC	23.86
6840479	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P1-2_#695A	operation	1409.0	116.51	117.29	DC	23.86

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
6839533	3	AE1-089 TAP 345.0 kV - 05DUMONT 345.0 kV Ckt 1	<u>AEP</u> AEP_AE1_REF_r0040 (156) : 1) A Sag Study will be required on the 7.0 miles of conductor to mitigate the overload. The new ratings after sag study will be: S/N: 1409 MVA, S/E: 1888 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$28,000(no remediation required, just sag study) and \$14.0 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$28,000 Time Estimate : 6-12 Months	\$28,000
1335447,1335446,1335445,1335444	2	05ELDERBRYSS 345.0 kV - AE1-089 TAP 345.0 kV Ckt 1	<u>AEP</u> AEP_AE1_REF_r0021 (135) : A Sag Study will be required on the 7.2 miles of ACSR ~ 954 ~ 45/7 ~ RAIL - Conductor section 1 conductor to mitigate the overload. The new ratings after sag study will be: S/N: 1409 MVA, S/E: 1888 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$28,800 (no remediation required, just sag study) and \$14.4million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$28,000 Time Estimate : 6-12 Months	\$28,000
1335121	1	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	n5034 (196) : Rebuilding a new Sullivan - Reynolds 765kV line which is driven by X3-028 MTX project will mitigate the identified overloads. Project Type : FAC Cost : \$441,700,000 Time Estimate : N/A Months n4106 (824) : PJM Network Upgrade n4106. Perform a sag study on the 345 kV line between Jefferson and Clifty Creek. Project Type : FAC Cost : \$1,960,000 Time Estimate : N/A Months	\$443,660,000
			TOTAL COST	\$443,716,000

17 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 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.

17.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1335121	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	2354.0	103.47	104.35	DC	39.31

Bus #	Bus	MW Impact
243441	05CKG2	15.47
243442	05RKG1	52.86
243443	05RKG2	50.68
243859	05FR-11G C	0.32
243862	05FR-12G C	0.32
243864	05FR-21G C	0.34
243866	05FR-22G C	0.33
243870	05FR-3G C	0.66
243873	05FR-4G C	0.51
246909	05MDL-1G C	0.68
246910	05MDL-2G C	0.34
246976	05MDL-3G C	0.34
246979	05MDL-4G C	0.68
247556	T-127 C	0.33
247900	05FR-11G E	10.62
247901	05FR-12G E	10.44
247902	05FR-21G E	11.16
247903	05FR-22G E	10.68
247904	05FR-3G E	21.64
247905	05FR-4G E	16.27
247906	05MDL-1G E	22.27
247907	05MDL-2G E	11.04
247912	05MDL-3G E	11.54
247913	05MDL-4G E	11.15
247943	T-127 E	11.15
274788	SE CHICAG;5U	3.99
274789	SE CHICAG;6U	3.99
274790	SE CHICAG;7U	3.99
274791	SE CHICAG;8U	3.99
274792	SE CHICAG;9U	3.99
274793	SE CHICAG;0U	3.99
274794	SE CHICAG;1U	3.99
274795	SE CHICAG;2U	3.99
900404	X3-028 C	257.34
900405	X3-028 E	343.12
910542	X3-005 E	0.58
915662	Y3-099 E	0.24
915672	Y3-100 E	0.24
916182	Z1-065 E	0.65
917712	Z2-114 E	0.26
925242	AB2-178 E	2.4
930041	AB1-006 C	0.44

Bus #	Bus	MW Impact
930042	AB1-006 E	24.26
930461	AB1-087	94.36
930471	AB1-088	94.36
930501	AB1-091 O1	56.64
932601	AC2-080 C O1	3.52
932602	AC2-080 E O1	23.55
932931	AC2-117	4.76
933281	AC2-140 C	4.2
933282	AC2-140 E	0.22
933441	AC2-157 C	13.04
933442	AC2-157 E	21.27
934721	AD1-100 C	15.44
934722	AD1-100 E	72.04
935271	AD1-137 C	8.81
935272	AD1-137 E	58.98
936781	AD2-101 C	3.63
936782	AD2-101 E	16.99
937031	AD2-137 C O1	2.75
937032	AD2-137 E O1	12.88
937041	AD2-138 C	4.76
937042	AD2-138 E	22.31
937051	AD2-140 C O1	2.76
937052	AD2-140 E O1	12.91
937061	AD2-141 C O1	2.74
937062	AD2-141 E O1	12.92
937071	AD2-142 C O1	5.51
937072	AD2-142 E O1	25.82
937121	AD2-148 C O1	2.72
937122	AD2-148 E O1	12.73
937131	AD2-149 C O1	2.72
937132	AD2-149 E O1	12.73
937141	AD2-150 C O1	2.72
937142	AD2-150 E O1	12.73
937181	AD2-155 C O1	2.72
937182	AD2-155 E O1	12.73
937321	AD2-175 C	12.67
937322	AD2-175 E	8.45
938012	AE1-002 E O1	5.52
938671	AE1-089 C	14.01
938672	AE1-089 E	19.23
939351	AE1-166 C O1	8.03
939352	AE1-166 E O1	7.41
939641	AE1-194 C	6.77
939642	AE1-194 E	45.3
939651	AE1-195 C	6.77
939652	AE1-195 E	45.3
940261	AE2-008	8.59
940581	AE2-045 C O1	16.56
940582	AE2-045 E O1	22.74
941341	AE2-130 C	153.56
941342	AE2-130 E	102.37
941551	AE2-152 C	10.29

Bus #	Bus	MW Impact
941552	AE2-152 E	5.15
941561	AE2-153 C O1	3.62
941562	AE2-153 E O1	16.96
941571	AE2-154 C	4.53
941572	AE2-154 E	30.32
942601	AE2-276	8.6
942881	AE2-307 C	10.68
942882	AE2-307 E	3.88
BLUEG	BLUEG	104.24
CALDERWOOD	CALDERWOOD	1.4
CANNELTON	CANNELTON	1.91
CARR	CARR	0.73
CATAWBA	CATAWBA	0.86
CBM-W1	CBM-W1	38.75
CBM-W2	CBM-W2	61.54
CHEOAH	CHEOAH	1.28
CHILHOWEE	CHILHOWEE	0.46
CIN	CIN	6.47
ELMERSMITH	ELMERSMITH	3.1
G-007	G-007	2.2
HAMLET	HAMLET	1.4
IPL	IPL	3.67
MEC	MEC	33.86
MECS	MECS	18.38
O-066	O-066	14.05
RENSSELAER	RENSSELAER	0.58
SANTEETLA	SANTEETLA	0.38
TRIMBLE	TRIMBLE	12.56
TVA	TVA	1.97
WEC	WEC	6.28
Z1-043	Z1-043	24.64

17.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1335444	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	120.7	121.17	DC	30.04

Bus #	Bus	MW Impact
247900	05FR-11G E	6.83
247901	05FR-12G E	6.72
247902	05FR-21G E	7.18
247903	05FR-22G E	6.87
247904	05FR-3G E	13.92
247905	05FR-4G E	10.47
247906	05MDL-1G E	15.59
247907	05MDL-2G E	7.73
247912	05MDL-3G E	8.08
247913	05MDL-4G E	7.81
247943	T-127 E	7.81
270859	PWR VTR EC;R	7.08
274722	S-055 E	6.52
274809	UNIV PK N;5U	0.64
274811	UNIV PK N;7U	0.64
274812	UNIV PK N;8U	0.64
274814	UNIV PK N;OU	0.64
274815	UNIV PK N;XU	0.64
274888	PILOT HIL;1E	10.28
275149	KEMPTON ;1E	10.28
290021	O50 E	11.42
290051	GSG-6; E	6.14
290108	LEEDK;1U E	14.18
293061	N-015 E	8.92
293644	O22 E1	5.91
293645	O22 E2	11.47
294392	P-010 E	11.33
295109	WESTBROOK E	3.29
909145	X2-052	28.77
914641	Y2-103	26.09
915011	Y3-013 1	2.17
915021	Y3-013 2	2.17
915031	Y3-013 3	2.17
916221	Z1-073 E	3.17
916502	Z1-106 E1	0.73
916504	Z1-106 E2	0.73
916512	Z1-107 E	1.49
916522	Z1-108 E	1.44
917711	Z2-114 C	0.05
917712	Z2-114 E	0.39
918052	AA1-018 E	9.77

Bus #	Bus	MW Impact
920272	AA2-123 E	1.43
924471	AB2-096	24.78
925302	AB2-191 E	0.81
926311	AC1-109 1	1.1
926321	AC1-109 2	1.1
926331	AC1-110 1	1.09
926341	AC1-110 2	1.09
926351	AC1-111 1	0.44
926361	AC1-111 2	0.44
926371	AC1-111 3	0.44
926381	AC1-111 4	0.44
926391	AC1-111 5	0.44
926401	AC1-111 6	0.44
926431	AC1-114	1.4
927091	AC1-204 1	41.76
927101	AC1-204 2	41.76
927451	AC1-142A 1	2.41
927461	AC1-142A 2	2.41
927511	AC1-113 1	0.7
927521	AC1-113 2	0.7
930042	AB1-006 E	16.99
930391	AB1-080	1.7
930481	AB1-089	38.61
930501	AB1-091 O1	40.0
930741	AB1-122 1O1	41.84
930751	AB1-122 2O1	42.5
932601	AC2-080 C O1	3.72
932602	AC2-080 E O1	24.87
932881	AC2-115 1	1.4
932891	AC2-115 2	1.4
932921	AC2-116	0.49
932931	AC2-117	5.16
933411	AC2-154 C	1.4
933412	AC2-154 E	2.28
933431	AC2-156 C O1	0.55
933432	AC2-156 E O1	0.9
933911	AD1-013 C	1.08
933912	AD1-013 E	1.73
933931	AD1-016 C	0.54
933932	AD1-016 E	0.88
934101	AD1-039 1	4.1
934111	AD1-039 2	4.17
934401	AD1-064 C O1	1.87
934402	AD1-064 E O1	8.77
934431	AD1-067 C	0.08
934432	AD1-067 E	0.32
934701	AD1-098 C O1	4.04
934702	AD1-098 E O1	2.95
934721	AD1-100 C	11.08
934722	AD1-100 E	51.72
934871	AD1-116 C	0.57
934872	AD1-116 E	0.93

Bus #	Bus	MW Impact
934971	AD1-129 C	0.53
934972	AD1-129 E	0.35
935001	AD1-133 C O1	11.14
935002	AD1-133 E O1	7.43
935271	AD1-137 C	5.67
935272	AD1-137 E	37.94
936291	AD2-038 C O1	1.4
936292	AD2-038 E O1	9.4
936371	AD2-047 C O1	1.25
936372	AD2-047 E O1	13.44
936461	AD2-060	1.47
936511	AD2-066 C O1	4.97
936512	AD2-066 E O1	3.31
936781	AD2-101 C	2.47
936782	AD2-101 E	11.55
937001	AD2-134 C	1.61
937002	AD2-134 E	6.63
937031	AD2-137 C O1	1.91
937032	AD2-137 E O1	8.97
937041	AD2-138 C	5.03
937042	AD2-138 E	23.55
937051	AD2-140 C O1	1.91
937052	AD2-140 E O1	8.96
937061	AD2-141 C O1	1.9
937062	AD2-141 E O1	8.97
937071	AD2-142 C O1	3.83
937072	AD2-142 E O1	17.91
937121	AD2-148 C O1	1.92
937122	AD2-148 E O1	8.99
937131	AD2-149 C O1	1.92
937132	AD2-149 E O1	8.99
937141	AD2-150 C O1	1.92
937142	AD2-150 E O1	8.99
937181	AD2-155 C O1	1.92
937182	AD2-155 E O1	8.99
937321	AD2-175 C	8.94
937322	AD2-175 E	5.96
937331	AD2-176 C O1	4.28
937332	AD2-176 E O1	2.85
937401	AD2-194 1	4.49
937411	AD2-194 2	4.49
938012	AE1-002 E O1	3.84
938511	AE1-070 1	5.28
938521	AE1-070 2	4.83
938851	AE1-113 C O1	5.17
938852	AE1-113 E O1	16.24
939321	AE1-163 C O1	3.53
939322	AE1-163 E O1	21.69
939351	AE1-166 C O1	5.83
939352	AE1-166 E O1	5.39
939401	AE1-172 C O1	3.7
939402	AE1-172 E O1	17.32

Bus #	Bus	MW Impact
939641	AE1-194 C	5.59
939642	AE1-194 E	37.41
939651	AE1-195 C	5.59
939652	AE1-195 E	37.41
939691	AE1-199	1.4
939701	AE1-201 C	1.17
939702	AE1-201 E	0.26
939732	AE1-204 E	0.17
939861	AE1-222 1	46.21
939871	AE1-222 2	46.94
939921	AE1-228 C O1	5.9
939922	AE1-228 E O1	3.93
940101	AE1-252 C O1	6.3
940102	AE1-252 E O1	4.2
940262	AE2-008 BAT	34.37
940581	AE2-045 C O1	12.66
940582	AE2-045 E O1	17.38
940621	AE2-049 C O1	5.07
940622	AE2-049 E O1	3.38
940631	AE2-050 C O1	6.95
940632	AE2-050 E O1	4.63
940752	AE2-062 E	0.07
940762	AE2-063 E	0.07
941131	AE2-107 C	4.26
941132	AE2-107 E	2.84
941551	AE2-152 C	7.48
941552	AE2-152 E	3.74
941561	AE2-153 C O1	2.67
941562	AE2-153 E O1	12.48
941571	AE2-154 C	3.17
941572	AE2-154 E	21.24
942421	AE2-255 C O1	1.78
942422	AE2-255 E O1	5.35
942651	AE2-281 C	0.5
942652	AE2-281 E	3.1
942881	AE2-307 C	12.74
942882	AE2-307 E	4.63
942911	AE2-310 C	4.93
942912	AE2-310 E	1.33
942991	AE2-321 C O1	4.77
942992	AE2-321 E O1	2.35
943121	AE2-341 C	7.34
943122	AE2-341 E	3.6
CARR	CARR	0.6
CATAWBA	CATAWBA	0.06
CBM-S1	CBM-S1	4.5
CBM-W1	CBM-W1	19.69
CBM-W2	CBM-W2	68.05
CIN	CIN	6.99
G-007	G-007	1.67
HAMLET	HAMLET	0.18
IPL	IPL	3.23

Bus #	Bus	MW Impact
LGEE	LGEE	0.71
MEC	MEC	25.2
O-066	O-066	10.74
RENSSELAER	RENSSELAER	0.48
WEC	WEC	4.68
Z1-043	Z1-043	17.58

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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
6839533	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	120.26	121.23	DC	30.04

Bus #	Bus	MW Impact
247900	05FR-11G E	6.83
247901	05FR-12G E	6.72
247902	05FR-21G E	7.18
247903	05FR-22G E	6.87
247904	05FR-3G E	13.92
247905	05FR-4G E	10.47
247906	05MDL-1G E	15.59
247907	05MDL-2G E	7.73
247912	05MDL-3G E	8.08
247913	05MDL-4G E	7.81
247943	T-127 E	7.81
274722	S-055 E	6.52
274809	UNIV PK N;5U	0.64
274811	UNIV PK N;7U	0.64
274812	UNIV PK N;8U	0.64
274814	UNIV PK N;0U	0.64
274815	UNIV PK N;XU	0.64
274888	PILOT HIL;1E	10.28
275149	KEMPTON ;1E	10.28
290021	O50 E	11.42
293061	N-015 E	8.92
293644	O22 E1	5.91
293645	O22 E2	11.47
294392	P-010 E	11.33
909145	X2-052	28.77
914641	Y2-103	26.09
915011	Y3-013 1	2.17
915021	Y3-013 2	2.17
915031	Y3-013 3	2.17
916502	Z1-106 E1	0.73
916504	Z1-106 E2	0.73
916512	Z1-107 E	1.49
916522	Z1-108 E	1.44
917711	Z2-114 C	0.05
917712	Z2-114 E	0.39
918052	AA1-018 E	9.77
920272	AA2-123 E	1.43
926311	AC1-109 1	1.1
926321	AC1-109 2	1.1
926331	AC1-110 1	1.09
926341	AC1-110 2	1.09

Bus #	Bus	MW Impact
926351	AC1-111 1	0.44
926361	AC1-111 2	0.44
926371	AC1-111 3	0.44
926381	AC1-111 4	0.44
926391	AC1-111 5	0.44
926401	AC1-111 6	0.44
927091	AC1-204 1	41.76
927101	AC1-204 2	41.76
927451	AC1-142A 1	2.41
927461	AC1-142A 2	2.41
930042	AB1-006 E	16.99
930391	AB1-080	1.7
930501	AB1-091 O1	40.0
930741	AB1-122 1O1	41.84
930751	AB1-122 2O1	42.5
932601	AC2-080 C O1	3.72
932602	AC2-080 E O1	24.87
932931	AC2-117	5.16
933411	AC2-154 C	1.4
933412	AC2-154 E	2.28
933431	AC2-156 C O1	0.55
933432	AC2-156 E O1	0.9
933931	AD1-016 C	0.54
933932	AD1-016 E	0.88
934101	AD1-039 1	4.1
934111	AD1-039 2	4.17
934721	AD1-100 C	11.08
934722	AD1-100 E	51.72
934871	AD1-116 C	0.57
934872	AD1-116 E	0.93
935271	AD1-137 C	5.67
935272	AD1-137 E	37.94
936291	AD2-038 C O1	1.4
936292	AD2-038 E O1	9.4
936371	AD2-047 C O1	1.25
936372	AD2-047 E O1	13.44
936461	AD2-060	1.47
936511	AD2-066 C O1	4.97
936512	AD2-066 E O1	3.31
937031	AD2-137 C O1	1.91
937032	AD2-137 E O1	8.97
937041	AD2-138 C	5.03
937042	AD2-138 E	23.55
937051	AD2-140 C O1	1.91
937052	AD2-140 E O1	8.96
937061	AD2-141 C O1	1.9
937062	AD2-141 E O1	8.97
937071	AD2-142 C O1	3.83
937072	AD2-142 E O1	17.91
937121	AD2-148 C O1	1.92
937122	AD2-148 E O1	8.99
937131	AD2-149 C O1	1.92

Bus #	Bus	MW Impact
937132	AD2-149 E O1	8.99
937141	AD2-150 C O1	1.92
937142	AD2-150 E O1	8.99
937181	AD2-155 C O1	1.92
937182	AD2-155 E O1	8.99
937321	AD2-175 C	8.94
937322	AD2-175 E	5.96
937331	AD2-176 C O1	4.28
937332	AD2-176 E O1	2.85
937401	AD2-194 1	4.49
937411	AD2-194 2	4.49
938012	AE1-002 E O1	3.84
938511	AE1-070 1	5.28
938521	AE1-070 2	4.83
938671	AE1-089 C	74.51
938672	AE1-089 E	102.29
938851	AE1-113 C O1	5.17
938852	AE1-113 E O1	16.24
939321	AE1-163 C O1	3.53
939322	AE1-163 E O1	21.69
939351	AE1-166 C O1	5.83
939352	AE1-166 E O1	5.39
939641	AE1-194 C	5.59
939642	AE1-194 E	37.41
939651	AE1-195 C	5.59
939652	AE1-195 E	37.41
939701	AE1-201 C	1.17
939702	AE1-201 E	0.26
939732	AE1-204 E	0.17
939861	AE1-222 1	46.21
939871	AE1-222 2	46.94
940261	AE2-008	45.68
940581	AE2-045 C O1	12.66
940582	AE2-045 E O1	17.38
940621	AE2-049 C O1	5.07
940622	AE2-049 E O1	3.38
940631	AE2-050 C O1	6.95
940632	AE2-050 E O1	4.63
940752	AE2-062 E	0.07
940762	AE2-063 E	0.07
941551	AE2-152 C	7.48
941552	AE2-152 E	3.74
941561	AE2-153 C O1	2.67
941562	AE2-153 E O1	12.48
941571	AE2-154 C	3.17
941572	AE2-154 E	21.24
942421	AE2-255 C O1	1.78
942422	AE2-255 E O1	5.35
942651	AE2-281 C	0.5
942652	AE2-281 E	3.1
942881	AE2-307 C	12.74
942882	AE2-307 E	4.63

Bus #	Bus	MW Impact
942911	AE2-310 C	4.93
942912	AE2-310 E	1.33
942991	AE2-321 C O1	4.77
942992	AE2-321 E O1	2.35
943121	AE2-341 C	7.34
943122	AE2-341 E	3.6
CARR	CARR	0.6
CATAWBA	CATAWBA	0.06
CBM-S1	CBM-S1	4.5
CBM-W1	CBM-W1	19.69
CBM-W2	CBM-W2	68.05
CIN	CIN	6.99
G-007	G-007	1.67
HAMLET	HAMLET	0.18
IPL	IPL	3.23
LGEE	LGEE	0.71
MEC	MEC	25.2
O-066	O-066	10.74
RENSSELAER	RENSSELAER	0.48
WEC	WEC	4.68
Z1-043	Z1-043	17.58

Affected Systems

18 Affected Systems

18.1 LG&E

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

18.2 MISO

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

18.3 TVA

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

18.4 Duke Energy Progress

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

18.5 NYISO

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

Contingency Name	Contingency Definition
AEP_P1-2_#695A	CONTINGENCY 'AEP_P1-2_#695A' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNNU 765 242934 05CORNNU 345 1 REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 END
COMED_P4_112-65-BT3-4__	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
AEP_P4_#2978_05DUMONT 765_B	CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B' OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
COMED_P4_023-65-BT2-3__	CONTINGENCY 'COMED_P4_023-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765 END
COMED_P4_112-65-BT4-5__	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END

Short Circuit

19 Short Circuit

The following Breakers are overduty

None

20 Option 2 : Network Impacts

The Queue Project AE2-045 was evaluated as a 280.0 MW (Capacity 118.0 MW), a direct connection to the AC2-080 proposed switching station in the AEP area. Project AE2-045 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-045 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

21 Generation Deliverability

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

None

22 Multiple Facility Contingency

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

None

23 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
1335121	242865	05JEFRSO	AEP	248000	06CLIFTY	OVER C	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	2354.0	103.54	104.37	DC	37.88
1335444	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#2978_05DUMON NT 765_B	breaker	1409.0	120.75	122.18	DC	40.02
1335445	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	COMED_P4_112-65-BT4-5	breaker	1409.0	110.69	111.9	DC	35.71
1335446	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	COMED_P4_112-65-BT3-4	breaker	1409.0	110.69	111.9	DC	35.71
6839533	938670	AE1-089 TAP	AEP	243219	05DUMON T	AEP	1	AEP_P4_#2978_05DUMON NT 765_B	breaker	1409.0	119.77	122.63	DC	40.02
11749555	938670	AE1-089 TAP	AEP	243219	05DUMON T	AEP	1	COMED_P4_023-65-BT2-3	breaker	1409.0	114.92	117.48	DC	35.7
11749556	938670	AE1-089 TAP	AEP	243219	05DUMON T	AEP	1	COMED_P4_112-65-BT4-5	breaker	1409.0	114.92	117.48	DC	35.71
11749557	938670	AE1-089 TAP	AEP	243219	05DUMON T	AEP	1	COMED_P4_112-65-BT3-4	breaker	1409.0	114.92	117.48	DC	35.71
11749558	938670	AE1-089 TAP	AEP	243219	05DUMON T	AEP	1	COMED_P4_023-65-BT4-5	breaker	1409.0	114.92	117.47	DC	35.71

24 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
1336293	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P1-2_#709	operation	2354.0	102.06	102.9	DC	37.96
1336312	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P1-2_#695A	operation	1409.0	110.69	111.9	DC	35.71
6840479	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P1-2_#695A	operation	1409.0	114.92	117.47	DC	35.71

25 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
			TOTAL COST	\$0

26 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.

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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
1335121	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	2354.0	103.54	104.37	DC	37.88

Bus #	Bus	MW Impact
243441	05CKG2	15.47
243442	05RKG1	52.85
243443	05RKG2	50.66
243859	05FR-11G C	0.32
243862	05FR-12G C	0.32
243864	05FR-21G C	0.34
243866	05FR-22G C	0.33
243870	05FR-3G C	0.66
243873	05FR-4G C	0.51
246909	05MDL-1G C	0.68
246910	05MDL-2G C	0.34
246976	05MDL-3G C	0.34
246979	05MDL-4G C	0.68
247556	T-127 C	0.33
247900	05FR-11G E	10.61
247901	05FR-12G E	10.44
247902	05FR-21G E	11.15
247903	05FR-22G E	10.68
247904	05FR-3G E	21.63
247905	05FR-4G E	16.26
247906	05MDL-1G E	22.26
247907	05MDL-2G E	11.04
247912	05MDL-3G E	11.54
247913	05MDL-4G E	11.15
247943	T-127 E	11.15
274788	SE CHICAG;5U	3.99
274789	SE CHICAG;6U	3.99
274790	SE CHICAG;7U	3.99
274791	SE CHICAG;8U	3.99
274792	SE CHICAG;9U	3.99
274793	SE CHICAG;0U	3.99
274794	SE CHICAG;1U	3.99
274795	SE CHICAG;2U	3.99
900404	X3-028 C	257.22
900405	X3-028 E	342.96
910542	X3-005 E	0.58
915662	Y3-099 E	0.24
915672	Y3-100 E	0.24
916182	Z1-065 E	0.65
917712	Z2-114 E	0.26
925242	AB2-178 E	2.4
930041	AB1-006 C	0.44

930042	AB1-006 E	24.25
930461	AB1-087	94.31
930471	AB1-088	94.31
930501	AB1-091 O1	56.62
932601	AC2-080 C O1	3.52
932602	AC2-080 E O1	23.54
932931	AC2-117	4.75
933281	AC2-140 C	4.2
933282	AC2-140 E	0.22
933441	AC2-157 C	13.03
933442	AC2-157 E	21.26
934721	AD1-100 C	15.43
934722	AD1-100 E	72.01
935271	AD1-137 C	8.81
935272	AD1-137 E	58.95
936781	AD2-101 C	3.63
936782	AD2-101 E	16.98
937031	AD2-137 C O1	2.75
937032	AD2-137 E O1	12.87
937041	AD2-138 C	4.76
937042	AD2-138 E	22.3
937051	AD2-140 C O1	2.76
937052	AD2-140 E O1	12.9
937061	AD2-141 C O1	2.74
937062	AD2-141 E O1	12.92
937071	AD2-142 C O1	5.51
937072	AD2-142 E O1	25.8
937121	AD2-148 C O1	2.72
937122	AD2-148 E O1	12.72
937131	AD2-149 C O1	2.72
937132	AD2-149 E O1	12.72
937141	AD2-150 C O1	2.72
937142	AD2-150 E O1	12.72
937181	AD2-155 C O1	2.72
937182	AD2-155 E O1	12.72
937321	AD2-175 C	12.66
937322	AD2-175 E	8.44
938012	AE1-002 E O1	5.52
938671	AE1-089 C	14.0
938672	AE1-089 E	19.22
939351	AE1-166 C O1	8.02
939352	AE1-166 E O1	7.41
939641	AE1-194 C	6.77
939642	AE1-194 E	45.27
939651	AE1-195 C	6.77
939652	AE1-195 E	45.27
940261	AE2-008	8.59
940581	AE2-045 C O2	15.96
940582	AE2-045 E O2	21.92
940621	AE2-049 C O2	1.94
940622	AE2-049 E O2	1.29
940631	AE2-050 C O2	9.26
940632	AE2-050 E O2	6.17

941341	AE2-130 C	153.52
941342	AE2-130 E	102.35
941571	AE2-154 C	4.53
941572	AE2-154 E	30.31
942601	AE2-276	8.59
942881	AE2-307 C	16.97
942882	AE2-307 E	6.17
942911	AE2-310 C	6.89
942912	AE2-310 E	1.86
BLUEG	BLUEG	104.31
CALDERWOOD	CALDERWOOD	1.4
CANNELTON	CANNELTON	1.91
CARR	CARR	0.73
CATAWBA	CATAWBA	0.86
CBM-W1	CBM-W1	38.73
CBM-W2	CBM-W2	61.38
CHEOAH	CHEOAH	1.28
CHILHOWEE	CHILHOWEE	0.46
CIN	CIN	6.44
ELMERSMITH	ELMERSMITH	3.11
G-007	G-007	2.19
HAMLET	HAMLET	1.4
IPL	IPL	3.66
MEC	MEC	33.84
MECS	MECS	18.37
O-066	O-066	14.03
RENSSELAER	RENSSELAER	0.58
SANTEETLA	SANTEETLA	0.38
TRIMBLE	TRIMBLE	12.57
TVA	TVA	1.98
WEC	WEC	6.28
Z1-043	Z1-043	24.62

26.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1335444	243918	05ELDERBRYSS	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	120.75	122.18	DC	40.02

Bus #	Bus	MW Impact
247900	05FR-11G E	6.83
247901	05FR-12G E	6.72
247902	05FR-21G E	7.18
247903	05FR-22G E	6.87
247904	05FR-3G E	13.92
247905	05FR-4G E	10.47
247906	05MDL-1G E	15.59
247907	05MDL-2G E	7.73
247912	05MDL-3G E	8.09
247913	05MDL-4G E	7.81
247943	T-127 E	7.81
270859	PWR VTR EC;R	7.08
274722	S-055 E	6.52
274809	UNIV PK N;5U	0.64
274811	UNIV PK N;7U	0.64
274812	UNIV PK N;8U	0.64
274814	UNIV PK N;0U	0.64
274815	UNIV PK N;XU	0.64
274888	PILOT HIL;1E	10.28
275149	KEMPTON ;1E	10.28
290021	O50 E	11.42
290051	GSG-6; E	6.14
290108	LEEDK;1U E	14.18
293061	N-015 E	8.93
293644	O22 E1	5.91
293645	O22 E2	11.47
294392	P-010 E	11.34
295109	WESTBROOK E	3.29
909145	X2-052	28.77
914641	Y2-103	26.09
915011	Y3-013 1	2.17
915021	Y3-013 2	2.17
915031	Y3-013 3	2.17
916221	Z1-073 E	3.17
916502	Z1-106 E1	0.73
916504	Z1-106 E2	0.73
916512	Z1-107 E	1.49
916522	Z1-108 E	1.44
917711	Z2-114 C	0.05
917712	Z2-114 E	0.39
918052	AA1-018 E	9.77

920272	AA2-123 E	1.43
924471	AB2-096	24.78
925302	AB2-191 E	0.81
926311	AC1-109 1	1.1
926321	AC1-109 2	1.1
926331	AC1-110 1	1.09
926341	AC1-110 2	1.09
926351	AC1-111 1	0.44
926361	AC1-111 2	0.44
926371	AC1-111 3	0.44
926381	AC1-111 4	0.44
926391	AC1-111 5	0.44
926401	AC1-111 6	0.44
926431	AC1-114	1.4
927091	AC1-204 1	41.76
927101	AC1-204 2	41.77
927451	AC1-142A 1	2.41
927461	AC1-142A 2	2.41
927511	AC1-113 1	0.7
927521	AC1-113 2	0.7
930042	AB1-006 E	16.99
930391	AB1-080	1.7
930481	AB1-089	38.62
930501	AB1-091 O1	40.0
930741	AB1-122 1O1	41.85
930751	AB1-122 2O1	42.52
932601	AC2-080 C O1	3.72
932602	AC2-080 E O1	24.87
932881	AC2-115 1	1.4
932891	AC2-115 2	1.4
932921	AC2-116	0.49
932931	AC2-117	5.16
933411	AC2-154 C	1.4
933412	AC2-154 E	2.28
933431	AC2-156 C O1	0.55
933432	AC2-156 E O1	0.9
933911	AD1-013 C	1.08
933912	AD1-013 E	1.73
933931	AD1-016 C	0.54
933932	AD1-016 E	0.88
934101	AD1-039 1	4.1
934111	AD1-039 2	4.17
934401	AD1-064 C O1	1.87
934402	AD1-064 E O1	8.77
934431	AD1-067 C	0.08
934432	AD1-067 E	0.32
934701	AD1-098 C O1	4.04
934702	AD1-098 E O1	2.95
934721	AD1-100 C	11.08
934722	AD1-100 E	51.72
934871	AD1-116 C	0.57
934872	AD1-116 E	0.93
934971	AD1-129 C	0.53

934972	AD1-129 E	0.35
935001	AD1-133 C O1	3.55
935002	AD1-133 E O1	2.36
935271	AD1-137 C	5.67
935272	AD1-137 E	37.95
936291	AD2-038 C O1	1.41
936292	AD2-038 E O1	9.4
936371	AD2-047 C O1	1.25
936372	AD2-047 E O1	13.44
936461	AD2-060	1.47
936511	AD2-066 C O1	4.97
936512	AD2-066 E O1	3.32
936781	AD2-101 C	2.47
936782	AD2-101 E	11.55
937001	AD2-134 C	1.61
937002	AD2-134 E	6.63
937031	AD2-137 C O1	1.92
937032	AD2-137 E O1	8.97
937041	AD2-138 C	5.03
937042	AD2-138 E	23.56
937051	AD2-140 C O1	1.91
937052	AD2-140 E O1	8.96
937061	AD2-141 C O1	1.9
937062	AD2-141 E O1	8.97
937071	AD2-142 C O1	3.83
937072	AD2-142 E O1	17.91
937121	AD2-148 C O1	1.92
937122	AD2-148 E O1	8.99
937131	AD2-149 C O1	1.92
937132	AD2-149 E O1	8.99
937141	AD2-150 C O1	1.92
937142	AD2-150 E O1	8.99
937181	AD2-155 C O1	1.92
937182	AD2-155 E O1	8.99
937321	AD2-175 C	8.94
937322	AD2-175 E	5.96
937331	AD2-176 C O1	4.28
937332	AD2-176 E O1	2.85
937401	AD2-194 1	4.49
937411	AD2-194 2	4.49
938012	AE1-002 E O1	3.85
938511	AE1-070 1	5.28
938521	AE1-070 2	4.83
938851	AE1-113 C O1	5.17
938852	AE1-113 E O1	16.24
939321	AE1-163 C O1	3.53
939322	AE1-163 E O1	21.69
939351	AE1-166 C O1	5.84
939352	AE1-166 E O1	5.39
939401	AE1-172 C O1	3.7
939402	AE1-172 E O1	17.32
939641	AE1-194 C	5.59
939642	AE1-194 E	37.41

939651	AE1-195 C	5.59
939652	AE1-195 E	37.41
939691	AE1-199	1.4
939701	AE1-201 C	1.17
939702	AE1-201 E	0.26
939732	AE1-204 E	0.17
939861	AE1-222 1	46.22
939871	AE1-222 2	46.95
939921	AE1-228 C O1	5.9
939922	AE1-228 E O1	3.93
940101	AE1-252 C O1	6.31
940102	AE1-252 E O1	4.2
940262	AE2-008 BAT	34.37
940581	AE2-045 C O2	16.87
940582	AE2-045 E O2	23.16
940621	AE2-049 C O2	5.07
940622	AE2-049 E O2	3.38
940631	AE2-050 C O2	6.94
940632	AE2-050 E O2	4.63
940752	AE2-062 E	0.07
940762	AE2-063 E	0.07
941131	AE2-107 C	4.26
941132	AE2-107 E	2.84
941551	AE2-152 C O2	6.64
941552	AE2-152 E O2	4.43
941561	AE2-153 C O2	2.59
941562	AE2-153 E O2	12.13
941571	AE2-154 C	3.17
941572	AE2-154 E	21.24
942421	AE2-255 C O2	1.79
942422	AE2-255 E O2	5.38
942651	AE2-281 C	0.5
942652	AE2-281 E	3.1
942881	AE2-307 C	12.73
942882	AE2-307 E	4.63
942911	AE2-310 C	4.92
942912	AE2-310 E	1.33
942991	AE2-321 C O2	4.78
942992	AE2-321 E O2	2.35
943121	AE2-341 C	7.34
943122	AE2-341 E	3.61
CARR	CARR	0.6
CATAWBA	CATAWBA	0.06
CBM-S1	CBM-S1	4.51
CBM-W1	CBM-W1	19.7
CBM-W2	CBM-W2	68.08
CIN	CIN	6.99
G-007	G-007	1.67
HAMLET	HAMLET	0.18
IPL	IPL	3.24
LGEE	LGEE	0.71
MEC	MEC	25.2
O-066	O-066	10.75

RENSSELAER	RENSSELAER	0.48
WEC	WEC	4.68
Z1-043	Z1-043	17.58

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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
6839533	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#2978_05DUMONT 765_B	breaker	1409.0	119.77	122.63	DC	40.02

Bus #	Bus	MW Impact
247900	05FR-11G E	6.83
247901	05FR-12G E	6.72
247902	05FR-21G E	7.18
247903	05FR-22G E	6.87
247904	05FR-3G E	13.92
247905	05FR-4G E	10.47
247906	05MDL-1G E	15.59
247907	05MDL-2G E	7.73
247912	05MDL-3G E	8.09
247913	05MDL-4G E	7.81
247943	T-127 E	7.81
274722	S-055 E	6.52
274809	UNIV PK N;5U	0.64
274811	UNIV PK N;7U	0.64
274812	UNIV PK N;8U	0.64
274814	UNIV PK N;0U	0.64
274815	UNIV PK N;XU	0.64
274888	PILOT HIL;1E	10.28
275149	KEMPTON ;1E	10.28
290021	O50 E	11.42
293061	N-015 E	8.93
293644	O22 E1	5.91
293645	O22 E2	11.47
294392	P-010 E	11.34
909145	X2-052	28.77
914641	Y2-103	26.09
915011	Y3-013 1	2.17
915021	Y3-013 2	2.17
915031	Y3-013 3	2.17
916502	Z1-106 E1	0.73
916504	Z1-106 E2	0.73
916512	Z1-107 E	1.49
916522	Z1-108 E	1.44
917711	Z2-114 C	0.05
917712	Z2-114 E	0.39
918052	AA1-018 E	9.77
926311	AC1-109 1	1.1
926321	AC1-109 2	1.1
926331	AC1-110 1	1.09
926341	AC1-110 2	1.09
926351	AC1-111 1	0.44

926361	AC1-111 2	0.44
926371	AC1-111 3	0.44
926381	AC1-111 4	0.44
926391	AC1-111 5	0.44
926401	AC1-111 6	0.44
927091	AC1-204 1	41.76
927101	AC1-204 2	41.77
927451	AC1-142A 1	2.41
927461	AC1-142A 2	2.41
930042	AB1-006 E	16.99
930391	AB1-080	1.7
930501	AB1-091 O1	40.0
930741	AB1-122 1O1	41.85
930751	AB1-122 2O1	42.52
932601	AC2-080 C O1	3.72
932602	AC2-080 E O1	24.87
932931	AC2-117	5.16
933411	AC2-154 C	1.4
933412	AC2-154 E	2.28
933431	AC2-156 C O1	0.55
933432	AC2-156 E O1	0.9
934101	AD1-039 1	4.1
934111	AD1-039 2	4.17
934721	AD1-100 C	11.08
934722	AD1-100 E	51.72
934871	AD1-116 C	0.57
934872	AD1-116 E	0.93
935271	AD1-137 C	5.67
935272	AD1-137 E	37.95
936291	AD2-038 C O1	1.41
936292	AD2-038 E O1	9.4
936371	AD2-047 C O1	1.25
936372	AD2-047 E O1	13.44
936461	AD2-060	1.47
936511	AD2-066 C O1	4.97
936512	AD2-066 E O1	3.32
937031	AD2-137 C O1	1.92
937032	AD2-137 E O1	8.97
937041	AD2-138 C	5.03
937042	AD2-138 E	23.56
937051	AD2-140 C O1	1.91
937052	AD2-140 E O1	8.96
937061	AD2-141 C O1	1.9
937062	AD2-141 E O1	8.97
937071	AD2-142 C O1	3.83
937072	AD2-142 E O1	17.91
937121	AD2-148 C O1	1.92
937122	AD2-148 E O1	8.99
937131	AD2-149 C O1	1.92
937132	AD2-149 E O1	8.99
937141	AD2-150 C O1	1.92
937142	AD2-150 E O1	8.99
937181	AD2-155 C O1	1.92

937182	AD2-155 E O1	8.99
937321	AD2-175 C	8.94
937322	AD2-175 E	5.96
937401	AD2-194 1	4.49
937411	AD2-194 2	4.49
938012	AE1-002 E O1	3.85
938511	AE1-070 1	5.28
938521	AE1-070 2	4.83
938671	AE1-089 C	74.52
938672	AE1-089 E	102.29
938851	AE1-113 C O1	5.17
938852	AE1-113 E O1	16.24
939321	AE1-163 C O1	3.53
939322	AE1-163 E O1	21.69
939351	AE1-166 C O1	5.84
939352	AE1-166 E O1	5.39
939641	AE1-194 C	5.59
939642	AE1-194 E	37.41
939651	AE1-195 C	5.59
939652	AE1-195 E	37.41
939732	AE1-204 E	0.17
939861	AE1-222 1	46.22
939871	AE1-222 2	46.95
940261	AE2-008	45.69
940581	AE2-045 C O2	16.87
940582	AE2-045 E O2	23.16
940621	AE2-049 C O2	5.07
940622	AE2-049 E O2	3.38
940631	AE2-050 C O2	6.94
940632	AE2-050 E O2	4.63
940752	AE2-062 E	0.07
940762	AE2-063 E	0.07
941551	AE2-152 C O2	6.64
941552	AE2-152 E O2	4.43
941561	AE2-153 C O2	2.59
941562	AE2-153 E O2	12.13
941571	AE2-154 C	3.17
941572	AE2-154 E	21.24
942421	AE2-255 C O2	1.79
942422	AE2-255 E O2	5.38
942651	AE2-281 C	0.5
942652	AE2-281 E	3.1
942881	AE2-307 C	12.73
942882	AE2-307 E	4.63
942911	AE2-310 C	4.92
942912	AE2-310 E	1.33
943121	AE2-341 C	7.34
943122	AE2-341 E	3.61
CARR	CARR	0.6
CATAWBA	CATAWBA	0.06
CBM-S1	CBM-S1	4.51
CBM-W1	CBM-W1	19.7
CBM-W2	CBM-W2	68.08

CIN	CIN	6.99
G-007	G-007	1.67
HAMLET	HAMLET	0.18
IPL	IPL	3.24
LGEE	LGEE	0.71
MEC	MEC	25.2
O-066	O-066	10.75
RENSSELAER	RENSSELAER	0.48
WEC	WEC	4.68
Z1-043	Z1-043	17.58

Affected Systems

27 Affected Systems

27.1 LG&E

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

27.2 MISO

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

27.3 TVA

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

27.4 Duke Energy Progress

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

27.5 NYISO

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

Contingency Name	Contingency Definition
AEP_P1-2_#695A	CONTINGENCY 'AEP_P1-2_#695A' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#2978_05DUMONT 765_B	CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B' OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNNU 765 242934 05CORNNU 345 1 REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 END
COMED_P4_112-65-BT3-4__	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
COMED_P4_023-65-BT4-5__	CONTINGENCY 'COMED_P4_023-65-BT4-5__' TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 / COLLI;2M 345 COLLI; 765 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 / COLLI;2M 345 COLLI; R 345 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 / COLLI;2M 345 COLLI;2C 33 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 END
COMED_P4_023-65-BT2-3__	CONTINGENCY 'COMED_P4_023-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765 END
COMED_P4_112-65-BT4-5__	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765

	TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 END	/ WILTO;4M 345 WILTO; R 345 / WILTO;4M 345 WILTO;4C 33
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Short Circuit

28 Short Circuit

The following Breakers are overduty

None