Merchant Transmission Interconnection

Feasibility Study Report

for

Queue Project AF1-088

SULLIVAN 345 KV

1000 MW Capacity / 1000 MW Energy

January, 2020

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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 (IC), has proposed a Merchant Transmission line to connect MISO's transmission system to AEP's transmission system, in Sullivan County, IN. The Interconnection Customer will install a 525kV HVDC line and tie it into AEP's Sullivan substation. The installed facilities will have a capability of 1000MW- with 1000MW of this output being recognized by PJM as of Firm Transmission Withdrawal Rights (TWR), and 1000MW being recognized as of non-firm TWR. The installed facilities will also have a capability of 1000MW Firm Transmission Injection Rights (TIR), and 1000MW being recognized as of non-firm TIRs. The proposed in-service date for this project is December 31, 2025. This study does not imply a TO commitment to this in-service date.

	Firm TWRs (MW)	Non-Firm TWRs (MW)	Firm TIRs (MW)	Non-Firm TIRs (MW)
AF1-088	1000	1000	1000	1000

Queue Number	**AF1-088**
Project Name	SULLIVAN 345 KV
State	Indiana
County	Sullivan
Transmission Owner	AEP
MFO	1000
MWE	1000
MWC	1000
Basecase Study Year	2023

Point of Interconnection

AF1-088 will interconnect with the AEP transmission system at the Sullivan 345kV Substation.

To accommodate this interconnection, the 345 kV substation will have to be expanded requiring the installation of one (1) 345 kV circuit breaker (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.

Cost Summary

This project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$350,000
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$3,200,000
Total Costs	$3,550,000

In addition, this project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 627,050,000

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
345 kV Revenue Metering	$350,000
Total Attachment Facility Costs	$350,000

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
Total Direct Connection Facility Costs	$0

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
Expand the 345 kV substation: Install one (1) additional 345 kV circuit breaker. Installation of associated protection and control equipment, 345 kV line risers and SCADA will also be required.	$2,500,000
Upgrade line protection and controls at the remote end 138kV substation #1	$350,000
Upgrade line protection and controls at the remote end 138kV substation #2	$350,000
Total Non-Direct Connection Facility Costs	$3,200,000

Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

Schedule

It is anticipated that the time between receipt of executed Agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would generally be between 24 to 36 months after 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 Huntington Junction 138 kV station 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.

In addition, if the Interconnection Customer considers use of the Option to Build, they should consult the guidance AEP has posted at:
https://www.aep.com/assets/docs/requiredpostings/TransmissionStudies/docs/2019/MerchantGenerationGuidelinesPJMoptiontoBuild.pdf

Revenue Metering and SCADA Requirements

PJM Requirements

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

AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP

Transmission System" document located at the following link:
http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

Network Impacts

The Queue Project AF1-088 was evaluated as a 1000 MW (Capacity 1000 MW) injection at in the AEP area. Project AF1-088 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-088 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
85770	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P1-2_#8905	single	3452.0	96.02	105.69	DC	333.94
85771	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P1-2_#8904	single	3452.0	93.34	103.3	DC	344.09
85772	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P1-2_#2963	single	3452.0	93.34	103.3	DC	344.09
85633	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P1-2_#10136	single	1160.0	85.68	104.58	DC	219.23
85606	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P1-2_#363	single	1466.0	95.86	120.79	DC	365.5
85639	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P1-2_#10136	single	1160.0	85.68	104.58	DC	219.23
466482	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P1-2_#363	single	1466.0	95.86	120.79	DC	365.5

Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
85427	243208	05JEFRSO	AEP	242865	05JEFRSO	AEP	2	AEP_P4_#1760_05JEFRSO 765_A	breaker	3039.0	94.63	102.43	DC	234.42
85408	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1409.0	87.01	105.22	DC	255.62
85434	247712	05SULLIVAN	AEP	243217	05DEQUIN	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1318.0	92.1	103.22	DC	146.6
466202	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1409.0	87.01	105.22	DC	255.62

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
85273	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	122.17	132.23	DC	234.42
466044	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	122.17	132.23	DC	234.42
2243160	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	122.17	132.23	DC	234.42
3189508	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	122.17	132.23	DC	234.42
85335	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P4_#8906_05SULLIVAN 345_C	breaker	3452.0	110.34	121.6	DC	388.59
85336	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P4_#8910_05DEQUIN 345_C	breaker	3452.0	104.39	113.89	DC	335.0

85937	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11042	tower	3452.0	118.36	127.78	DC	331.99
85938	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11041	tower	3452.0	112.87	122.28	DC	332.14
85258	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.94	137.73	DC	218.0
85630	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P1-2_#363	single	1160.0	109.96	128.73	DC	217.71
85228	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1466.0	120.8	145.74	DC	365.66
85263	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.94	137.73	DC	218.0
85636	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P1-2_#363	single	1160.0	109.96	128.73	DC	217.71
466005	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1466.0	120.8	145.74	DC	365.66
2243524	248000	06CLIFTY	OVEC	248001	06DEARB1	OVEC	1	AEP_P4_#1760_05JEFRSO 765_A	breaker	1023.0	100.18	103.34	DC	60.99
963320	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	133.49	137.25	DC	57.52
963321	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	127.85	131.61	DC	57.52
963346	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	129.98	133.77	DC	57.85
963347	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	124.33	128.12	DC	57.85
963356	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-B	single	1528.0	122.35	125.83	DC	53.08
963357	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-C	single	1528.0	119.32	122.8	DC	53.08
2501518	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	117.7	122.09	DC	63.71
2501522	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#10136	single	1451.0	112.05	116.47	DC	64.15
3189837	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	117.7	122.09	DC	63.71
3189841	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#10136	single	1451.0	112.05	116.47	DC	64.15
963440	348847	7BROKAW	AMIL	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1793.0	104.53	107.77	DC	58.07
963441	348847	7BROKAW	AMIL	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L17802__-S	single	1793.0	102.5	105.75	DC	58.29
963388	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L8002___-S	single	1793.0	110.95	114.18	DC	57.93
963389	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L17802__-S	single	1793.0	108.92	112.16	DC	58.15
963336	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-B	single	1528.0	128.97	132.44	DC	53.08
963337	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-C	single	1528.0	126.78	130.26	DC	53.08
963309	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	138.26	142.03	DC	57.52
963310	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	132.62	136.38	DC	57.52
85178	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGENE 345_A2	breaker	1466.0	169.23	188.37	DC	280.11
465940	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGENE 345_A2	breaker	1466.0	169.23	188.37	DC	280.11

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
85764	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P1-2_#8905	operation	3452.0	104.04	113.51	DC	333.94
85769	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	Base Case	operation	3452.0	96.85	105.69	DC	304.98
85629	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P1-2_#363	operation	1160.0	118.28	137.04	DC	217.71
85780	243217	05DEQUIN	AEP	243878	05MEADOW	AEP	1	AEP_P1-2_#6490	operation	1959.0	104.13	110.91	DC	132.73
85794	243217	05DEQUIN	AEP	243878	05MEADOW	AEP	2	AEP_P1-2_#6472	operation	1959.0	103.37	110.1	DC	131.76
85600	243878	05MEADOW	AEP	255205	17REYNOLDS	NIPS	1	AEP_P1-2_#8807-B	operation	2246.0	126.97	133.17	DC	139.31
85617	243878	05MEADOW	AEP	945420	AF1-207 TAP	AEP	2	AEP_P1-2_#8695	operation	2246.0	127.77	133.98	DC	139.35
466459	243878	05MEADOW	AEP	255205	17REYNOLDS	NIPS	1	AEP_P1-2_#8807-B	operation	2246.0	126.97	133.17	DC	139.31
85605	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P1-2_#363	operation	1466.0	119.85	144.78	DC	365.5
85635	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P1-2_#363	operation	1160.0	118.28	137.04	DC	217.71
85821	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P1-2_#363	operation	1409.0	86.39	104.68	DC	256.72
85831	247712	05SULLIVAN	AEP	243217	05DEQUIN	AEP	1	AEP_P1-2_#363	operation	1318.0	90.82	101.89	DC	145.95
466481	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P1-2_#363	operation	1466.0	119.85	144.78	DC	365.5
466730	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P1-2_#363	operation	1409.0	86.39	104.68	DC	256.72
2501517	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	operation	1451.0	120.76	123.09	DC	63.71
3189836	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	operation	1451.0	120.76	123.09	DC	63.71
2501626	347830	7NEWTON	AMIL	346809	7CASEY	AMIL	1	Base Case	operation	1200.0	102.81	105.82	DC	68.19
2634037	347830	7NEWTON	AMIL	346809	7CASEY	AMIL	1	Base Case	operation	1200.0	102.81	105.82	DC	68.19
2820980	347830	7NEWTON	AMIL	346809	7CASEY	AMIL	1	Base Case	operation	1200.0	102.81	105.82	DC	68.19
85744	348885	7BUNSONVILLE	AMIL	243221	05EUGENE	AEP	1	AEP_P1-2_#8907-A	operation	1793.0	112.41	114.28	DC	78.6
466631	348885	7BUNSONVILLE	AMIL	243221	05EUGENE	AEP	1	AEP_P1-2_#8907-A	operation	1793.0	112.41	114.28	DC	78.6
85813	923880	AB2-028 TAP	AEP	243218	05DESOTO	AEP	1	AEP_P1-2_#363	operation	1160.0	101.95	105.59	DC	79.5
85587	945420	AF1-207 TAP	AEP	255205	17REYNOLDS	NIPS	2	AEP_P1-2_#8695	operation	2246.0	127.01	133.22	DC	139.35
466452	945420	AF1-207 TAP	AEP	255205	17REYNOLDS	NIPS	2	AEP_P1-2_#8695	operation	2246.0	127.01	133.22	DC	139.35
85531	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P1-2_#286	operation	1466.0	168.36	186.17	DC	260.99
85532	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	Base Case	operation	1334.0	144.26	163.54	DC	256.77
466396	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P1-2_#286	operation	1466.0	168.36	186.17	DC	260.99

466397	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	Base Case	operation	1334.0	144.26	163.54	DC	256.77

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
85770,85771,85772, 85335,85336,85937, 85938	1	**05ROCKPT 765.0 kV - 05JEFRSO 765.0 kV Ckt 1**	**AEP** **AEPI0002b (550) : An engineering study will need to be conducted to determine if the Jefferson CT Thermal limits 2996 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000** **Project Type : FAC** **Cost : $50,000** **Time Estimate : 12-18 Months** **AEPI0002c (551) : Replace 6 Rockport Current Transformers 3000Amps** **Project Type : FAC** **Cost : $4,800,000** **Time Estimate : 12-18 Months** **AEPI0002d (552) : Replace 2 Rockport 3000A non-oil Breakers at Rockport** **Project Type : FAC** **Cost : $6,000,000** **Time Estimate : 12-18 Months**	$10,850,000
85633,85258,85630	2	**05DARWIN 345.0 kV - 05EUGENE 345.0 kV Ckt 1**	**AEP** **n5034 (923) : 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**	$441,700,000
85606,466482,85228 ,466005	3	**05SULLIVAN 345.0 kV - J1180 TAP 345.0 kV Ckt 1**	**AEP** **AEPI0010a (223) : Reconductor/rebuild 0.82 miles of ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 5** **Project Type : FAC** **Cost : $1,640,000** **Time Estimate : 24 - 36 Months** **AEPI0010b (224) : Reconductor/rebuild 1 miles of ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 6** **Project Type : FAC** **Cost : $2,000,000** **Time Estimate : 24 - 36 Months** **AEPI0010c (225) : Replace two Sullivan 3000A Wavetrap** **Project Type : FAC** **Cost : $400,000**	$4,740,000
85178,465940	22	**J1180 TAP 345.0 kV - 05SULLIVAN 345.0 kV Ckt 1**		

ID	Index	Facility	Upgrade Description	Cost
			Time Estimate : 12- 18 Months **AEPI0010d (226)** : Replace three 2-2000 AAC 91 Str **Project Type** : FAC **Cost** : $300,000 **Time Estimate** : 12- 18 Months **AEPI0010e (227)** : Reconductor/rebuild 0.2 miles of ACAR ~ 1315.5 ~ 45/7 ~ DIPPER conductor sec 3, 1 **Project Type** : FAC **Cost** : $400,000 **Time Estimate** : 24 - 36 Months **AMIL** **NonPJMArea** : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. **Project Type** : FAC **Cost** : $0 **Time Estimate** : 0.0 Months	
85639,85263,85636	4	05SULLIVAN 345.0 kV - 05DARWIN 345.0 kV Ckt 1	**AEP** **n5034 (923)** : 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	$441,700,000
85427	5	05JEFRSO 765.0 kV - 05JEFRSO 345.0 kV Ckt 2	**AEP** **n5034 (923)** : Rebuilding a new Sullivan - Reynolds 765kV line which is driven by X3-028 MTX project will mitigate the identified overloads.	$441,700,000
85408,466202	7	05SULLIVAN 345.0 kV - 16PETE 345.0 kV Ckt 1	**AEP** **n5034 (923)** : 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 **IPL** **NonPJMArea** : The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase. **Project Type** : FAC **Cost** : $0 **Time Estimate** : 0.0 Months	$441,700,000
85434	8	05SULLIVAN 345.0 kV - 05DEQUIN 345.0 kV Ckt 1	**AEP** **n5034 (923)** : Rebuilding a new Sullivan - Reynolds 765kV line which is driven by X3-028 MTX project will mitigate the identified overloads.	$441,700,000

ID	Index	Facility	Upgrade Description	Cost
			Project Type : FAC **Cost** : $441,700,000 **Time Estimate** : N/A	
85273,466044,2243160,3189508	9	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	**AEP** **n5034 (923)** : 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 **OVEC** **n4106 (1097)** : Perform a sag study on the 345 kV line between Jefferson and Clifty Creek. The 345 kV line between Jefferson and Clifty Creek can be sag studied to increase the emergency rating from 2354 to 3212. The cost of a sag study to identify any mitigation requirements should cost around $3,680. If remediation can only be reached through a rebuild, wed expect that to cost around $1,960,000. Note that the transformer will still be limited to 2919 MVA emergency. **Project Type** : FAC **Cost** : $1,960,000 **Time Estimate** : N/A	$443,660,000
2243524	12	06CLIFTY 345.0 kV - 06DEARB1 345.0 kV Ckt 1	**OVEC** **B2943** : PJM Baseline Upgrade b2943. Perform a LIDAR study on the Clifty Creek - Dearborn 345 kV line to increase the Summer Emergency rating. The baseline project had a projected in-service date of 12/01/2018. **Project Type** : FAC **Cost** : $0 **Time Estimate** : N/A	$0
963320,963321	13	LORETTO ; B 345.0 kV - AE1-172 TAP 345.0 kV Ckt 1	**ComEd** **CE_NUN_L11212_2** : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to replace-2-345kV circuit breakers, upgrade a line relay scheme, station conductor upgrades at both terminals and reconductor the line. A preliminary estimate for the upgrades to $41M with an estimated construction timeline of 24-30 months. Upon completion the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). **Project Type** : FAC **Cost** : $41,000,000 **Time Estimate** : 24-30 Months	$41,000,000
963346,963347	14	PONTIAC ; B 345.0 kV-LORETTO ; B 345.0kV Ckt 1	**ComEd** **CE_NUN_Sta. 12 Dresden** : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to	$4,000,000

ID	Index	Facility	Upgrade Description	Cost
			confirm this proposal in study. Assuming this proposal is acceptable in solution, a preliminary estimate is $4M with a 24 month estimated construction contingent upon outage scheduling with Station 12 Dresden. The ratings for L11212 will not change rather the contingency as stated above will be revised. **Project Type** : FAC **Cost** : $ 4,000,000 **Time Estimate** : 24 Months	
963356,963357	15	PONTIAC ; R 345.0 kV - AD1-133 TAP 345.0 kV Ckt 1	ComEd **CE_NUN_8014** : ComEd 345kV L8014 SSTE rating is 1797 MVA. The upgrade will be to re-conductor a section of the line, upgrade station conductor at both terminals, upgrade 1-345kV circuit breaker and associated equipment and upgraded 1- line disconnect switch. A preliminary estimate for the upgraded is $38.2M with an estimated construction timeline of 24 months contingent upon line outage coordination with Dresden station. Upon completion of the upgrades the ratings will be 2293/2293/2293/2436 MVA (SN/SLTE/SSTE/SLD). **Project Type** : FAC **Cost** : $ 38,200,000 **Time Estimate** : 24 Months	$38,200,000
2501518,2501522,3189837,3189841	16	7TRIMBL REAC 345.0 kV - 06CLIFTY 345.0 kV Ckt 1	OVEC Reconductor the line with a high temperature conductor and upgrade necessary terminal equipment to achieve ratings of 2610/2610 MVA SN/SE. **Project Type** : FAC **Cost** : $ 17,400,000 **Time Estimate** : 18 Months LGEE **NonPJMArea** : The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase. **Project Type** : FAC **Cost** : $0 **Time Estimate** : 0.0 Months	$17,400,000
963440,963441	17	7BROKAW 345.0 kV - Z2-087 TAP 345.0 kV Ckt 1	ComEd **CE_NUN_L9203** : ComEd 345kV L9203 SSTE rating is 1854 MVA. The upgrade will be to mitigate sag on the line. A preliminary estimate for the upgrade is $9.1 M with an estimated timeline of 24 months. Upon completion the rating will be 1679/2058/2107/2280 MVA (SN/SLTE/SSTE/SLD). **Project Type** : FAC **Cost** : $9,100,000 **Time Estimate** : 24 Months AMIL **NonPJMArea** : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. **Project Type** : FAC **Cost** : $0 **Time Estimate** : 0.0 Months	$9,100,000

ID	Index	Facility	Upgrade Description	Cost
963388,963389	18	Z2-087 TAP 345.0 kV - PONTIAC ; R 345.0 kV Ckt 1	ComEd CE_NUN_8001 : ComEd L8001 SSTE rating is 1837 MVA. The upgrade will be to reconductor the line, replace station conductor at both line terminals, 1-345kV motor operated disconnect switch and replace 2-345kV bus tie circuit breakers and associated disconnect switches. A preliminary estimate for the upgrades is $19.9M with a preliminary construction timeline of 30 months. Upon completion of the upgrades the ratings will be 1825/2004/2295/2707 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $19,900,000 Time Estimate : 30 Months	$19,900,000
963336,963337	20	AD1-133 TAP 345.0 kV - DRESDEN ; R 345.0 kV Ckt 1	ComEd CE_NUN_8014: ComEd 345kV L8014 SSTE rating is 1797 MVA. The upgrade will be to re-conductor a section of the line, upgrade station conductor at both terminals, upgrade 1-345kV circuit breaker and associated equipment and upgrade 1- line disconnect switch. A preliminary estimate for the upgrades is $38.2M with an estimated construction timeline of 24 months contingent upon line outage coordination with Dresden station. Upon completion of the upgrades the ratings will be 2293/2293/2293/2436 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $38,200,000 Time Estimate : 24 Months	$38,200,000
963309,963310	21	AE1-172 TAP 345.0 kV - AD1-100 TAP 345.0 kV Ckt 1	ComEd CE_NUN_L11212_2: ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to replace-2-345kV circuit breakers, upgrade a line relay scheme, station conductor upgrades at both terminals and reconductor the line. A preliminary estimate for the upgrades as $41M with an estimated construction timeline of 24-30 months. Upon completion the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $41,000,000 Time Estimate : 24-30 Months	$41,000,000
			TOTAL COST	$627,050,000

Flow Gate Details

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

presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
85937	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11042	tower	3452.0	118.36	127.78	DC	331.99

Bus #	Bus	MW Impact
243442	05RKG1	116.65
243443	05RKG2	114.88
243859	05FR-11G C	0.5
243862	05FR-12G C	0.49
243864	05FR-21G C	0.52
243866	05FR-22G C	0.5
243870	05FR-3G C	1.01
243873	05FR-4G C	0.78
246909	05MDL-1G C	1.01
246910	05MDL-2G C	0.5
246976	05MDL-3G C	0.51
246979	05MDL-4G C	0.5
247556	T-127 C	0.51
247900	05FR-11G E	14.23
247901	05FR-12G E	13.99
247902	05FR-21G E	14.95
247903	05FR-22G E	14.32
247904	05FR-3G E	29.0
247905	05FR-4G E	22.71
247906	05MDL-1G E	29.02
247907	05MDL-2G E	14.54
247912	05MDL-3G E	14.54
247913	05MDL-4G E	14.54
247943	T-127 E	14.54
274650	KINCAID ;1U	8.43
930041	AB1-006 C	0.66
930042	AB1-006 E	31.62
930461	AB1-087	182.59
930471	AB1-088	182.59
933441	AC2-157 C	25.23
933442	AC2-157 E	41.17
935271	AD1-137 C	11.81
935272	AD1-137 E	79.04
936771	AD2-100 C	14.17
936772	AD2-100 E	9.45
936971	AD2-131 C	0.93
936972	AD2-131 E	4.69
941341	AE2-130 C	303.89
941342	AE2-130 E	202.6
941571	AE2-154 C	5.91
941572	AE2-154 E	39.52

Bus #	Bus	MW Impact
942481	AE2-261 C	19.68
942482	AE2-261 E	13.12
942601	AE2-276	16.6
944201	AF1-088 FTIR	331.99
944221	AF1-090 C O1	4.25
944222	AF1-090 E O1	19.88
945391	AF1-204 C O1	12.46
945392	AF1-204 E O1	37.37
945871	AF1-252 O1	7.53
945881	AF1-253 O1	5.21
946581	AF1-322 C	15.26
946582	AF1-322 E	21.08
954681	J949 C	18.68
954761	J468 C	3.1
954762	J468 E	17.55
956821	J1180	15.91
BLUEG	BLUEG	0.44
CATAWBA	CATAWBA	0.06
CBM-S1	CBM-S1	26.42
CBM-W1	CBM-W1	40.56
CBM-W2	CBM-W2	61.03
G-007	G-007	1.97
LGEE	LGEE	0.24
MADISON	MADISON	17.09
MEC	MEC	10.26
NY	NY	1.08
O-066	O-066	12.76
TRIMBLE	TRIMBLE	0.5
TVA	TVA	5.2
WEC	WEC	1.38

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
85258	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.94	137.73	DC	218.0

Bus #	Bus	MW Impact
243442	05RKG1	40.17
243443	05RKG2	39.56
930461	AB1-087	119.9
930471	AB1-088	119.9
933441	AC2-157 C	16.57
933442	AC2-157 E	27.03
941341	AE2-130 C	104.64
941342	AE2-130 E	69.76
942601	AE2-276	10.9
944201	AF1-088 FTIR	218.0
955131	J991	10.5
956821	J1180	11.11
CBM-S1	CBM-S1	9.13
CBM-S2	CBM-S2	1.64
CBM-W2	CBM-W2	10.53
CPLE	CPLE	0.1
EDWARDS	EDWARDS	0.05
G-007	G-007	0.3
LGEE	LGEE	0.39
MADISON	MADISON	1.83
MEC	MEC	1.06
NY	NY	0.17
O-066	O-066	1.96
TILTON	TILTON	4.78
TVA	TVA	1.62

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
466005	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1466.0	120.8	145.74	DC	365.66

Bus #	Bus	MW Impact
243442	05RKG1	67.39
243443	05RKG2	66.37
247900	05FR-11G E	3.99
247901	05FR-12G E	3.93
247902	05FR-21G E	4.2
247903	05FR-22G E	4.02
247904	05FR-3G E	8.14
247905	05FR-4G E	6.37
930461	AB1-087	201.11
930471	AB1-088	201.11
933441	AC2-157 C	27.79
933442	AC2-157 E	45.34
935271	AD1-137 C	3.31
935272	AD1-137 E	22.18
936973	AD2-131 BAT	5.51
941341	AE2-130 C	175.56
941342	AE2-130 E	117.04
941732	AE2-173 BAT	2.74
942601	AE2-276	18.28
944201	AF1-088 FTIR	365.66
945872	AF1-252 BAT	7.71
945882	AF1-253 BAT	5.33
951731	J446 C	1.81
951732	J446 E	9.79
951811	J513 C	0.96
951812	J513 E	5.21
952581	J740 C	2.16
952582	J740 E	11.7
952801	J754 C	3.31
952802	J754 E	17.9
952811	J759	4.44
952821	J762	10.05
952861	J783 C	4.22
952862	J783 E	0.18
953161	J837 C	2.16
953162	J837 E	11.71
953171	J838 C	1.08
953172	J838 E	5.85
953351	J805	14.34
953831	J842 C	2.27

Bus #	Bus	MW Impact
953832	J842 E	12.27
953841	J843 C	2.38
953842	J843 E	12.87
953931	J856	5.48
954171	J883 C	0.7
954172	J883 E	3.8
954351	J903	6.86
954421	J913 C	11.09
954772	J515 E	27.09
954941	J968 C	2.16
954942	J968 E	11.7
955141	J992	10.13
955151	J993	14.31
955371	J1016	3.73
955451	J1027	13.05
955461	J1028	12.37
955491	J1031 C	1.49
955492	J1031 E	8.08
955791	J1063	17.66
955821	J1067	13.96
955841	J1069 C	2.16
955842	J1069 E	11.7
955891	J1074	14.92
956561	J1152	14.51
956911	J1189	0.3
AC1-056	AC1-056	11.88
CALDERWOOD	CALDERWOOD	1.1
CATAWBA	CATAWBA	0.49
CHEOAH	CHEOAH	1.1
COFFEEN	COFFEEN	8.22
DUCKCREEK	DUCKCREEK	7.25
EDWARDS	EDWARDS	1.88
FARMERCITY	FARMERCITY	0.38
G-007	G-007	0.07
LGEE	LGEE	0.74
NEWTON	NEWTON	26.39
NY	NY	0.02
O-066	O-066	0.44
PRAIRIE	PRAIRIE	31.29
TILTON	TILTON	1.47

Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
85263	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.94	137.73	DC	218.0

Bus #	Bus	MW Impact
243442	05RKG1	40.17
243443	05RKG2	39.56
930461	AB1-087	119.9
930471	AB1-088	119.9
933441	AC2-157 C	16.57
933442	AC2-157 E	27.03
941341	AE2-130 C	104.64
941342	AE2-130 E	69.76
942601	AE2-276	10.9
944201	AF1-088 FTIR	218.0
955131	J991	10.5
956821	J1180	11.11
CBM-S1	CBM-S1	9.13
CBM-S2	CBM-S2	1.64
CBM-W2	CBM-W2	10.53
CPLE	CPLE	0.1
EDWARDS	EDWARDS	0.05
G-007	G-007	0.3
LGEE	LGEE	0.39
MADISON	MADISON	1.83
MEC	MEC	1.06
NY	NY	0.17
O-066	O-066	1.96
TILTON	TILTON	4.78
TVA	TVA	1.62

Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
85427	243208	05JEFRSO	AEP	242865	05JEFRSO	AEP	2	AEP_P4_#1760_05JEFRSO 765_A	breaker	3039.0	94.63	102.43	DC	234.42

Bus #	Bus	MW Impact
243442	05RKG1	88.03
243443	05RKG2	86.7
247900	05FR-11G E	6.16
247901	05FR-12G E	6.06
247902	05FR-21G E	6.48
247903	05FR-22G E	6.2
247904	05FR-3G E	12.56
247905	05FR-4G E	9.84
247906	05MDL-1G E	10.76
247907	05MDL-2G E	5.39
247912	05MDL-3G E	5.39
247913	05MDL-4G E	5.39
247943	T-127 E	5.39
250163	Y3-099 BAT	0.14
250167	Y3-100 BAT	0.14
251823	Z1-065 BAT	0.36
274882	W4-005 E	23.48
274890	CAYUG;1U E	7.19
274891	CAYUG;2U E	7.19
276153	W2-048 E	1.01
290261	S-027 E	11.34
290265	S-028 E	11.34
293771	O-035 E	3.45
294401	BSHIL;1U E	4.65
294410	BSHIL;2U E	4.65
909052	X2-022 E	14.61
917502	Z2-087 E	11.18
919621	AA2-039 C	1.13
919622	AA2-039 E	7.59
924041	AB2-047 C O1	2.09
924042	AB2-047 E O1	13.97
924261	AB2-070 C O1	2.0
924262	AB2-070 E O1	13.35
925243	AB2-178 BAT	1.37
925581	AC1-033 C	0.76
925582	AC1-033 E	5.1
925771	AC1-053 C	2.0
925772	AC1-053 E	13.41
926821	AC1-168 C O1	0.58
926822	AC1-168 E O1	3.91

Bus #	Bus	MW Impact
926841	AC1-171 C O1	0.64
926842	AC1-171 E O1	4.29
927201	AC1-214 C O1	1.11
927202	AC1-214 E O1	3.52
930042	AB1-006 E	11.72
930461	AB1-087	128.93
930471	AB1-088	128.93
932601	AC2-080 C O1	1.52
932602	AC2-080 E O1	10.17
933441	AC2-157 C	17.82
933442	AC2-157 E	29.07
934051	AD1-031 C O1	1.55
934052	AD1-031 E O1	2.52
935001	AD1-133 C O1	10.44
935002	AD1-133 E O1	6.96
935141	AD1-148	3.81
935271	AD1-137 C	5.11
935272	AD1-137 E	34.23
936771	AD2-100 C	10.6
936772	AD2-100 E	7.07
936971	AD2-131 C	0.7
936972	AD2-131 E	3.51
937041	AD2-138 C	2.06
937042	AD2-138 E	9.63
937211	AD2-159 C	2.54
937212	AD2-159 E	11.88
939401	AE1-172 C O1	2.58
939402	AE1-172 E O1	12.1
939741	AE1-205 C O1	5.4
939742	AE1-205 E O1	7.45
940101	AE1-252 C O1	5.18
940102	AE1-252 E O1	3.45
940581	AE2-045 C O1	6.9
940582	AE2-045 E O1	9.47
941341	AE2-130 C	229.33
941342	AE2-130 E	152.89
941571	AE2-154 C	2.19
941572	AE2-154 E	14.65
941731	AE2-173 O1	3.21
942111	AE2-223 C	1.25
942112	AE2-223 E	8.38
942481	AE2-261 C	14.84
942482	AE2-261 E	9.9
942601	AE2-276	11.72
944201	AF1-088 FTIR	234.42
944221	AF1-090 C O1	3.11
944222	AF1-090 E O1	14.54
945391	AF1-204 C O1	7.58
945392	AF1-204 E O1	22.73
945421	AF1-207 C O1	2.38
945422	AF1-207 E O1	10.15
945871	AF1-252 O1	5.5

Bus #	Bus	MW Impact
945881	AF1-253 O1	3.81
946541	AF1-318 C O1	3.09
946542	AF1-318 E O1	14.45
946581	AF1-322 C	5.66
946582	AF1-322 E	7.81
954681	J949 C	11.08
954761	J468 C	1.8
954762	J468 E	10.22
955131	J991	11.47
956821	J1180	10.62
990901	L-005 E	7.08
BLUEG	BLUEG	14.86
CALDERWOOD	CALDERWOOD	0.09
CATAWBA	CATAWBA	0.26
CBM-W1	CBM-W1	45.07
CBM-W2	CBM-W2	35.21
CHEOAH	CHEOAH	0.1
G-007	G-007	1.52
LGE-0012019	LGE-0012019	3.54
MADISON	MADISON	23.33
MEC	MEC	8.72
NY	NY	0.88
O-066	O-066	9.85
TRIMBLE	TRIMBLE	5.32
TVA	TVA	1.84
WEC	WEC	1.63

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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
86039	243222	05FALL C	AEP	923880	AB2-028 TAP	AEP	1	AEP_P7-1_#11042	tower	1160.0	97.86	101.04	DC	69.47

Bus #	Bus	MW Impact
247285	05AND G1	0.92
247286	05AND G2	0.92
247287	05AND G3	1.93
247900	05FR-11G E	6.26
247901	05FR-12G E	6.16
247902	05FR-21G E	6.58
247903	05FR-22G E	6.3
247904	05FR-3G E	12.76
247905	05FR-4G E	9.99
247906	05MDL-1G E	12.76
247907	05MDL-2G E	6.39
247912	05MDL-3G E	6.39
247913	05MDL-4G E	6.39
247943	T-127 E	6.39
920501	AA2-148 C OP	2.38
920502	AA2-148 E OP	15.92
930042	AB1-006 E	13.91
930461	AB1-087	38.21
930471	AB1-088	38.21
933441	AC2-157 C	5.28
933442	AC2-157 E	8.61
934161	AD1-043 C O1	3.2
934162	AD1-043 E O1	5.22
935271	AD1-137 C	5.2
935272	AD1-137 E	34.78
941571	AE2-154 C	2.6
941572	AE2-154 E	17.38
941692	AE2-169 BAT	1.99
941702	AE2-170 BAT	4.45
941711	AE2-171	2.1
941722	AE2-172 BAT	2.69
942601	AE2-276	3.47
942791	AE2-297 C O1	9.94
942792	AE2-297 E O1	6.63
944201	AF1-088 FTIR	36.82
945391	AF1-204 C O1	6.92
945392	AF1-204 E O1	20.77
946581	AF1-322 C	6.71
946582	AF1-322 E	9.27
950981	J333	12.35

Bus #	Bus	MW Impact
950991	J334	12.38
952801	J754 C	4.54
952802	J754 E	24.55
953351	J805	32.88
953761	J829	16.93
953831	J842 C	2.09
953832	J842 E	11.33
953841	J843 C	2.14
953842	J843 E	11.58
953931	J856	4.7
954351	J903	15.98
954772	J515 E	27.58
955151	J993	38.34
955371	J1016	3.18
955451	J1027	10.44
955461	J1028	9.85
955491	J1031 C	4.38
955492	J1031 E	23.72
955891	J1074	12.71
956561	J1152	37.35
956911	J1189	0.38
CBM-S1	CBM-S1	28.64
CBM-S2	CBM-S2	7.42
CBM-W1	CBM-W1	7.53
CBM-W2	CBM-W2	41.27
CPLE	CPLE	0.64
G-007	G-007	0.27
LGEE	LGEE	2.54
MADISON	MADISON	6.56
MEC	MEC	3.92
NY	NY	0.17
O-066	O-066	1.77
TVA	TVA	4.36
WEC	WEC	0.34

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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
466202	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1409.0	87.01	105.22	DC	255.62

Bus #	Bus	MW Impact
243442	05RKG1	47.09
243443	05RKG2	46.37
247900	05FR-11G E	4.19
247901	05FR-12G E	4.12
247902	05FR-21G E	4.41
247903	05FR-22G E	4.22
247904	05FR-3G E	8.55
247905	05FR-4G E	6.69
274882	W4-005 E	15.27
276153	W2-048 E	0.66
909052	X2-022 E	9.54
925771	AC1-053 C	1.3
925772	AC1-053 E	8.71
930461	AB1-087	140.59
930471	AB1-088	140.59
933441	AC2-157 C	19.43
933442	AC2-157 E	31.7
935141	AD1-148	2.49
935271	AD1-137 C	3.48
935272	AD1-137 E	23.29
936771	AD2-100 C	7.19
936772	AD2-100 E	4.79
936971	AD2-131 C	0.47
936972	AD2-131 E	2.38
937211	AD2-159 C	1.65
937212	AD2-159 E	7.73
941341	AE2-130 C	122.66
941342	AE2-130 E	81.78
942481	AE2-261 C	9.99
942482	AE2-261 E	6.66
942601	AE2-276	12.78
944201	AF1-088 FTIR	255.62
944221	AF1-090 C O1	2.15
944222	AF1-090 E O1	10.05
945391	AF1-204 C O1	4.72
945392	AF1-204 E O1	14.15
945871	AF1-252 O1	3.8
945881	AF1-253 O1	2.63
953401	J811	6.45
953651	J815	12.72

Bus #	Bus	MW Impact
953881	J848 C	2.04
953882	J848 E	11.06
954411	J912	5.48
954681	J949 C	11.74
954761	J468 C	1.93
954762	J468 E	10.91
955031	J979 C	1.64
955032	J979 E	8.85
955041	J980 C	1.64
955042	J980 E	8.85
955131	J991	13.59
956451	J1139	8.45
956821	J1180	13.61
BLUEG	BLUEG	9.34
CALDERWOOD	CALDERWOOD	0.47
CATAWBA	CATAWBA	0.28
CBM-W1	CBM-W1	24.33
CHEOAH	CHEOAH	0.47
G-007	G-007	0.86
GIBSON	GIBSON	6.46
MADISON	MADISON	12.66
MEC	MEC	4.84
NY	NY	0.47
O-066	O-066	5.55
TRIMBLE	TRIMBLE	2.89
WEC	WEC	0.89

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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
85434	247712	05SULLIVAN	AEP	243217	05DEQUIN	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1318.0	92.1	103.22	DC	146.6

Bus #	Bus	MW Impact
243442	05RKG1	27.01
243443	05RKG2	26.6
930461	AB1-087	80.63
930471	AB1-088	80.63
933441	AC2-157 C	11.14
933442	AC2-157 E	18.18
941341	AE2-130 C	70.36
941342	AE2-130 E	46.91
942601	AE2-276	7.33
944201	AF1-088 FTIR	146.6
956821	J1180	7.65
CBM-S1	CBM-S1	14.36
CBM-S2	CBM-S2	3.16
CBM-W2	CBM-W2	20.0
CPLE	CPLE	0.24
G-007	G-007	0.24
LGEE	LGEE	0.96
MADISON	MADISON	1.77
MEC	MEC	1.95
NY	NY	0.13
O-066	O-066	1.55
TVA	TVA	2.36

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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
3189508	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	122.17	132.23	DC	234.42

Bus #	Bus	MW Impact
243442	05RKG1	88.03
243443	05RKG2	86.7
247900	05FR-11G E	6.16
247901	05FR-12G E	6.06
247902	05FR-21G E	6.48
247903	05FR-22G E	6.2
247904	05FR-3G E	12.56
247905	05FR-4G E	9.84
247906	05MDL-1G E	10.76
247907	05MDL-2G E	5.39
247912	05MDL-3G E	5.39
247913	05MDL-4G E	5.39
247943	T-127 E	5.39
250163	Y3-099 BAT	0.14
250167	Y3-100 BAT	0.14
251823	Z1-065 BAT	0.36
274882	W4-005 E	23.48
274890	CAYUG;1U E	7.19
274891	CAYUG;2U E	7.19
276153	W2-048 E	1.01
290261	S-027 E	11.34
290265	S-028 E	11.34
293771	O-035 E	3.45
294401	BSHIL;1U E	4.65
294410	BSHIL;2U E	4.65
909052	X2-022 E	14.61
917502	Z2-087 E	11.18
919621	AA2-039 C	1.13
919622	AA2-039 E	7.59
924041	AB2-047 C O1	2.09
924042	AB2-047 E O1	13.97
924261	AB2-070 C O1	2.0
924262	AB2-070 E O1	13.35
925243	AB2-178 BAT	1.37
925581	AC1-033 C	0.76
925582	AC1-033 E	5.1
925771	AC1-053 C	2.0
925772	AC1-053 E	13.41
926821	AC1-168 C O1	0.58
926822	AC1-168 E O1	3.91

Bus #	Bus	MW Impact
926841	AC1-171 C O1	0.64
926842	AC1-171 E O1	4.29
927201	AC1-214 C O1	1.11
927202	AC1-214 E O1	3.52
930042	AB1-006 E	11.72
930461	AB1-087	128.93
930471	AB1-088	128.93
932601	AC2-080 C O1	1.52
932602	AC2-080 E O1	10.17
933441	AC2-157 C	17.82
933442	AC2-157 E	29.07
934051	AD1-031 C O1	1.55
934052	AD1-031 E O1	2.52
935001	AD1-133 C O1	10.44
935002	AD1-133 E O1	6.96
935141	AD1-148	3.81
935271	AD1-137 C	5.11
935272	AD1-137 E	34.23
936771	AD2-100 C	10.6
936772	AD2-100 E	7.07
936971	AD2-131 C	0.7
936972	AD2-131 E	3.51
937041	AD2-138 C	2.06
937042	AD2-138 E	9.63
937211	AD2-159 C	2.54
937212	AD2-159 E	11.88
939401	AE1-172 C O1	2.58
939402	AE1-172 E O1	12.1
939741	AE1-205 C O1	5.4
939742	AE1-205 E O1	7.45
940101	AE1-252 C O1	5.18
940102	AE1-252 E O1	3.45
940581	AE2-045 C O1	6.9
940582	AE2-045 E O1	9.47
941341	AE2-130 C	229.33
941342	AE2-130 E	152.89
941571	AE2-154 C	2.19
941572	AE2-154 E	14.65
941731	AE2-173 O1	3.21
942111	AE2-223 C	1.25
942112	AE2-223 E	8.38
942481	AE2-261 C	14.84
942482	AE2-261 E	9.9
942601	AE2-276	11.72
944201	AF1-088 FTIR	234.42
944221	AF1-090 C O1	3.11
944222	AF1-090 E O1	14.54
945391	AF1-204 C O1	7.58
945392	AF1-204 E O1	22.73
945421	AF1-207 C O1	2.38
945422	AF1-207 E O1	10.15
945871	AF1-252 O1	5.5

Bus #	Bus	MW Impact
945881	AF1-253 O1	3.81
946541	AF1-318 C O1	3.09
946542	AF1-318 E O1	14.45
946581	AF1-322 C	5.66
946582	AF1-322 E	7.81
954681	J949 C	11.08
954761	J468 C	1.8
954762	J468 E	10.22
955131	J991	11.47
956821	J1180	10.62
990901	L-005 E	7.08
BLUEG	BLUEG	14.86
CALDERWOOD	CALDERWOOD	0.09
CATAWBA	CATAWBA	0.26
CBM-W1	CBM-W1	45.07
CBM-W2	CBM-W2	35.21
CHEOAH	CHEOAH	0.1
G-007	G-007	1.52
LGE-0012019	LGE-0012019	3.54
MADISON	MADISON	23.33
MEC	MEC	8.72
NY	NY	0.88
O-066	O-066	9.85
TRIMBLE	TRIMBLE	5.32
TVA	TVA	1.84
WEC	WEC	1.63

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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
85358	243217	05DEQUIN	AEP	243878	05MEADOW	AEP	1	AEP_P4_#6485_05DEQUIN 345_C1	breaker	1959.0	107.45	114.29	DC	133.89

Bus #	Bus	MW Impact
243859	05FR-11G C	1.5
243862	05FR-12G C	1.48
243864	05FR-21G C	1.58
243866	05FR-22G C	1.51
243870	05FR-3G C	3.06
243873	05FR-4G C	2.37
247900	05FR-11G E	42.96
247901	05FR-12G E	42.25
247902	05FR-21G E	45.16
247903	05FR-22G E	43.24
247904	05FR-3G E	87.57
247905	05FR-4G E	68.59
930461	AB1-087	73.64
930471	AB1-088	73.64
933441	AC2-157 C	10.18
933442	AC2-157 E	16.6
935271	AD1-137 C	35.67
935272	AD1-137 E	238.69
942601	AE2-276	6.69
944201	AF1-088 FTIR	133.89
945391	AF1-204 C O1	15.31
945392	AF1-204 E O1	45.92
950981	J333	17.46
950991	J334	19.54
952801	J754 C	6.64
952802	J754 E	35.94
953761	J829	25.13
954681	J949 C	16.16
954761	J468 C	3.2
954762	J468 E	18.12
954772	J515 E	66.54
955391	J1021 C	2.18
955392	J1021 E	11.79
956451	J1139	16.04
956821	J1180	7.77
CBM-S1	CBM-S1	28.47
CBM-S2	CBM-S2	8.8
CBM-W2	CBM-W2	41.28
CPLE	CPLE	0.8
G-007A	G-007A	0.09

Bus #	Bus	MW Impact
LGEE	LGEE	2.01
MADISON	MADISON	1.48
MEC	MEC	2.9
NY	NY	0.0
TVA	TVA	4.62
VFT	VFT	0.23

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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
85363	243217	05DEQUIN	AEP	243878	05MEADOW	AEP	2	AEP_P4_#4704_05DEQUIN 345_B1	breaker	1959.0	106.7	113.49	DC	132.96

Bus #	Bus	MW Impact
243859	05FR-11G C	1.49
243862	05FR-12G C	1.47
243864	05FR-21G C	1.57
243866	05FR-22G C	1.5
243870	05FR-3G C	3.03
243873	05FR-4G C	2.35
247900	05FR-11G E	42.66
247901	05FR-12G E	41.96
247902	05FR-21G E	44.84
247903	05FR-22G E	42.94
247904	05FR-3G E	86.96
247905	05FR-4G E	68.11
930461	AB1-087	73.13
930471	AB1-088	73.13
933441	AC2-157 C	10.11
933442	AC2-157 E	16.49
935271	AD1-137 C	35.42
935272	AD1-137 E	237.02
942601	AE2-276	6.65
944201	AF1-088 FTIR	132.96
945391	AF1-204 C O1	15.2
945392	AF1-204 E O1	45.59
950981	J333	17.34
950991	J334	19.41
952801	J754 C	6.6
952802	J754 E	35.69
953761	J829	24.95
954681	J949 C	16.05
954761	J468 C	3.18
954762	J468 E	17.99
954772	J515 E	66.08
955391	J1021 C	2.16
955392	J1021 E	11.7
956451	J1139	15.93
956821	J1180	7.71
CBM-S1	CBM-S1	28.27
CBM-S2	CBM-S2	8.75
CBM-W2	CBM-W2	40.99
CPLE	CPLE	0.8
G-007A	G-007A	0.09

Bus #	Bus	MW Impact
LGEE	LGEE	2.0
MADISON	MADISON	1.47
MEC	MEC	2.88
NY	NY	0.0
TVA	TVA	4.59
VFT	VFT	0.23

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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
2243524	248000	06CLIFTY	OVEC	248001	06DEARB1	OVEC	1	AEP_P4_#1760_05JEFRSO 765_A	breaker	1023.0	100.18	103.34	DC	60.99

Bus #	Bus	MW Impact
930461	AB1-087	33.54
930471	AB1-088	33.54
933441	AC2-157 C	4.64
933442	AC2-157 E	7.56
941341	AE2-130 C	56.45
941342	AE2-130 E	37.64
942601	AE2-276	3.05
944201	AF1-088 FTIR	32.32
944211	AF1-089 C O1	3.24
944212	AF1-089 E O1	0.99
CBM-S1	CBM-S1	28.21
CBM-S2	CBM-S2	4.83
CBM-W1	CBM-W1	13.04
CBM-W2	CBM-W2	19.46
CPLE	CPLE	0.39
G-007	G-007	0.26
LGEE	LGEE	4.67
MADISON	MADISON	14.15
MEC	MEC	2.73
NY	NY	0.09
O-066	O-066	1.72
TVA	TVA	3.08
WEC	WEC	0.34

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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
963320	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	133.49	137.25	DC	57.52

Bus #	Bus	MW Impact
274650	KINCAID ;1U	15.84
274651	KINCAID ;2U	15.84
274853	TWINGROVE;U1	2.1
274854	TWINGROVE;U2	2.1
274863	CAYUGA RI;1U	2.51
274864	CAYUGA RI;2U	2.51
274880	GENERATOR;	1.92
917501	Z2-087 C	1.77
924041	AB2-047 C O1	15.82
924261	AB2-070 C O1	7.49
925771	AC1-053 C	7.35
926841	AC1-171 C O1	0.61
930461	AB1-087	31.64
930471	AB1-088	31.64
933441	AC2-157 C	4.37
935001	AD1-133 C O1	87.87
935141	AD1-148	13.3
936771	AD2-100 C	24.58
936971	AD2-131 C	1.62
937211	AD2-159 C	9.95
939741	AE1-205 C O1	40.9
941731	AE2-173 O1	24.34
942111	AE2-223 C	9.49
942481	AE2-261 C	36.18
942601	AE2-276	2.88
944201	AF1-088 FTIR	57.52
944221	AF1-090 C O1	6.19
945391	AF1-204 C O1	5.12
945871	AF1-252 O1	10.97
945881	AF1-253 O1	7.59
951741	J474 C	5.25
952251	J641	13.56
952271	J644	13.64
952651	J756 C	4.54
952871	J757 C	5.83
953401	J811	10.7
953651	J815	37.53
953741	J826 C	3.11
953851	J845 C	3.02

Bus #	Bus	MW Impact
953881	J848 C	5.75
954181	J884	26.09
954411	J912	14.18
954681	J949 C	15.16
954721	J750 C	3.69
954761	J468 C	3.01
954821	J955	178.7
955031	J979 C	4.6
955041	J980 C	4.6
955171	J995	12.4
955391	J1021 C	6.03
955401	J1022 C	4.66
955711	J1055 C	2.17
956151	J1102	11.42
956281	J1115 C	7.73
956451	J1139	17.58
CBM-S1	CBM-S1	30.63
CBM-S2	CBM-S2	12.14
CBM-W2	CBM-W2	47.18
CPLE	CPLE	1.2
G-007A	G-007A	1.91
LGEE	LGEE	1.51
MADISON	MADISON	2.87
MEC	MEC	3.38
TVA	TVA	5.34
VFT	VFT	5.13

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
963346	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	129.98	133.77	DC	57.85

Bus #	Bus	MW Impact
274650	KINCAID ;1U	15.87
274651	KINCAID ;2U	15.86
274853	TWINGROVE;U1	2.1
274854	TWINGROVE;U2	2.1
274880	GENERATOR;	1.92
917501	Z2-087 C	1.77
924041	AB2-047 C O1	15.84
924261	AB2-070 C O1	7.5
925771	AC1-053 C	7.36
926841	AC1-171 C O1	0.62
930461	AB1-087	31.82
930471	AB1-088	31.82
933441	AC2-157 C	4.4
935001	AD1-133 C O1	87.93
935141	AD1-148	13.32
936771	AD2-100 C	24.62
936971	AD2-131 C	1.62
937211	AD2-159 C	9.96
939741	AE1-205 C O1	40.93
941731	AE2-173 O1	24.36
942111	AE2-223 C	9.5
942481	AE2-261 C	36.24
942601	AE2-276	2.89
944201	AF1-088 FTIR	57.85
944221	AF1-090 C O1	6.2
945391	AF1-204 C O1	5.15
945871	AF1-252 O1	10.99
945881	AF1-253 O1	7.61
951741	J474 C	5.25
952251	J641	13.56
952271	J644	13.64
952651	J756 C	4.54
952871	J757 C	5.83
953401	J811	10.7
953651	J815	37.53
953741	J826 C	3.11
953851	J845 C	3.02
953881	J848 C	5.75
954181	J884	26.09

Bus #	Bus	MW Impact
954411	J912	14.18
954681	J949 C	15.16
954721	J750 C	3.69
954761	J468 C	3.01
954821	J955	178.7
955031	J979 C	4.6
955041	J980 C	4.6
955171	J995	12.4
955391	J1021 C	6.03
955401	J1022 C	4.66
955711	J1055 C	2.17
956151	J1102	11.42
956281	J1115 C	7.73
956451	J1139	17.58
CBM-S1	CBM-S1	30.9
CBM-S2	CBM-S2	12.32
CBM-W2	CBM-W2	47.44
CPLE	CPLE	1.22
G-007A	G-007A	1.99
LGEE	LGEE	1.53
MADISON	MADISON	2.87
MEC	MEC	3.43
TVA	TVA	5.38
VFT	VFT	5.34

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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
963356	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-B	single	1528.0	122.35	125.83	DC	53.08

Bus #	Bus	MW Impact
274650	KINCAID ;1U	14.16
274651	KINCAID ;2U	14.16
274853	TWINGROVE;U1	1.92
274854	TWINGROVE;U2	1.92
274863	CAYUGA RI;1U	1.88
274864	CAYUGA RI;2U	1.88
274880	GENERATOR;	1.74
917501	Z2-087 C	1.63
924041	AB2-047 C O1	14.58
924261	AB2-070 C O1	6.8
925771	AC1-053 C	6.67
930461	AB1-087	29.19
930471	AB1-088	29.19
933441	AC2-157 C	4.03
935141	AD1-148	12.05
936771	AD2-100 C	21.97
936971	AD2-131 C	1.45
937211	AD2-159 C	9.04
939401	AE1-172 C O1	20.12
939741	AE1-205 C O1	37.68
940101	AE1-252 C O1	40.41
941731	AE2-173 O1	22.43
942111	AE2-223 C	8.75
942481	AE2-261 C	32.35
942601	AE2-276	2.65
944201	AF1-088 FTIR	53.08
944221	AF1-090 C O1	5.52
945391	AF1-204 C O1	4.74
945871	AF1-252 O1	9.79
945881	AF1-253 O1	6.78
951741	J474 C	4.88
952271	J644	12.23
952651	J756 C	4.05
952871	J757 C	5.22
953401	J811	10.1
953651	J815	34.8
953741	J826 C	2.91
953851	J845 C	2.86
953881	J848 C	5.36

Bus #	Bus	MW Impact
954181	J884	24.26
954411	J912	13.22
954681	J949 C	14.74
954721	J750 C	3.35
954761	J468 C	2.91
954821	J955	164.83
955031	J979 C	4.28
955041	J980 C	4.28
955171	J995	11.12
955391	J1021 C	5.66
955401	J1022 C	4.37
956151	J1102	10.31
956281	J1115 C	7.19
956451	J1139	16.91
CBM-S1	CBM-S1	27.18
CBM-S2	CBM-S2	11.33
CBM-W2	CBM-W2	40.61
CPLE	CPLE	1.15
G-007A	G-007A	2.17
LGEE	LGEE	1.44
MEC	MEC	1.06
TVA	TVA	4.68
VFT	VFT	5.84

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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
3189837	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	117.7	122.09	DC	63.71

Bus #	Bus	MW Impact
243442	05RKG1	11.73
243443	05RKG2	11.55
342900	1COOPER1 G	1.96
342903	1COOPER2 G	3.8
342918	1JKCT 1G	1.53
342921	1JKCT 2G	1.13
342924	1JKCT 3G	1.53
342927	1JKCT 4G	1.01
342930	1JKCT 5G	1.01
342933	1JKCT 6G	1.01
342936	1JKCT 7G	1.01
342939	1JKCT 9G	1.04
342942	1JKCT 10G	1.04
342945	1LAUREL 1G	1.1
925981	AC1-074 C O1	3.98
930461	AB1-087	35.04
930471	AB1-088	35.04
932551	AC2-075 C	0.95
933441	AC2-157 C	4.84
936381	AD2-048 C	3.43
936571	AD2-072 C O1	10.11
936821	AD2-105 C O1	2.94
936831	AD2-106 C O1	1.77
936841	AD2-107 C O1	1.18
939131	AE1-143 C	9.57
940041	AE1-246 C O1	11.95
940051	AE1-247 C O1	20.29
940831	AE2-071 C	3.03
941341	AE2-130 C	30.55
941411	AE2-138 C	15.13
941961	AE2-208	1.27
941981	AE2-210 C O1	5.21
942411	AE2-254 C O1	4.03
942591	AE2-275 C O1	6.81
942601	AE2-276	3.19
942891	AE2-308 C O1	11.5
943111	AE2-339 C	2.56
943701	AF1-038 C	4.66
943821	AF1-050 C	5.41
944151	AF1-083 C O1	4.98

Bus #	Bus	MW Impact
944201	AF1-088 FTIR	63.71
944211	AF1-089 C O1	11.27
944511	AF1-116 C	10.73
944621	AF1-127 C O1	4.43
944981	AF1-163 C O1	11.22
945381	AF1-203 C	1.73
945541	AF1-219 C O1	4.91
945861	AF1-251 C	10.71
946021	AF1-267 C O1	3.8
952811	J759	9.74
952821	J762	30.02
952861	J783 C	9.33
953611	J800	14.13
953831	J842 C	3.05
953841	J843 C	3.31
953931	J856	9.45
955371	J1016	5.77
955451	J1027	13.79
955461	J1028	15.27
955891	J1074	23.08
956911	J1189	0.45
CBM-S1	CBM-S1	97.43
CBM-S2	CBM-S2	14.7
CBM-W1	CBM-W1	19.45
CBM-W2	CBM-W2	55.71
CPLE	CPLE	1.19
LGEE	LGEE	18.14
MADISON	MADISON	12.37
MEC	MEC	6.08
NY	NY	0.29
TVA	TVA	9.5
WEC	WEC	0.66

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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
963440	348847	7BROKAW	AMIL	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1793.0	104.53	107.77	DC	58.07

Bus #	Bus	MW Impact
274650	KINCAID ;1U	14.71
274651	KINCAID ;2U	14.69
274853	TWINGROVE;U1	1.22
274854	TWINGROVE;U2	1.22
274880	GENERATOR;	1.4
924261	AB2-070 C O1	8.79
925771	AC1-053 C	8.55
926841	AC1-171 C O1	0.58
930461	AB1-087	31.94
930471	AB1-088	31.94
933441	AC2-157 C	4.41
935141	AD1-148	15.12
936771	AD2-100 C	22.89
936971	AD2-131 C	1.51
937211	AD2-159 C	7.28
942481	AE2-261 C	33.63
942601	AE2-276	2.9
944201	AF1-088 FTIR	58.07
944221	AF1-090 C O1	5.79
945391	AF1-204 C O1	5.3
945871	AF1-252 O1	10.27
945881	AF1-253 O1	7.11
951741	J474 C	5.83
952251	J641	12.46
952271	J644	12.7
952651	J756 C	4.08
952871	J757 C	5.39
953401	J811	10.37
953641	J813	18.54
953651	J815	35.61
953741	J826 C	3.64
953851	J845 C	3.54
953881	J848 C	5.47
954181	J884	32.09
954411	J912	13.54
954681	J949 C	15.59
954721	J750 C	3.52
954761	J468 C	3.15
954821	J955	167.43

Bus #	Bus	MW Impact
955031	J979 C	4.38
955041	J980 C	4.38
955171	J995	11.54
955391	J1021 C	6.31
955401	J1022 C	5.46
955711	J1055 C	2.05
956151	J1102	10.25
956281	J1115 C	6.88
956451	J1139	18.84
CBM-S1	CBM-S1	29.87
CBM-S2	CBM-S2	12.28
CBM-W2	CBM-W2	45.56
CPLE	CPLE	1.24
G-007A	G-007A	2.23
LGEE	LGEE	1.56
MADISON	MADISON	1.41
MEC	MEC	2.24
TVA	TVA	5.15
VFT	VFT	6.0

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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
963388	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L8002___-S	single	1793.0	110.95	114.18	DC	57.93

Bus #	Bus	MW Impact
274650	KINCAID ;1U	14.7
274651	KINCAID ;2U	14.68
274853	TWINGROVE;U1	1.22
274854	TWINGROVE;U2	1.22
274880	GENERATOR;	1.4
917501	Z2-087 C	2.48
924041	AB2-047 C O1	22.25
924261	AB2-070 C O1	8.79
925771	AC1-053 C	8.54
926841	AC1-171 C O1	0.58
930461	AB1-087	31.86
930471	AB1-088	31.86
933441	AC2-157 C	4.4
935141	AD1-148	15.12
936771	AD2-100 C	22.87
936971	AD2-131 C	1.51
937211	AD2-159 C	7.27
939741	AE1-205 C O1	57.5
941731	AE2-173 O1	34.23
942111	AE2-223 C	13.35
942481	AE2-261 C	33.6
942601	AE2-276	2.9
944201	AF1-088 FTIR	57.93
944221	AF1-090 C O1	5.79
945391	AF1-204 C O1	5.29
945871	AF1-252 O1	10.26
945881	AF1-253 O1	7.1
951741	J474 C	5.83
952271	J644	12.7
952651	J756 C	4.08
952871	J757 C	5.39
953401	J811	10.37
953651	J815	35.61
953741	J826 C	3.64
953851	J845 C	3.54
953881	J848 C	5.47
954181	J884	32.09
954411	J912	13.54
954681	J949 C	15.59

Bus #	Bus	MW Impact
954721	J750 C	3.52
954761	J468 C	3.15
954821	J955	167.43
955031	J979 C	4.38
955041	J980 C	4.38
955171	J995	11.54
955391	J1021 C	6.31
955401	J1022 C	5.46
955711	J1055 C	2.05
956151	J1102	10.25
956281	J1115 C	6.88
956451	J1139	18.84
CBM-S1	CBM-S1	29.75
CBM-S2	CBM-S2	12.2
CBM-W2	CBM-W2	45.45
CPLE	CPLE	1.23
G-007A	G-007A	2.2
LGEE	LGEE	1.55
MADISON	MADISON	1.41
MEC	MEC	2.21
TVA	TVA	5.14
VFT	VFT	5.91

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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
85971	923880	AB2-028 TAP	AEP	243218	05DESOTO	AEP	1	AEP_P7-1_#11042	tower	1160.0	106.4	109.58	DC	69.47

Bus #	Bus	MW Impact
247285	05AND G1	0.92
247286	05AND G2	0.92
247287	05AND G3	1.93
247900	05FR-11G E	6.26
247901	05FR-12G E	6.16
247902	05FR-21G E	6.58
247903	05FR-22G E	6.3
247904	05FR-3G E	12.76
247905	05FR-4G E	9.99
247906	05MDL-1G E	12.76
247907	05MDL-2G E	6.39
247912	05MDL-3G E	6.39
247913	05MDL-4G E	6.39
247943	T-127 E	6.39
920501	AA2-148 C OP	2.38
920502	AA2-148 E OP	15.92
923881	AB2-028 C	12.94
923882	AB2-028 E	86.61
930042	AB1-006 E	13.91
930461	AB1-087	38.21
930471	AB1-088	38.21
933441	AC2-157 C	5.28
933442	AC2-157 E	8.61
934161	AD1-043 C O1	3.2
934162	AD1-043 E O1	5.22
935271	AD1-137 C	5.2
935272	AD1-137 E	34.78
941571	AE2-154 C	2.6
941572	AE2-154 E	17.38
941692	AE2-169 BAT	1.99
941702	AE2-170 BAT	4.45
941711	AE2-171	2.1
941722	AE2-172 BAT	2.69
942601	AE2-276	3.47
942791	AE2-297 C O1	9.94
942792	AE2-297 E O1	6.63
944201	AF1-088 FTIR	36.82
945391	AF1-204 C O1	6.92
945392	AF1-204 E O1	20.77
946581	AF1-322 C	6.71

Bus #	Bus	MW Impact
946582	AF1-322 E	9.27
950981	J333	12.35
950991	J334	12.38
952801	J754 C	4.54
952802	J754 E	24.55
953351	J805	32.88
953761	J829	16.93
953831	J842 C	2.09
953832	J842 E	11.33
953841	J843 C	2.14
953842	J843 E	11.58
953931	J856	4.7
954351	J903	15.98
954772	J515 E	27.58
955151	J993	38.34
955371	J1016	3.18
955451	J1027	10.44
955461	J1028	9.85
955491	J1031 C	4.38
955492	J1031 E	23.72
955891	J1074	12.71
956561	J1152	37.35
956911	J1189	0.38
CBM-S1	CBM-S1	28.64
CBM-S2	CBM-S2	7.42
CBM-W1	CBM-W1	7.53
CBM-W2	CBM-W2	41.27
CPLE	CPLE	0.64
G-007	G-007	0.27
LGEE	LGEE	2.54
MADISON	MADISON	6.56
MEC	MEC	3.92
NY	NY	0.17
O-066	O-066	1.77
TVA	TVA	4.36
WEC	WEC	0.34

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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
963336	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-B	single	1528.0	128.97	132.44	DC	53.08

Bus #	Bus	MW Impact
274650	KINCAID ;1U	14.16
274651	KINCAID ;2U	14.16
274853	TWINGROVE;U1	1.92
274854	TWINGROVE;U2	1.92
274863	CAYUGA RI;1U	1.88
274864	CAYUGA RI;2U	1.88
274880	GENERATOR;	1.74
917501	Z2-087 C	1.63
924041	AB2-047 C O1	14.58
924261	AB2-070 C O1	6.8
925771	AC1-053 C	6.67
930461	AB1-087	29.19
930471	AB1-088	29.19
933441	AC2-157 C	4.03
935001	AD1-133 C O1	118.68
935141	AD1-148	12.05
936771	AD2-100 C	21.97
936971	AD2-131 C	1.45
937211	AD2-159 C	9.04
939401	AE1-172 C O1	20.12
939741	AE1-205 C O1	37.68
940101	AE1-252 C O1	40.41
941731	AE2-173 O1	22.43
942111	AE2-223 C	8.75
942481	AE2-261 C	32.35
942601	AE2-276	2.65
944201	AF1-088 FTIR	53.08
944221	AF1-090 C O1	5.52
945391	AF1-204 C O1	4.74
945871	AF1-252 O1	9.79
945881	AF1-253 O1	6.78
951741	J474 C	4.88
952271	J644	12.23
952651	J756 C	4.05
952871	J757 C	5.22
953401	J811	10.1
953651	J815	34.8
953741	J826 C	2.91
953851	J845 C	2.86

Bus #	Bus	MW Impact
953881	J848 C	5.36
954181	J884	24.26
954411	J912	13.22
954721	J750 C	3.35
954761	J468 C	2.91
954821	J955	164.83
955031	J979 C	4.28
955041	J980 C	4.28
955171	J995	11.12
955391	J1021 C	5.66
955401	J1022 C	4.37
956151	J1102	10.31
956281	J1115 C	7.19
956451	J1139	16.91
CBM-S1	CBM-S1	27.18
CBM-S2	CBM-S2	11.33
CBM-W2	CBM-W2	40.61
CPLE	CPLE	1.15
G-007A	G-007A	2.17
LGEE	LGEE	1.44
MEC	MEC	1.06
TVA	TVA	4.68
VFT	VFT	5.84

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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
963309	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	138.26	142.03	DC	57.52

Bus #	Bus	MW Impact
274650	KINCAID ;1U	15.84
274651	KINCAID ;2U	15.84
274853	TWINGROVE;U1	2.1
274854	TWINGROVE;U2	2.1
274863	CAYUGA RI;1U	2.51
274864	CAYUGA RI;2U	2.51
274880	GENERATOR;	1.92
917501	Z2-087 C	1.77
924041	AB2-047 C O1	15.82
924261	AB2-070 C O1	7.49
925771	AC1-053 C	7.35
926841	AC1-171 C O1	0.61
930461	AB1-087	31.64
930471	AB1-088	31.64
933441	AC2-157 C	4.37
935001	AD1-133 C O1	87.87
935141	AD1-148	13.3
936771	AD2-100 C	24.58
936971	AD2-131 C	1.62
937211	AD2-159 C	9.95
939401	AE1-172 C O1	29.65
939741	AE1-205 C O1	40.9
940101	AE1-252 C O1	59.57
941731	AE2-173 O1	24.34
942111	AE2-223 C	9.49
942481	AE2-261 C	36.18
942601	AE2-276	2.88
944201	AF1-088 FTIR	57.52
944221	AF1-090 C O1	6.19
945391	AF1-204 C O1	5.12
945871	AF1-252 O1	10.97
945881	AF1-253 O1	7.59
951741	J474 C	5.25
952251	J641	13.56
952271	J644	13.64
952651	J756 C	4.54
952871	J757 C	5.83
953401	J811	10.7
953651	J815	37.53

Bus #	Bus	MW Impact
953741	J826 C	3.11
953851	J845 C	3.02
953881	J848 C	5.75
954181	J884	26.09
954411	J912	14.18
954721	J750 C	3.69
954761	J468 C	3.01
954821	J955	178.7
955031	J979 C	4.6
955041	J980 C	4.6
955171	J995	12.4
955391	J1021 C	6.03
955401	J1022 C	4.66
955711	J1055 C	2.17
956151	J1102	11.42
956281	J1115 C	7.73
956451	J1139	17.58
CBM-S1	CBM-S1	30.63
CBM-S2	CBM-S2	12.14
CBM-W2	CBM-W2	47.18
CPLE	CPLE	1.2
G-007A	G-007A	1.91
LGEE	LGEE	1.51
MADISON	MADISON	2.87
MEC	MEC	3.38
TVA	TVA	5.34
VFT	VFT	5.13

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
465940	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGENE 345_A2	breaker	1466.0	169.23	188.37	DC	280.11

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.29
274651	KINCAID ;2U	13.29
274830	U3-021 1	3.18
274831	U3-021 2	3.18
274853	TWINGROVE;U1	0.71
274854	TWINGROVE;U2	0.71
274859	EASYR;U1 E	6.86
274860	EASYR;U2 E	6.86
274880	GENERATOR;	0.94
274882	W4-005 E	45.23
274890	CAYUG;1U E	10.37
274891	CAYUG;2U E	10.37
276153	W2-048 E	1.97
276160	W4-084	0.27
276161	W4-086	0.11
276170	Z1-108 E	1.18
290021	O50 E	10.97
290051	GSG-6; E	5.64
290108	LEEDK;1U E	12.45
290261	S-027 E	20.37
290265	S-028 E	20.37
293516	O-009 E1	6.37
293517	O-009 E2	3.24
293518	O-009 E3	3.57
293644	O22 E1	4.99
293645	O22 E2	9.68
293715	O-029 E	6.81
293716	O-029 E	3.74
293717	O-029 E	3.43
293771	O-035 E	5.13
294401	BSHIL;1U E	6.97
294410	BSHIL;2U E	6.97
294763	P-046 E	5.44
909052	X2-022 E	28.45
914321	Y2-103	21.03
915011	Y3-013 1	1.75
915021	Y3-013 2	1.75
915031	Y3-013 3	1.75
917501	Z2-087 C	0.37
917502	Z2-087 E	17.73

Bus #	Bus	MW Impact
918052	AA1-018 E OP	8.06
919581	AA2-030	11.72
919621	AA2-039 C	1.7
919622	AA2-039 E	11.38
920272	AA2-123 E	1.23
924041	AB2-047 C O1	3.31
924042	AB2-047 E O1	22.16
924261	AB2-070 C O1	3.82
924262	AB2-070 E O1	25.59
924471	AB2-096	22.09
925161	AB2-173	2.09
925581	AC1-033 C	1.14
925582	AC1-033 E	7.64
925771	AC1-053 C	3.86
925772	AC1-053 E	25.83
926431	AC1-114	1.31
926821	AC1-168 C O1	0.83
926822	AC1-168 E O1	5.55
926841	AC1-171 C O1	1.04
926842	AC1-171 E O1	6.95
927201	AC1-214 C O1	1.65
927202	AC1-214 E O1	5.23
927511	AC1-113 1	0.66
927521	AC1-113 2	0.66
930481	AB1-089	35.7
930741	AB1-122 1O1	35.6
932881	AC2-115 1	1.31
932891	AC2-115 2	1.31
932921	AC2-116	0.46
933341	AC2-147 C	0.54
933342	AC2-147 E	0.88
933911	AD1-013 C	0.98
933912	AD1-013 E	1.57
933931	AD1-016 C	0.47
933932	AD1-016 E	0.76
934051	AD1-031 C O1	2.32
934052	AD1-031 E O1	3.78
934101	AD1-039 1	3.49
934431	AD1-067 C	0.07
934432	AD1-067 E	0.3
934651	AD1-096 C	0.52
934652	AD1-096 E	0.84
934701	AD1-098 C O1	3.75
934702	AD1-098 E O1	2.74
934871	AD1-116 C	0.47
934872	AD1-116 E	0.77
934971	AD1-129 C	0.48
934972	AD1-129 E	0.32
935001	AD1-133 C O1	14.42
935002	AD1-133 E O1	9.61
935141	AD1-148	7.42
936291	AD2-038 C O1	1.37

Bus #	Bus	MW Impact
936292	AD2-038 E O1	9.15
936511	AD2-066 C O1	4.78
936512	AD2-066 E O1	3.19
936771	AD2-100 C	22.47
936772	AD2-100 E	14.98
936791	AD2-102 C	8.0
936792	AD2-102 E	5.33
936971	AD2-131 C	1.48
936972	AD2-131 E	7.44
937001	AD2-134 C	1.47
937002	AD2-134 E	6.09
937211	AD2-159 C	4.89
937212	AD2-159 E	22.88
937311	AD2-172 C	1.43
937312	AD2-172 E	1.97
937531	AD2-214 C	3.25
937532	AD2-214 E	2.17
938851	AE1-113 C	4.52
938852	AE1-113 E	16.04
938861	AE1-114 C O1	2.38
938862	AE1-114 E O1	8.14
939051	AE1-134 1	0.91
939061	AE1-134 2	0.91
939321	AE1-163 C O1	3.43
939322	AE1-163 E O1	21.1
939401	AE1-172 C O1	3.49
939402	AE1-172 E O1	16.36
939732	AE1-204 E	0.25
939741	AE1-205 C O1	8.56
939742	AE1-205 E O1	11.82
940101	AE1-252 C O1	7.0
940102	AE1-252 E O1	4.67
940501	AE2-035 C	1.43
940502	AE2-035 E	1.97
941131	AE2-107 C	3.71
941132	AE2-107 E	2.47
941343	AE2-130 BAT	31.79
941731	AE2-173 O1	5.09
942111	AE2-223 C	1.99
942112	AE2-223 E	13.29
942421	AE2-255 C O1	1.71
942422	AE2-255 E O1	5.14
942481	AE2-261 C	31.07
942482	AE2-261 E	20.71
942602	AE2-276 BAT	14.01
942651	AE2-281 C O1	0.49
942652	AE2-281 E O1	3.01
942991	AE2-321 C	4.14
942992	AE2-321 E	2.04
943381	AF1-009 C	0.32
943382	AF1-009 E	1.3
943391	AF1-010 C	1.4

Bus #	Bus	MW Impact
943392	AF1-010 E	0.93
943401	AF1-011 C	0.87
943402	AF1-011 E	1.46
943411	AF1-012 C	7.54
943412	AF1-012 E	5.03
943422	AF1-013 E	1.62
943801	AF1-048 C	1.94
943802	AF1-048 E	1.29
943921	AF1-060	0.82
944041	AF1-072	1.0
944202	AF1-088 FTWR	280.11
944221	AF1-090 C O1	6.81
944222	AF1-090 E O1	31.9
945871	AF1-252 O1	12.08
945881	AF1-253 O1	8.36
946151	AF1-280 C O1	9.92
946152	AF1-280 E O1	4.56
946161	AF1-281 C	0.22
946162	AF1-281 E	1.23
946321	AF1-296 C O1	3.08
946322	AF1-296 E O1	14.42
946501	AF1-314 C	2.68
946502	AF1-314 E	12.55
946531	AF1-317 C O1	1.44
946541	AF1-318 C O1	4.54
946542	AF1-318 E O1	21.25
946661	AF1-330 C	1.01
946662	AF1-330 E	0.22
946671	AF1-331	1.27
946681	AF1-332 C	1.44
946682	AF1-332 E	2.15
951741	J474 C	1.9
951742	J474 E	10.29
952251	J641	9.98
952271	J644	9.24
952651	J756 C	2.2
952652	J756 E	11.92
952871	J757 C	3.93
952872	J757 E	21.27
953371	J808	8.81
953401	J811	17.75
953431	J853	10.81
953641	J813	39.52
953651	J815	31.48
953671	J817	10.38
953741	J826 C	1.61
953742	J826 E	8.73
953851	J845 C	1.68
953852	J845 E	9.1
953881	J848 C	5.15
953882	J848 E	27.86
953951	J859	9.4

Bus #	Bus	MW Impact
954181	J884	7.39
954411	J912	14.04
954681	J949 C	32.78
954721	J750 C	2.04
954722	J750 E	11.02
954761	J468 C	5.21
954762	J468 E	29.52
954821	J955	107.65
954831	J956	13.03
955001	J976	22.79
955031	J979 C	4.12
955032	J979 E	22.29
955041	J980 C	4.12
955042	J980 E	22.29
955101	J987	7.09
955131	J991	40.71
955161	J994	6.47
955171	J995	8.4
955391	J1021 C	3.52
955392	J1021 E	19.06
955401	J1022 C	2.42
955402	J1022 E	13.1
955441	J1026 C	3.84
955442	J1026 E	20.75
955551	J1039	3.8
956071	J1094	13.52
956091	J1096	11.09
956151	J1102	5.24
956241	J1111	10.71
956281	J1115 C	2.8
956282	J1115 E	15.16
956341	J1123 C	1.52
956342	J1123 E	8.25
956451	J1139	21.98
956501	J1145	16.1
956821	J1180	36.48
990901	L-005 E	10.81
BLUEG	BLUEG	2.7
CBM-S1	CBM-S1	36.99
CBM-S2	CBM-S2	8.65
CBM-W1	CBM-W1	61.44
CBM-W2	CBM-W2	71.5
CPLE	CPLE	0.6
G-007	G-007	0.78
MADISON	MADISON	25.33
MEC	MEC	15.77
NY	NY	0.45
O-066	O-066	5.09
TRIMBLE	TRIMBLE	1.0
TVA	TVA	7.8
WEC	WEC	2.02

Affected Systems

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 Descriptions

Contingency Name	Contingency Definition
AEP_P1-2_#8904	CONTINGENCY 'AEP_P1-2_#8904' OPEN BRANCH FROM BUS 243216 TO BUS 247712 CKT 1 / 243216 05DARWIN 345 247712 05SULLIVAN 345 1 END
AEP_P1-2_#8905	CONTINGENCY 'AEP_P1-2_#8905' OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
AEP_P1-2_#286	CONTINGENCY 'AEP_P1-2_#286' OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
AEP_P4_#8648_05JEFRSO 765_B	CONTINGENCY 'AEP_P4_#8648_05JEFRSO 765_B' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243208 TO BUS 242865 CKT 2 / 243208 05JEFRSO 765 242865 05JEFRSO 345 2 OPEN BRANCH FROM BUS 242865 TO BUS 248000 CKT Z1 / 242865 05JEFRSO 345 248000 06CLIFTY 345 Z1 END
COMED_P1-2_345-L8002___-S	CONTINGENCY 'COMED_P1-2_345-L8002___-S' TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345 END
AEP_P1-2_#6490	CONTINGENCY 'AEP_P1-2_#6490' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2 END
AEP_P4_#3128_05EUGENE 345_A2	CONTINGENCY 'AEP_P4_#3128_05EUGENE 345_A2' OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
AEP_P4_#8906_05SULLIVAN 345_C	CONTINGENCY 'AEP_P4_#8906_05SULLIVAN 345_C' OPEN BRANCH FROM BUS 243216 TO BUS 247712 CKT 1 / 243216 05DARWIN 345 247712 05SULLIVAN 345 1 OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
COMED_P1-2_345-L8014___-S-A	

	CONTINGENCY 'COMED_P1-2_345-L8014___-S-A' TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1 / PONTIAC ; R 345 AD1-133 TAP 345 END
COMED_P1-2_345-L8014___-S-B	CONTINGENCY 'COMED_P1-2_345-L8014___-S-B' TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1 / AD1-133 TAP 345 DRESDEN ; R 345 END
AEP_P1-2_#6472	CONTINGENCY 'AEP_P1-2_#6472' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217 05DEQUIN 345 243878 05MEADOW 345 1 END
AEP_P1-2_#8695	CONTINGENCY 'AEP_P1-2_#8695' OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1 / 243878 05MEADOW 345 255205 17REYNOLDS 345 1 END
AEP_P4_#1760_05JEFRSO 765_A	CONTINGENCY 'AEP_P4_#1760_05JEFRSO 765_A' OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P7-1_#11042	CONTINGENCY 'AEP_P7-1_#11042' OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1 / 243878 05MEADOW 345 255205 17REYNOLDS 345 1 OPEN BRANCH FROM BUS 243878 TO BUS 945420 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2 END
AEP_P7-1_#11041	CONTINGENCY 'AEP_P7-1_#11041' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217 05DEQUIN 345 243878 05MEADOW 345 1 OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2 END
COMED_P1-2_345-L11212_B-S-C	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-C' TRIP BRANCH FROM BUS 939400 TO BUS 270704 CKT 1 / AE1-172 TAP 345 LORET; B 345 END
COMED_P1-2_345-L11212_B-S-B	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-B' TRIP BRANCH FROM BUS 934720 TO BUS 939400 CKT 1 / AD1-100 TAP 345 AE1-172 TAP 345 END
AEP_P4_#6485_05DEQUIN 345_C1	CONTINGENCY 'AEP_P4_#6485_05DEQUIN 345_C1' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2 OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1 / 243217 05DEQUIN 345 249525 08WESTWD 345 1 REMOVE SWSHUNT FROM BUS 243217 / 243217 05DEQUIN 345

	END
Base Case	
AEP_P4_#4704_05DEQUIN 345_B1	CONTINGENCY 'AEP_P4_#4704_05DEQUIN 345_B1' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217 05DEQUIN 345 243878 05MEADOW 345 1 OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1 / 243217 05DEQUIN 345 249525 08WESTWD 345 1 REMOVE SWSHUNT FROM BUS 243217 / 243217 05DEQUIN 345 END
AEP_P1-2_#8807-B	CONTINGENCY 'AEP_P1-2_#8807-B' OPEN BRANCH FROM BUS 945420 TO BUS 255205 CKT 2 / 945420 AF1-207 TAP 345 255205 17REYNOLDS 345 2 END
COMED_P1-2_345-L17802__-S	CONTINGENCY 'COMED_P1-2_345-L17802__-S' TRIP BRANCH FROM BUS 270668 TO BUS 270912 CKT 1 / BLUEM; B 345 CHESTNUT 345 END
AEP_P1-2_#10136	CONTINGENCY 'AEP_P1-2_#10136' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243209 TO BUS 243443 CKT 2 / 243209 05ROCKPT 765 243443 05RKG2 26.0 2 REMOVE UNIT 2H FROM BUS 243443 / 243443 05RKG2 26.0 REMOVE UNIT 2L FROM BUS 243443 / 243443 05RKG2 26.0 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
AEP_P1-2_#2963	CONTINGENCY 'AEP_P1-2_#2963' OPEN BRANCH FROM BUS 243216 TO BUS 243221 CKT 1 / 243216 05DARWIN 345 243221 05EUGENE 345 1 END
AEP_P4_#8910_05DEQUIN 345_C	CONTINGENCY 'AEP_P4_#8910_05DEQUIN 345_C' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2 OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
AEP_P1-2_#8907-A	CONTINGENCY 'AEP_P1-2_#8907-A' OPEN BRANCH FROM BUS 247712 TO BUS 956820 CKT 1 / 247712 05SULLIVAN 345 956820 J1180 TAP 345 1 END

Short Circuit

Short Circuit

The following Breakers are overduty

None