Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-204

EUGENE 345 KV

75 MW Capacity / 300 MW Energy

January, 2020

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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 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.

2 General

The Interconnection Customer (IC), has proposed a Wind generating facility located in Vermillion County, Indiana. The installed facilities will have a total capability of 300 MW with 75 MW of this output being recognized by PJM as Capacity. The Primary Point of Interconnection will be a direct connection to AEP's Eugene 345 kV substation. The secondary point of interconnection will be via a new switching station cut into AEP's Dequine - Sullivan 345 kV circuit.

The proposed in-service date for this project is 12/31/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF1-204
Project Name	EUGENE 345 KV
State	Indiana
County	Vermillion
Transmission Owner	AEP
MFO	300
MWE	300
MWC	75
Fuel	Wind
Basecase Study Year	2023

2.1 Primary Point of Interconnection

AF1-204 will interconnect with the AEP transmission system via a direct connection at the Eugene 345 kV substation.

To accommodate for the interconnection at the Eugene 345 kV substation, the substation will require expansion and the installation of one (1) new 345 kV circuit breaker. 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 AF1-204 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$350,000
Direct Connection Network Upgrade	$2,500,000
Non Direct Connection Network Upgrades	$0
Total Costs	$2,850,000

In addition, the AF1-204 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$454,510,000

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

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
Station expansion and the installation of one (1) new 345 kV circuit breaker. Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required.	$2,500,000
Total Direct Connection Facility Costs	$2,500,000

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
Total Non-Direct Connection Facility Costs	$0

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

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 Eugene 345 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

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 Network Impacts – Option 1

The Queue Project AF1-204 was evaluated as a 300.0 MW (Capacity 75.0 MW) injection at the Eugene 345 kV substation in the AEP area. Project AF1-204 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-204 was studied with a commercial probability of 0.53. 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41616566	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	123.52	124.88	DC	30.3
43524691	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P4_#8910_05DEQUIN 345_C	breaker	3452.0	105.04	106.14	DC	38.0
43525200	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11042	tower	3452.0	119.06	120.5	DC	49.83
43525201	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11041	tower	3452.0	113.57	115.01	DC	49.88
43524740	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	102.77	103.74	DC	24.97
43525241	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P7-1_#11042	tower	1160.0	106.4	107.48	DC	27.69

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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4352507 6	24320 9	05ROCKPT	765. 0	AEP	24320 8	05JEFRSO	765. 0	AEP	1	AEP_P1-2_#890 5	operatio n	3452. 0	104.69	105.77	DC	37.21
4352507 5	24321 7	05DEQUIN	345. 0	AEP	24387 8	05MEADO W	345. 0	AEP	1	AEP_P1-2_#649 0	operatio n	1959. 0	104.13	107.24	DC	61.0
4352508 8	24321 7	05DEQUIN	345. 0	AEP	24387 8	05MEADO W	345. 0	AEP	2	AEP_P1-2_#647 2	operatio n	1959. 0	103.37	106.46	DC	60.56
4352489 1	24387 8	05MEADO W	345. 0	AEP	25520 5	17REYNOL DS	345. 0	NIPS	1	AEP_P1-2_#880 7-B	operatio n	2246. 0	126.97	129.83	DC	64.15
4352492 4	24387 8	05MEADO W	345. 0	AEP	94542 0	AF1-207 TAP	345. 0	AEP	2	AEP_P1-2_#869 5	operatio n	2246. 0	127.77	130.63	DC	64.17
4352509 2	92388 0	AB2-028 TAP	345. 0	AEP	24321 8	05DESOTO	345. 0	AEP	1	AEP_P1-2_#363	operatio n	1160. 0	101.95	102.92	DC	24.94
4352488 6	94542 0	AF1-207 TAP	345. 0	AEP	25520 5	17REYNOL DS	345. 0	NIPS	2	AEP_P1-2_#869 5	operatio n	2246. 0	127.01	129.87	DC	64.17

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
43524740,43525241	3	AB2-028 TAP 345.0 kV - 05DESOTO 345.0 kV Ckt 1	**MISO** **NonPJMArea (1101) : The external (i.e. Non-PJM) Transmission Owner, MISO, will not evaluate this violation until the impact study phase.** **Project Type : FAC** **Cost : $0** **Time Estimate : 0.0 Months**	$0
43524691,43525200, 43525201	2	05ROCKPT 765.0 kV - 05JEFRSO 765.0 kV Ckt 1	**AEP** **AEPI0002a (835) : An engineering study will need to be conducted to determine if the Rockport Relay 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 : $25,000** **Time Estimate : 12-18 Months** **AEPI0002b (836) : 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 : $25,000** **Time Estimate : 12-18 Months** **AEPI0002c (837) : Replace 6 Rockport Current Transformers 3000Amps** **Project Type : FAC** **Cost : $4,800,000** **Time Estimate : 12-18 Months** **AEPI0002d (838) : Replace 2 Rockport 3000A non-oil Breakers at Rockport** **Project Type : FAC** **Cost : $6,000,000** **Time Estimate : 12-18 Months**	$10,850,000

ID	Index	Facility	Upgrade Description	Cost
41616566	1	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** **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
			TOTAL COST	**$454,510,000**

17 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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.

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
4161656	24286	05JEFRS	AEP	24800	06CLIFT	OVE	Z1	AEP_P4_#1760_05JEFRS	breake	2354.	123.52	124.88	DC	30.3
6	5	O		0	Y	C		O 765_A	r	0				

Bus #	Bus	MW Impact
243442	05RKG1	88.0309
243443	05RKG2	86.6969
247900	05FR-11G E	5.2365
247901	05FR-12G E	5.1496
247902	05FR-21G E	5.5041
247903	05FR-22G E	5.2700
247904	05FR-3G E	10.6737
247905	05FR-4G E	8.3598
247906	05MDL-1G E	9.1438
247907	05MDL-2G E	4.5805
247912	05MDL-3G E	4.5805
247913	05MDL-4G E	4.5805
247943	T-127 E	4.5805
250163	Y3-099 BAT	0.1383
250167	Y3-100 BAT	0.1383
251823	Z1-065 BAT	0.3608
274882	W4-005 E	19.9605
274890	CAYUG;1U E	6.1149
274891	CAYUG;2U E	6.1149
276153	W2-048 E	0.8586
290261	S-027 E	9.6348
290265	S-028 E	9.6348
293516	O-009 E1	3.8354
293517	O-009 E2	1.9481
293518	O-009 E3	2.1454
293715	O-029 E	4.1004
293716	O-029 E	2.2482
293717	O-029 E	2.0664
293771	O-035 E	2.9321
294401	BSHIL;1U E	3.9542
294410	BSHIL;2U E	3.9542
909052	X2-022 E	12.4165
913222	Y1-054 E	-1.0955
917502	Z2-087 E	9.4996
919621	AA2-039 C	0.9638
919622	AA2-039 E	6.4503
924041	AB2-047 C O1	1.7744
924042	AB2-047 E O1	11.8745
924261	AB2-070 C O1	1.6962
924262	AB2-070 E O1	11.3513
925243	**AB2-178 BAT (Withdrawn : 12/10/2019)**	**1.3692**
925581	AC1-033 C	0.6474

Bus #	Bus	MW Impact
925582	AC1-033 E	4.3340
925771	AC1-053 C	1.7028
925772	AC1-053 E	11.3957
926821	AC1-168 C O1	0.4956
926822	AC1-168 E O1	3.3257
926841	AC1-171 C O1	0.5457
926842	AC1-171 E O1	3.6451
926951	AC1-182	-0.9602
927201	AC1-214 C O1	0.9411
927202	AC1-214 E O1	2.9916
930042	AB1-006 E	9.9625
930461	AB1-087	128.9310
930471	AB1-088	128.9310
932601	AC2-080 C O1	1.2917
932602	AC2-080 E O1	8.6448
933441	AC2-157 C	17.8159
933442	AC2-157 E	29.0681
934051	AD1-031 C O1	1.3145
934052	AD1-031 E O1	2.1448
935001	AD1-133 C O1	8.8725
935002	AD1-133 E O1	5.9150
935141	AD1-148	3.2362
935271	**AD1-137 C (Withdrawn : 01/16/2020)**	**4.3471**
935272	**AD1-137 E (Withdrawn : 01/16/2020)**	**29.0919**
936771	AD2-100 C	9.0103
936772	AD2-100 E	6.0069
936971	AD2-131 C	0.5935
936972	AD2-131 E	2.9820
937041	AD2-138 C	1.7488
937042	AD2-138 E	8.1877
937211	AD2-159 C	2.1570
937212	AD2-159 E	10.0989
937531	AD2-214 C	1.8998
937532	AD2-214 E	1.2665
939401	AE1-172 C O1	2.1926
939402	AE1-172 E O1	10.2878
939741	AE1-205 C O1	4.5860
939742	AE1-205 E O1	6.3331
940101	AE1-252 C O1	4.4049
940102	AE1-252 E O1	2.9366
940581	AE2-045 C O1	5.8625
940582	AE2-045 E O1	8.0486
941341	AE2-130 C	229.3344
941342	AE2-130 E	152.8896
941571	AE2-154 C	0.9862
941572	AE2-154 E	6.6002
941731	AE2-173 O1	2.7298
942111	AE2-223 C	1.0646
942112	AE2-223 E	7.1247
942481	AE2-261 C	12.6170
942482	AE2-261 E	8.4113
942601	AE2-276	11.7210

Bus #	Bus	MW Impact
943401	AF1-011 C	0.7235
943402	AF1-011 E	0.7631
944221	AF1-090 C O1	1.3990
944222	AF1-090 E O1	6.5497
945391	AF1-204 C O1	7.5758
945392	AF1-204 E O1	22.7273
945421	AF1-207 C O1	1.0730
945422	AF1-207 E O1	4.5744
945881	AF1-253 O1	4.1969
946321	AF1-296 C O1	0.9278
946322	AF1-296 E O1	4.3437
946541	AF1-318 C O1	1.3901
946542	AF1-318 E O1	6.5087
946581	AF1-322 C	2.5490
946582	AF1-322 E	3.5201
954681	J949 C	11.0806
954761	J468 C	1.8032
954762	J468 E	10.2179
955131	J991	11.4700
956821	J1180	10.6238
990901	L-005 E	6.0211
WEC	WEC	1.6270
LGE-0012019	LGE-0012019	3.5431
CBM-W2	CBM-W2	35.2088
NY	NY	0.8760
CBM-W1	CBM-W1	45.0735
TVA	TVA	1.8396
O-066	O-066	9.8515
CHEOAH	CHEOAH	0.0956
G-007	G-007	1.5246
MADISON	MADISON	23.3251
MEC	MEC	8.7188
CALDERWOOD	CALDERWOOD	0.0880
BLUEG	BLUEG	14.8619
TRIMBLE	TRIMBLE	5.3151
CATAWBA	CATAWBA	0.2594

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
43525200	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11042	tower	3452.0	119.06	120.5	DC	49.83

Bus #	Bus	MW Impact
243442	05RKG1	116.6504
243443	05RKG2	114.8827
243859	05FR-11G C	0.4971
243862	05FR-12G C	0.4895
243864	05FR-21G C	0.5225
243866	05FR-22G C	0.4996
243870	05FR-3G C	1.0120
243873	05FR-4G C	0.7837
246909	05MDL-1G C	1.0145
246910	05MDL-2G C	0.5022
246976	05MDL-3G C	0.5123
246979	05MDL-4G C	0.4996
247556	T-127 C	0.5072
247900	05FR-11G E	14.2271
247901	05FR-12G E	13.9909
247902	05FR-21G E	14.9539
247903	05FR-22G E	14.3180
247904	05FR-3G E	28.9993
247905	05FR-4G E	22.7125
247906	05MDL-1G E	29.0175
247907	05MDL-2G E	14.5360
247912	05MDL-3G E	14.5360
247913	05MDL-4G E	14.5360
247943	T-127 E	14.5360
274650	KINCAID ;1U	8.4345
274651	KINCAID ;2U	8.4314
930041	AB1-006 C	0.6594
930042	AB1-006 E	31.6158
930461	AB1-087	182.5945
930471	AB1-088	182.5945
933441	AC2-157 C	25.2312
933442	AC2-157 E	41.1668
935271	**AD1-137 C (Withdrawn : 01/16/2020)**	**11.8105**
935272	**AD1-137 E (Withdrawn : 01/16/2020)**	**79.0395**
936771	AD2-100 C	14.1725
936772	AD2-100 E	9.4483
936971	AD2-131 C	0.9336
936972	AD2-131 E	4.6904
941341	AE2-130 C	303.8928
941342	AE2-130 E	202.5952
941571	AE2-154 C	5.9053
941572	AE2-154 E	39.5198

Bus #	Bus	MW Impact
942481	AE2-261 C	19.6802
942482	AE2-261 E	13.1201
942601	AE2-276	16.5995
944221	AF1-090 C O1	4.2465
944222	AF1-090 E O1	19.8815
945391	AF1-204 C O1	12.4582
945392	AF1-204 E O1	37.3747
945881	AF1-253 O1	12.7396
946581	AF1-322 C	15.2628
946582	AF1-322 E	21.0772
954681	J949 C	18.6796
954761	J468 C	3.0976
954762	J468 E	17.5529
956821	J1180	15.9128
LGEE	LGEE	0.2402
WEC	WEC	1.3825
CBM-W2	CBM-W2	61.0319
NY	NY	1.0817
CBM-W1	CBM-W1	40.5574
TVA	TVA	5.1982
O-066	O-066	12.7613
CBM-S1	CBM-S1	26.4205
G-007	G-007	1.9739
MADISON	MADISON	17.0937
MEC	MEC	10.2570
BLUEG	BLUEG	0.4375
TRIMBLE	TRIMBLE	0.5025
CATAWBA	CATAWBA	0.0627

17.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
43525241	923880	AB2-028 TAP	AEP	243218	05DESOTO	AEP	1	AEP_P7-1_#11042	tower	1160.0	106.4	107.48	DC	27.69

Bus #	Bus	MW Impact
247285	05AND G1	0.9242
247286	05AND G2	0.9242
247287	05AND G3	1.9328
247900	05FR-11G E	5.3211
247901	05FR-12G E	5.2327
247902	05FR-21G E	5.5929
247903	05FR-22G E	5.3551
247904	05FR-3G E	10.8460
247905	05FR-4G E	8.4947
247906	05MDL-1G E	10.8487
247907	05MDL-2G E	5.4346
247912	05MDL-3G E	5.4346
247913	05MDL-4G E	5.4346
247935	V3-007 E	-29.3227
247943	T-127 E	5.4346
920501	AA2-148 C OP	2.3785
920502	AA2-148 E OP	15.9177
923881	AB2-028 C	12.9420
923882	AB2-028 E	86.6120
930042	AB1-006 E	11.8202
930461	AB1-087	32.4772
930471	AB1-088	32.4772
933441	AC2-157 C	4.4878
933442	AC2-157 E	7.3221
933591	AC2-176 C O1	-1.6513
933592	AC2-176 E O1	-11.0507
934161	AD1-043 C O1	2.7182
934162	AD1-043 E O1	4.4350
935271	**AD1-137 C (Withdrawn : 01/16/2020)**	**4.4172**
935272	**AD1-137 E (Withdrawn : 01/16/2020)**	**29.5615**
941571	AE2-154 C	1.1701
941572	AE2-154 E	7.8309
941692	AE2-169 BAT	1.9919
941702	AE2-170 BAT	4.4510
941711	AE2-171	0.9478
941722	AE2-172 BAT	2.6892
942601	AE2-276	1.5648
942791	AE2-297 C O1	9.9396
942792	AE2-297 E O1	6.6264
945391	AF1-204 C O1	3.1182
945392	AF1-204 E O1	9.3547
946581	AF1-322 C	3.0243

Bus #	Bus	MW Impact
946582	AF1-322 E	4.1765
950981	J333	12.3471
950991	J334	12.3768
952801	J754 C	4.5377
952802	J754 E	24.5502
953351	J805	32.8768
953761	J829	16.9250
953831	J842 C	2.0935
953832	J842 E	11.3265
953841	J843 C	2.1413
953842	J843 E	11.5847
953931	J856	4.7000
954351	J903	15.9830
954772	J515 E	27.5800
955151	J993	38.3420
955371	J1016	3.1775
955451	J1027	10.4430
955461	J1028	9.8460
955491	J1031 C	4.3842
955492	J1031 E	23.7198
955891	J1074	12.7100
956561	J1152	37.3460
956911	J1189	0.3786
LGEE	LGEE	2.5370
CPLE	CPLE	0.6350
WEC	WEC	0.3380
CBM-W2	CBM-W2	41.2694
NY	NY	0.1665
CBM-W1	CBM-W1	7.5310
TVA	TVA	4.3596
O-066	O-066	1.7674
CBM-S2	CBM-S2	7.4215
CBM-S1	CBM-S1	28.6357
G-007	G-007	0.2694
MADISON	MADISON	6.5621
MEC	MEC	3.9248

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).

19 Contingency Descriptions

Contingency Name	Contingency Definition
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_#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
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_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
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_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_#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_#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

Contingency Name	Contingency Definition
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
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

Short Circuit

20 Short Circuit

The following Breakers are overduty:

None

21 Secondary Point of Interconnection

AF1-204 will interconnect with the AEP transmission system via a new switching station cut into the Dequine - Sullivan 345 kV circuit.

To accommodate the interconnection on the Dequine - Sullivan 345 kV circuit, 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 will be constructed (Figure 3). 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.

22 Network Impacts – Option 2

The Queue Project AF1-204 was evaluated as a 300.0 MW (Capacity 75.0 MW) injection at the Dequine-Sullivan 345 kV circuit in the AEP area. Project AF1-204 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-204 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

23 Generation Deliverability

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

None

24 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
51923698	945390	AF1-204 TAP	345.0	AEP	243217	05DEQUIN	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1318.0	91.77	104.27	DC	164.7

25 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41616566	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	123.36	125.39	DC	45.59
43524691	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P4_#8910_05DEQUIN 345_C	breaker	3452.0	105.01	107.92	DC	100.5
43525200	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11042	tower	3452.0	119.07	121.26	DC	75.73
43525201	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11041	tower	3452.0	113.57	115.77	DC	75.77
51923618	243216	05DARWIN	345.0	AEP	243221	05EUGENE	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.89	119.97	DC	26.74
43524700	243217	05DEQUIN	345.0	AEP	243878	05MEADOW	345.0	AEP	1	AEP_P4_#6485_05DEQUIN 345_C1	breaker	1959.0	107.5	112.92	DC	106.05
43524704	243217	05DEQUIN	345.0	AEP	243878	05MEADOW	345.0	AEP	2	AEP_P4_#4704_05DEQUIN 345_B1	breaker	1959.0	106.75	112.13	DC	105.31
43524615	243918	05ELDERBERRY	345.0	AEP	938670	AE1-089 TAP	345.0	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	122.7	123.45	DC	23.28
44780826	247712	05SULLIVAN	345.0	AEP	956820	J1180 TAP	345.0	AMIL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1466.0	120.75	124.82	DC	59.72
51923622	247712	05SULLIVAN	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.89	119.97	DC	26.74
43524740	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	102.76	103.42	DC	17.12
43525241	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P7-1_#11042	tower	1160.0	106.39	107.27	DC	22.51
43524635	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	114.43	115.18	DC	23.28
43524636	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8167_05OLIVE	breaker	1409.0	103.48	104.01	DC	16.62

26 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
51924066	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P1-2_#8905-A	operation	3452.0	104.65	107.56	DC	100.19
51924002	243216	05DARWIN	345.0	AEP	243221	05EUGENE	345.0	AEP	1	AEP_P1-2_#363	operation	1160.0	118.23	119.31	DC	26.77
43525075	243217	05DEQUIN	345.0	AEP	243878	05MEADOW	345.0	AEP	1	AEP_P1-2_#6490	operation	1959.0	104.18	109.48	DC	103.96
43525088	243217	05DEQUIN	345.0	AEP	243878	05MEADOW	345.0	AEP	2	AEP_P1-2_#6472	operation	1959.0	103.42	108.69	DC	103.21
51923885	243878	05MEADOW	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	2	AEP_P1-2_#8695	operation	2246.0	127.85	132.73	DC	109.51
51923889	243878	05MEADOW	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	1	AEP_P1-2_#8807	operation	2246.0	127.81	132.69	DC	109.48
44781203	247712	05SULLIVAN	345.0	AEP	956820	J1180 TAP	345.0	AMIL	1	AEP_P1-2_#363	operation	1466.0	119.8	123.88	DC	59.74
51923996	247712	05SULLIVAN	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P1-2_#363	operation	1160.0	118.23	119.31	DC	26.77
43525092	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P1-2_#363	operation	1160.0	101.93	102.6	DC	17.15
43525067	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P1-2_#11219	operation	1409.0	100.79	101.52	DC	22.75
51924090	945390	AF1-204 TAP	345.0	AEP	243217	05DEQUIN	345.0	AEP	1	AEP_P1-2_#363	operation	1318.0	90.49	103.0	DC	164.77

27 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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.

27.1 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
51923698	945390	AF1-204 TAP	AEP	243217	05DEQUIN	AEP	1	AEP_P4_#8648_05JEFRSO765_B	breaker	1318.0	91.77	104.27	DC	164.7

Bus #	Bus	MW Impact
243442	05RKG1	27.0092
243443	05RKG2	26.5999
930461	AB1-087	80.6300
930471	AB1-088	80.6300
933441	AC2-157 C	11.1416
933442	AC2-157 E	18.1784
941341	AE2-130 C	70.3632
941342	AE2-130 E	46.9088
942601	AE2-276	7.3300
945391	AF1-204 C O2	41.1757
945392	AF1-204 E O2	123.5272
956821	J1180	7.6530
LGEE	LGEE	0.9567
CPLE	CPLE	0.2408
CBM-W2	CBM-W2	20.0000
NY	NY	0.1349
TVA	TVA	2.3618
O-066	O-066	1.5456
CBM-S2	CBM-S2	3.1559
CBM-S1	CBM-S1	14.3562
G-007	G-007	0.2382
MADISON	MADISON	1.7741
MEC	MEC	1.9481

27.2 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
4161656 6	24286 5	05JEFRS O	AEP	24800 0	06CLIFT Y	OVE C	Z1	AEP_P4_#1760_05JEFRS O 765_A	breake r	2354. 0	123.36	125.39	DC	45.59

Bus #	Bus	MW Impact
243442	05RKG1	88.0309
243443	05RKG2	86.6969
247900	05FR-11G E	5.2365
247901	05FR-12G E	5.1496
247902	05FR-21G E	5.5041
247903	05FR-22G E	5.2700
247904	05FR-3G E	10.6737
247905	05FR-4G E	8.3598
247906	05MDL-1G E	9.1438
247907	05MDL-2G E	4.5805
247912	05MDL-3G E	4.5805
247913	05MDL-4G E	4.5805
247943	T-127 E	4.5805
250163	Y3-099 BAT	0.1383
250167	Y3-100 BAT	0.1383
251823	Z1-065 BAT	0.3608
274882	W4-005 E	19.9605
274890	CAYUG;1U E	6.1149
274891	CAYUG;2U E	6.1149
276153	W2-048 E	0.8586
290261	S-027 E	9.6348
290265	S-028 E	9.6348
293516	O-009 E1	3.8354
293517	O-009 E2	1.9481
293518	O-009 E3	2.1454
293715	O-029 E	4.1004
293716	O-029 E	2.2482
293717	O-029 E	2.0664
293771	O-035 E	2.9321
294401	BSHIL;1U E	3.9542
294410	BSHIL;2U E	3.9542
909052	X2-022 E	12.4165
913222	Y1-054 E	-1.0955
917502	Z2-087 E	9.4996
919621	AA2-039 C	0.9638
919622	AA2-039 E	6.4503
924041	AB2-047 C O1	1.7744
924042	AB2-047 E O1	11.8745
924261	AB2-070 C O1	1.6962
924262	AB2-070 E O1	11.3513
925243	**AB2-178 BAT (Withdrawn : 12/10/2019)**	**1.3692**
925581	AC1-033 C	0.6474

Bus #	Bus	MW Impact
925582	AC1-033 E	4.3340
925771	AC1-053 C	1.7028
925772	AC1-053 E	11.3957
926821	AC1-168 C O1	0.4956
926822	AC1-168 E O1	3.3257
926841	AC1-171 C O1	0.5457
926842	AC1-171 E O1	3.6451
926951	AC1-182	-0.9602
927201	AC1-214 C O1	0.9411
927202	AC1-214 E O1	2.9916
930042	AB1-006 E	9.9625
930461	AB1-087	128.9310
930471	AB1-088	128.9310
932601	AC2-080 C O1	1.2917
932602	AC2-080 E O1	8.6448
933441	AC2-157 C	17.8159
933442	AC2-157 E	29.0681
934051	AD1-031 C O1	1.3145
934052	AD1-031 E O1	2.1448
935001	AD1-133 C O1	8.8725
935002	AD1-133 E O1	5.9150
935141	AD1-148	3.2362
935271	AD1-137 C	4.3471
935272	AD1-137 E	29.0919
936771	AD2-100 C	9.0103
936772	AD2-100 E	6.0069
936971	AD2-131 C	0.5935
936972	AD2-131 E	2.9820
937041	AD2-138 C	1.7488
937042	AD2-138 E	8.1877
937211	AD2-159 C	2.1570
937212	AD2-159 E	10.0989
939401	AE1-172 C O1	2.1926
939402	AE1-172 E O1	10.2878
939741	AE1-205 C O1	4.5860
939742	AE1-205 E O1	6.3331
940101	AE1-252 C O1	4.4049
940102	AE1-252 E O1	2.9366
940581	AE2-045 C O1	5.8625
940582	AE2-045 E O1	8.0486
941341	AE2-130 C	229.3344
941342	AE2-130 E	152.8896
941571	AE2-154 C	0.9862
941572	AE2-154 E	6.6002
941731	AE2-173 O1	2.7298
942111	AE2-223 C	1.0646
942112	AE2-223 E	7.1247
942481	AE2-261 C	12.6170
942482	AE2-261 E	8.4113
942601	AE2-276	11.7210
943401	AF1-011 C	0.7235
943402	AF1-011 E	0.7631

Bus #	Bus	MW Impact
944221	AF1-090 C O2	1.4220
944222	AF1-090 E O2	6.6573
945391	AF1-204 C O2	11.3977
945392	AF1-204 E O2	34.1932
945421	AF1-207 C O2	1.0657
945422	AF1-207 E O2	4.5431
945881	AF1-253	4.2659
946321	AF1-296 C O2	0.9256
946322	AF1-296 E O2	4.3335
946541	AF1-318 C O2	1.3691
946542	AF1-318 E O2	6.4107
946581	AF1-322 C	2.5490
946582	AF1-322 E	3.5201
954681	J949 C	11.0806
954761	J468 C	1.8032
954762	J468 E	10.2179
955131	J991	11.4700
956821	J1180	10.6238
990901	L-005 E	6.0211
WEC	WEC	1.6270
LGE-0012019	LGE-0012019	3.5431
CBM-W2	CBM-W2	35.2088
NY	NY	0.8760
CBM-W1	CBM-W1	45.0735
TVA	TVA	1.8396
O-066	O-066	9.8515
CHEOAH	CHEOAH	0.0956
G-007	G-007	1.5246
MADISON	MADISON	23.3251
MEC	MEC	8.7188
CALDERWOOD	CALDERWOOD	0.0880
BLUEG	BLUEG	14.8619
TRIMBLE	TRIMBLE	5.3151
CATAWBA	CATAWBA	0.2594

27.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
43525200	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11042	tower	3452.0	119.07	121.26	DC	75.73

Bus #	Bus	MW Impact
243442	05RKG1	116.6504
243443	05RKG2	114.8827
243859	05FR-11G C	0.4971
243862	05FR-12G C	0.4895
243864	05FR-21G C	0.5225
243866	05FR-22G C	0.4996
243870	05FR-3G C	1.0120
243873	05FR-4G C	0.7837
246909	05MDL-1G C	1.0145
246910	05MDL-2G C	0.5022
246976	05MDL-3G C	0.5123
246979	05MDL-4G C	0.4996
247556	T-127 C	0.5072
247900	05FR-11G E	14.2271
247901	05FR-12G E	13.9909
247902	05FR-21G E	14.9539
247903	05FR-22G E	14.3180
247904	05FR-3G E	28.9993
247905	05FR-4G E	22.7125
247906	05MDL-1G E	29.0175
247907	05MDL-2G E	14.5360
247912	05MDL-3G E	14.5360
247913	05MDL-4G E	14.5360
247943	T-127 E	14.5360
274650	KINCAID ;1U	8.4345
274651	KINCAID ;2U	8.4314
930041	AB1-006 C	0.6594
930042	AB1-006 E	31.6158
930461	AB1-087	182.5945
930471	AB1-088	182.5945
933441	AC2-157 C	25.2312
933442	AC2-157 E	41.1668
935271	AD1-137 C	11.8105
935272	AD1-137 E	79.0395
936771	AD2-100 C	14.1725
936772	AD2-100 E	9.4483
936971	AD2-131 C	0.9336
936972	AD2-131 E	4.6904
941341	AE2-130 C	303.8928
941342	AE2-130 E	202.5952
941571	AE2-154 C	5.9053
941572	AE2-154 E	39.5198

Bus #	Bus	MW Impact
942481	AE2-261 C	19.6802
942482	AE2-261 E	13.1201
942601	AE2-276	16.5995
944221	AF1-090 C O2	4.3486
944222	AF1-090 E O2	20.3594
945391	AF1-204 C O2	18.9322
945392	AF1-204 E O2	56.7967
945881	AF1-253	13.0458
946581	AF1-322 C	15.2628
946582	AF1-322 E	21.0772
954681	J949 C	18.6796
954761	J468 C	3.0976
954762	J468 E	17.5529
956821	J1180	15.9128
LGEE	LGEE	0.2402
WEC	WEC	1.3825
CBM-W2	CBM-W2	61.0319
NY	NY	1.0817
CBM-W1	CBM-W1	40.5574
TVA	TVA	5.1982
O-066	O-066	12.7613
CBM-S1	CBM-S1	26.4205
G-007	G-007	1.9739
MADISON	MADISON	17.0937
MEC	MEC	10.2570
BLUEG	BLUEG	0.4375
TRIMBLE	TRIMBLE	0.5025
CATAWBA	CATAWBA	0.0627

27.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
51923618	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.89	119.97	DC	26.74

Bus #	Bus	MW Impact
243442	05RKG1	40.1665
243443	05RKG2	39.5578
930461	AB1-087	119.9000
930471	AB1-088	119.9000
933441	AC2-157 C	16.5680
933442	AC2-157 E	27.0320
941341	AE2-130 C	104.6400
941342	AE2-130 E	69.7600
942601	AE2-276	10.9000
945391	AF1-204 C O2	3.0122
945392	AF1-204 E O2	9.0365
955131	J991	10.5040
956821	J1180	11.1052
LGEE	LGEE	0.3925
CPLE	CPLE	0.0972
CBM-W2	CBM-W2	10.5323
NY	NY	0.1687
TVA	TVA	1.6226
O-066	O-066	1.9555
CBM-S2	CBM-S2	1.6357
EDWARDS	EDWARDS	0.0532
CBM-S1	CBM-S1	9.1334
TILTON	TILTON	4.7811
G-007	G-007	0.3016
MADISON	MADISON	1.8265
MEC	MEC	1.0615

27.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4352470	243217	05DEQUIN	AEP	243878	05MEADOW	AEP	1	AEP_P4_#6485_05DEQUIN 345_C1	breaker	1959.0	107.5	112.92	DC	106.05

Bus #	Bus	MW Impact
243859	05FR-11G C	1.5012
243862	05FR-12G C	1.4782
243864	05FR-21G C	1.5778
243866	05FR-22G C	1.5088
243870	05FR-3G C	3.0560
243873	05FR-4G C	2.3667
247900	05FR-11G E	42.9640
247901	05FR-12G E	42.2507
247902	05FR-21G E	45.1588
247903	05FR-22G E	43.2383
247904	05FR-3G E	87.5741
247905	05FR-4G E	68.5887
930461	AB1-087	73.6395
930471	AB1-088	73.6395
933441	AC2-157 C	10.1756
933442	AC2-157 E	16.6024
935271	AD1-137 C	35.6661
935272	AD1-137 E	238.6888
942601	AE2-276	6.6945
945391	AF1-204 C O2	26.5125
945392	AF1-204 E O2	79.5375
950981	J333	17.4624
950991	J334	19.5408
952801	J754 C	6.6429
952802	J754 E	35.9400
953761	J829	25.1300
954681	J949 C	16.1602
954761	J468 C	3.1973
954762	J468 E	18.1178
954772	J515 E	66.5400
955391	J1021 C	2.1784
955392	J1021 E	11.7856
956451	J1139	16.0425
956821	J1180	7.7677
LGEE	LGEE	2.0122
CPLE	CPLE	0.8031
G-007A	G-007A	0.0911
VFT	VFT	0.2322
CBM-W2	CBM-W2	41.2776
NY	NY	0.0022
TVA	TVA	4.6186
CBM-S2	CBM-S2	8.8029

Bus #	Bus	MW Impact
CBM-S1	CBM-S1	28.4653
MADISON	MADISON	1.4797
MEC	MEC	2.9031

27.6 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4352470 4	24321 7	05DEQUI N	AEP	24387 8	05MEADO W	AEP	2	AEP_P4_#4704_05DEQUI N 345_B1	breake r	1959. 0	106.75	112.13	DC	105.31

Bus #	Bus	MW Impact
243859	05FR-11G C	1.4907
243862	05FR-12G C	1.4679
243864	05FR-21G C	1.5668
243866	05FR-22G C	1.4983
243870	05FR-3G C	3.0346
243873	05FR-4G C	2.3501
247900	05FR-11G E	42.6641
247901	05FR-12G E	41.9558
247902	05FR-21G E	44.8436
247903	05FR-22G E	42.9365
247904	05FR-3G E	86.9628
247905	05FR-4G E	68.1100
930461	AB1-087	73.1280
930471	AB1-088	73.1280
933441	AC2-157 C	10.1050
933442	AC2-157 E	16.4870
935271	AD1-137 C	35.4172
935272	AD1-137 E	237.0228
942601	AE2-276	6.6480
945391	AF1-204 C O2	26.3272
945392	AF1-204 E O2	78.9817
950981	J333	17.3400
950991	J334	19.4058
952801	J754 C	6.5965
952802	J754 E	35.6889
953761	J829	24.9525
954681	J949 C	16.0480
954761	J468 C	3.1751
954762	J468 E	17.9924
954772	J515 E	66.0760
955391	J1021 C	2.1631
955392	J1021 E	11.7029
956451	J1139	15.9315
956821	J1180	7.7137
LGEE	LGEE	1.9985
CPLE	CPLE	0.7978
G-007A	G-007A	0.0911
VFT	VFT	0.2322
CBM-W2	CBM-W2	40.9910
NY	NY	0.0028
TVA	TVA	4.5864
CBM-S2	CBM-S2	8.7451

Bus #	Bus	MW Impact
CBM-S1	CBM-S1	28.2694
MADISON	MADISON	1.4697
MEC	MEC	2.8824

27.7 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4352461 5	24391 8	05ELDERBERR Y	AEP	93867 0	AE1 -089 TAP	AEP	1	AEP_P4_#8165_05OLIV E 345_B1	breake r	1409. 0	122.7	123.45	DC	23.28

Bus #	Bus	MW Impact
244130	05ST.JOE CTR	53.0772
247900	05FR-11G E	7.4788
247901	05FR-12G E	7.3546
247902	05FR-21G E	7.8608
247903	05FR-22G E	7.5265
247904	05FR-3G E	15.2441
247905	05FR-4G E	11.9393
247906	05MDL-1G E	17.4392
247907	05MDL-2G E	8.7360
247912	05MDL-3G E	8.7360
247913	05MDL-4G E	8.7360
247943	T-127 E	8.7360
274808	UNIV PK N;4U	0.9159
274809	UNIV PK N;5U	0.9159
274811	UNIV PK N;7U	0.9159
274812	UNIV PK N;8U	0.9159
274814	UNIV PK N;0U	0.9159
274815	UNIV PK N;XU	0.9159
274881	PILOT HIL;1E	8.2812
275149	KELLYCK ;1E	8.2812
276169	Z1-107 E	1.1703
290021	O50 E	8.7870
293644	O22 E1	4.7213
293645	O22 E2	9.1649
910542	X3-005 E	0.3092
918052	AA1-018 E OP	7.9700
922912	AB1-080	3.1453
926581	AC1-141	-5.7494
927091	AC1-204 1	32.3586
927101	AC1-204 2	32.3538
927451	AC1-142A 1	1.8912
927461	AC1-142A 2	1.8909
930042	AB1-006 E	19.0007
930501	AB1-091 O1	31.9490
930751	AB1-122 2O1	32.5801
932601	AC2-080 C O1	5.4340
932602	AC2-080 E O1	36.3660
932931	AC2-117	5.4979
933411	AC2-154 C	1.1240
933412	AC2-154 E	1.8340
934111	AD1-039 2	3.1928

Bus #	Bus	MW Impact
934871	AD1-116 C	0.4642
934872	AD1-116 E	0.7573
935271	AD1-137 C	6.2084
935272	AD1-137 E	41.5488
936291	AD2-038 C O1	1.1170
936292	AD2-038 E O1	7.4752
936371	AD2-047 C O1	2.0114
936372	AD2-047 E O1	9.8206
936461	AD2-060	0.6271
936511	AD2-066 C O1	3.8016
936512	AD2-066 E O1	2.5344
937041	AD2-138 C	7.3568
937042	AD2-138 E	34.4432
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**7.1418**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**4.7612**
937401	AD2-194 1	3.4797
937411	AD2-194 2	3.4792
938511	AE1-070 1	4.0887
938521	AE1-070 2	3.7402
938851	AE1-113 C	3.6246
938852	AE1-113 E	12.8509
939321	AE1-163 C O1	2.8068
939322	AE1-163 E O1	17.2417
939351	AE1-166 C O1	2.3389
939352	AE1-166 E O1	2.1589
939631	AE1-193 C	6.0040
939632	AE1-193 E	40.1807
939641	AE1-194 C	6.0040
939642	AE1-194 E	40.1807
939651	AE1-195 C	6.0040
939652	AE1-195 E	40.1807
939681	AE1-198 C	17.8273
939682	AE1-198 E	15.1486
940262	AE2-008 BAT	22.9208
940581	AE2-045 C O1	24.6620
940582	AE2-045 E O1	33.8580
940621	AE2-049 C O1	2.1566
940622	AE2-049 E O1	1.4378
940631	AE2-050 C O1	2.9505
940632	AE2-050 E O1	1.9670
940752	AE2-062 E	0.0310
940762	AE2-063 E	0.0310
941551	AE2-152 C O1	2.6987
941552	AE2-152 E O1	1.7991
941561	AE2-153 C O1	2.1124
941562	AE2-153 E O1	9.8896
941571	AE2-154 C	1.8810
941572	AE2-154 E	12.5880
942421	AE2-255 C O1	1.3730
942422	AE2-255 E O1	4.1189
942651	AE2-281 C O1	0.4010
942652	AE2-281 E O1	2.4631

Bus #	Bus	MW Impact
942682	AE2-284 BAT	5.3182
942881	AE2-307 C O1	5.4092
942882	AE2-307 E O1	1.9670
942911	AE2-310 C O1	2.0941
942912	AE2-310 E O1	0.5626
943023	AE2-325 BAT	3.4447
944911	AF1-156 C	2.8625
944912	AF1-156 E	1.9083
944963	AF1-161 BAT	3.2995
945391	AF1-204 C O2	2.6219
945392	AF1-204 E O2	7.8657
945421	AF1-207 C O2	2.3718
945422	AF1-207 E O2	10.1115
945501	AF1-215 C O2	60.6780
945502	AF1-215 E O2	40.4520
946521	AF1-316 C O2	1.5499
946522	AF1-316 E O2	2.3249
946581	AF1-322 C	4.8616
946582	AF1-322 E	6.7136
951811	J513 C	1.2368
951812	J513 E	6.6916
952581	J740 C	3.4510
952582	J740 E	18.6710
953161	J837 C	3.4528
953162	J837 E	18.6803
953171	J838 C	1.7255
953172	J838 E	9.3355
954421	J913 C	17.6976
954941	J968 C	3.4510
954942	J968 E	18.6710
955741	J1058	24.7860
955821	J1067	15.9360
955841	J1069 C	3.4510
955842	J1069 E	18.6710
LGEE	LGEE	0.4364
WEC	WEC	1.9165
CBM-W2	CBM-W2	22.1539
NY	NY	0.8135
CBM-W1	CBM-W1	23.9191
TVA	TVA	1.9446
O-066	O-066	9.5357
CBM-S1	CBM-S1	10.8460
G-007	G-007	1.4716
MADISON	MADISON	10.7110
MEC	MEC	7.6526
CATAWBA	CATAWBA	0.0364

27.8 Index 8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4478086	247712	05SULLIVAN	AEP	956820	J118 0 TAP	AMIL	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1466.0	120.75	124.82	DC	59.72

Bus #	Bus	MW Impact
243442	05RKG1	67.3876
243443	05RKG2	66.3664
247900	05FR-11G E	3.3936
247901	05FR-12G E	3.3373
247902	05FR-21G E	3.5670
247903	05FR-22G E	3.4153
247904	05FR-3G E	6.9173
247905	05FR-4G E	5.4177
276153	W2-048 E	-0.9237
909052	X2-022 E	-13.3577
930461	AB1-087	201.1130
930471	AB1-088	201.1130
933441	AC2-157 C	27.7902
933442	AC2-157 E	45.3418
935271	AD1-137 C	2.8172
935272	AD1-137 E	18.8536
936973	AD2-131 BAT	5.5085
941341	AE2-130 C	175.5552
941342	AE2-130 E	117.0368
941732	AE2-173 BAT	2.7385
942601	AE2-276	18.2830
945391	AF1-204 C O2	14.9303
945392	AF1-204 E O2	44.7908
945882	AF1-253 BAT	13.5400
951731	J446 C	1.8090
951732	J446 E	9.7870
951811	J513 C	0.9626
951812	J513 E	5.2081
952581	J740 C	2.1634
952582	J740 E	11.7046
952801	J754 C	3.3092
952802	J754 E	17.9034
952811	J759	4.4422
952821	J762	10.0520
952861	J783 C	4.2188
952862	J783 E	0.1758
953161	J837 C	2.1645
953162	J837 E	11.7104
953171	J838 C	1.0817
953172	J838 E	5.8523
953351	J805	14.3419
953831	J842 C	2.2686

Bus #	Bus	MW Impact
953832	J842 E	12.2734
953841	J843 C	2.3790
953842	J843 E	12.8710
953931	J856	5.4752
954171	J883 C	0.7029
954172	J883 E	3.8027
954351	J903	6.8550
954421	J913 C	11.0944
954772	J515 E	27.0880
954941	J968 C	2.1634
954942	J968 E	11.7046
955141	J992	10.1300
955151	J993	14.3140
955371	J1016	3.7295
955451	J1027	13.0530
955461	J1028	12.3675
955491	J1031 C	1.4929
955492	J1031 E	8.0771
955791	J1063	17.6610
955821	J1067	13.9584
955841	J1069 C	2.1634
955842	J1069 E	11.7046
955891	J1074	14.9180
956561	J1152	14.5060
956911	J1189	0.2983
DUCKCREEK	DUCKCREEK	7.2487
LGEE	LGEE	0.7377
NEWTON	NEWTON	26.3876
FARMERCITY	FARMERCITY	0.3827
NY	NY	0.0160
PRAIRIE	PRAIRIE	31.2905
O-066	O-066	0.4435
COFFEEN	COFFEEN	8.2224
EDWARDS	EDWARDS	1.8834
CHEOAH	CHEOAH	1.0986
TILTON	TILTON	1.4666
G-007	G-007	0.0707
CALDERWOOD	CALDERWOOD	1.1023
CATAWBA	CATAWBA	0.4907
AC1-056	AC1-056	11.8790

27.9 Index 9

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
51923622	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1160.0	118.89	119.97	DC	26.74

Bus #	Bus	MW Impact
243442	05RKG1	40.1665
243443	05RKG2	39.5578
930461	AB1-087	119.9000
930471	AB1-088	119.9000
933441	AC2-157 C	16.5680
933442	AC2-157 E	27.0320
941341	AE2-130 C	104.6400
941342	AE2-130 E	69.7600
942601	AE2-276	10.9000
945391	AF1-204 C O2	3.0122
945392	AF1-204 E O2	9.0365
955131	J991	10.5040
956821	J1180	11.1052
LGEE	LGEE	0.3925
CPLE	CPLE	0.0972
CBM-W2	CBM-W2	10.5323
NY	NY	0.1687
TVA	TVA	1.6226
O-066	O-066	1.9555
CBM-S2	CBM-S2	1.6357
EDWARDS	EDWARDS	0.0532
CBM-S1	CBM-S1	9.1334
TILTON	TILTON	4.7811
G-007	G-007	0.3016
MADISON	MADISON	1.8265
MEC	MEC	1.0615

27.10 Index 10

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
43525241	923880	AB2-028 TAP	AEP	243218	05DESOTO	AEP	1	AEP_P7-1_#11042	tower	1160.0	106.39	107.27	DC	22.51

Bus #	Bus	MW Impact
247285	05AND G1	0.9242
247286	05AND G2	0.9242
247287	05AND G3	1.9328
247900	05FR-11G E	5.3211
247901	05FR-12G E	5.2327
247902	05FR-21G E	5.5929
247903	05FR-22G E	5.3551
247904	05FR-3G E	10.8460
247905	05FR-4G E	8.4947
247906	05MDL-1G E	10.8487
247907	05MDL-2G E	5.4346
247912	05MDL-3G E	5.4346
247913	05MDL-4G E	5.4346
247935	V3-007 E	-29.3227
247943	T-127 E	5.4346
920501	AA2-148 C OP	2.3785
920502	AA2-148 E OP	15.9177
923881	AB2-028 C	12.9420
923882	AB2-028 E	86.6120
930042	AB1-006 E	11.8202
930461	AB1-087	32.4772
930471	AB1-088	32.4772
933441	AC2-157 C	4.4878
933442	AC2-157 E	7.3221
933591	AC2-176 C O1	-1.6513
933592	AC2-176 E O1	-11.0507
934161	AD1-043 C O1	2.7182
934162	AD1-043 E O1	4.4350
935271	AD1-137 C	4.4172
935272	AD1-137 E	29.5615
941571	AE2-154 C	1.1701
941572	AE2-154 E	7.8309
941692	AE2-169 BAT	1.9919
941702	AE2-170 BAT	4.4510
941711	AE2-171	0.9478
941722	AE2-172 BAT	2.6892
942601	AE2-276	1.5648
942791	AE2-297 C O1	9.9396
942792	AE2-297 E O1	6.6264
945391	AF1-204 C O2	2.5347
945392	AF1-204 E O2	7.6042
946581	AF1-322 C	3.0243

Bus #	Bus	MW Impact
946582	AF1-322 E	4.1765
950981	J333	12.3471
950991	J334	12.3768
952801	J754 C	4.5377
952802	J754 E	24.5502
953351	J805	32.8768
953761	J829	16.9250
953831	J842 C	2.0935
953832	J842 E	11.3265
953841	J843 C	2.1413
953842	J843 E	11.5847
953931	J856	4.7000
954351	J903	15.9830
954772	J515 E	27.5800
955151	J993	38.3420
955371	J1016	3.1775
955451	J1027	10.4430
955461	J1028	9.8460
955491	J1031 C	4.3842
955492	J1031 E	23.7198
955891	J1074	12.7100
956561	J1152	37.3460
956911	J1189	0.3786
LGEE	LGEE	2.5370
CPLE	CPLE	0.6350
WEC	WEC	0.3380
CBM-W2	CBM-W2	41.2694
NY	NY	0.1665
CBM-W1	CBM-W1	7.5310
TVA	TVA	4.3596
O-066	O-066	1.7674
CBM-S2	CBM-S2	7.4215
CBM-S1	CBM-S1	28.6357
G-007	G-007	0.2694
MADISON	MADISON	6.5621
MEC	MEC	3.9248

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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
43524635	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	114.43	115.18	DC	23.28

Bus #	Bus	MW Impact
244130	05ST.JOE CTR	53.0772
247900	05FR-11G E	7.4788
247901	05FR-12G E	7.3546
247902	05FR-21G E	7.8608
247903	05FR-22G E	7.5265
247904	05FR-3G E	15.2441
247905	05FR-4G E	11.9393
247906	05MDL-1G E	17.4392
247907	05MDL-2G E	8.7360
247912	05MDL-3G E	8.7360
247913	05MDL-4G E	8.7360
247943	T-127 E	8.7360
274808	UNIV PK N;4U	0.9159
274809	UNIV PK N;5U	0.9159
274811	UNIV PK N;7U	0.9159
274812	UNIV PK N;8U	0.9159
274814	UNIV PK N;0U	0.9159
274815	UNIV PK N;XU	0.9159
922912	AB1-080	3.1453
926581	AC1-141	-5.7494
930042	AB1-006 E	19.0007
932601	AC2-080 C O1	5.4340
932602	AC2-080 E O1	36.3660
932931	AC2-117	5.4979
935271	AD1-137 C	6.2084
935272	AD1-137 E	41.5488
937041	AD2-138 C	7.3568
937042	AD2-138 E	34.4432
938671	AE1-089 C	93.2175
938672	AE1-089 E	127.9644
939631	AE1-193 C	6.0040
939632	AE1-193 E	40.1807
939641	AE1-194 C	6.0040
939642	AE1-194 E	40.1807
939651	AE1-195 C	6.0040
939652	AE1-195 E	40.1807
939681	AE1-198 C	17.8273
939682	AE1-198 E	15.1486
940261	AE2-008	57.0792
940581	AE2-045 C O1	24.6620
940582	AE2-045 E O1	33.8580

Bus #	Bus	MW Impact
941571	AE2-154 C	1.8810
941572	AE2-154 E	12.5880
945391	AF1-204 C O2	2.6219
945392	AF1-204 E O2	7.8657
945421	AF1-207 C O2	2.3718
945422	AF1-207 E O2	10.1115
945501	AF1-215 C O2	60.6780
945502	AF1-215 E O2	40.4520
946581	AF1-322 C	4.8616
946582	AF1-322 E	6.7136
951811	J513 C	1.2368
951812	J513 E	6.6916
952581	J740 C	3.4510
952582	J740 E	18.6710
953161	J837 C	3.4528
953162	J837 E	18.6803
953171	J838 C	1.7255
953172	J838 E	9.3355
954421	J913 C	17.6976
954941	J968 C	3.4510
954942	J968 E	18.6710
955741	J1058	24.7860
955841	J1069 C	3.4510
955842	J1069 E	18.6710
LGEE	LGEE	0.4364
WEC	WEC	1.9165
CBM-W2	CBM-W2	22.1539
NY	NY	0.8135
CBM-W1	CBM-W1	23.9191
TVA	TVA	1.9446
O-066	O-066	9.5357
CBM-S1	CBM-S1	10.8460
G-007	G-007	1.4716
MADISON	MADISON	10.7110
MEC	MEC	7.6526
CATAWBA	CATAWBA	0.0364

Affected Systems

28 Affected Systems

28.1 LG&E

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

28.2 MISO

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

28.3 TVA

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

28.4 Duke Energy Progress

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

28.5 NYISO

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

29 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_P1-2_#8905-A	CONTINGENCY 'AEP_P1-2_#8905-A' OPEN BRANCH FROM BUS 243217 TO BUS 945390 CKT 1 / 243217 05DEQUIN 345 945390 AF1-204 TAP 345 1 END
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_P4_#8167_05OLIVE	CONTINGENCY 'AEP_P4_#8167_05OLIVE' OPEN BRANCH FROM BUS 243229 TO BUS 274804 CKT 1 / 243229 05OLIVE 345 274804 UNIV PK N;RP 345 1 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2 / 243229 05OLIVE 345 243353 05OLIVE 138 2 END
AEP_P1-2_#8807	CONTINGENCY 'AEP_P1-2_#8807' OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2 END
AEP_P4_#8165_05OLIVE 345_B1	CONTINGENCY 'AEP_P4_#8165_05OLIVE 345_B1' OPEN BRANCH FROM BUS 945100 TO BUS 243229 CKT 1 / 945100 AF1-175 TAP 345 243229 05OLIVE 345 1 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2 / 243229 05OLIVE 345 243353 05OLIVE 138 2 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
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_#11219	CONTINGENCY 'AEP_P1-2_#11219' OPEN BRANCH FROM BUS 243207 TO BUS 255204 CKT N1 / 243207 05GRNTWN 765 255204 17REYNOLDS 765 N1 END

Contingency Name	Contingency Definition
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 945390 CKT 1 / 243217 05DEQUIN 345 945390 AF1-204 TAP 345 1 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_#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_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_#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
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 255205 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
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

Short Circuit

30 Short Circuit

The following Breakers are overduty:

None