



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF1-215
REYNOLDS-OLIVE 345 KV
180 MW Capacity / 300 MW Energy**

January, 2020

Table of Contents

1	Preface.....	4
2	General.....	6
2.1	Point of Interconnection	7
2.2	Cost Summary.....	7
3	Transmission Owner Scope of Work.....	8
4	Attachment Facilities	8
5	Direct Connection Cost Estimate.....	8
6	Non-Direct Connection Cost Estimate.....	8
7	Incremental Capacity Transfer Rights (ICTRs)	9
8	Schedule.....	9
9	Interconnection Customer Requirements.....	9
10	Revenue Metering and SCADA Requirements	10
10.1	PJM Requirements	10
10.2	AEP Requirements.....	10
11	Network Impacts.....	11
12	Generation Deliverability	13
13	Multiple Facility Contingency	13
14	Contribution to Previously Identified Overloads	13
15	Potential Congestion due to Local Energy Deliverability.....	13
16	System Reinforcements.....	15
17	Flow Gate Details	17
17.1	Index 1	18
17.2	Index 2	21
17.3	Index 3	24
17.4	Index 4	27
17.5	Index 5	31
17.6	Index 6	36
18	Affected Systems	39
18.1	LG&E.....	39
18.2	MISO	39
18.3	TVA.....	39

18.4	Duke Energy Progress.....	39
18.5	NYISO	39
19	Contingency Descriptions.....	40
20	Short Circuit.....	43
21	Network Impacts – Secondary POI	45
22	Generation Deliverability.....	47
23	Multiple Facility Contingency	47
24	Contribution to Previously Identified Overloads	47
25	Potential Congestion due to Local Energy Deliverability	47
26	Flow Gate Details.....	49
26.1	Index 1.....	50
26.2	Index 2.....	53
26.3	Index 3.....	56
26.4	Index 4.....	60
26.5	Index 5.....	65
27	Affected Systems	68
27.1	LG&E.....	68
27.2	MISO	68
27.3	TVA	68
27.4	Duke Energy Progress.....	68
27.5	NYISO	68
28	Contingency Descriptions.....	69
29	Short Circuit	72

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 Solar generating facility located in Starke County, IN. The installed facilities will have a total capability of 300 MW with 180 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 5/31/2021. This study does not imply a TO commitment to this in-service date.

The objective of this Feasibility Study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required for maintaining the reliability of the AEP transmission system.

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

Queue Number	AF1-215
Project Name	REYNOLDS-OLIVE 345 KV
State	Indiana
County	Starke
Transmission Owner	AEP
MFO	300
MWE	300
MWC	180
Fuel	Solar
Basecase Study Year	2023

2.1 Point of Interconnection

AF1-215 will interconnect with the AEP transmission system tapping the Reynolds to Olive 345kV line circuit 2.

To accommodate the interconnection on the Reynolds to Olive 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 (see Figure 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

2.2 Cost Summary

This project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$350,000
Direct Connection Network Upgrade	\$8,000,000
Non Direct Connection Network Upgrades	\$1,900,000
Total Costs	\$10,250,000

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

Description	Total Cost
System Upgrades	\$43,335,840

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
Construct a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus (See Figure 1). Installation of associated protection and control equipment, 345 kV line risers and SCADA will also be required.	\$8,000,000
Total Direct Connection Facility Costs	\$8,000,000

6 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Upgrade line protections & Controls at the 345kV remote end Substation #1	\$350,000
Upgrade line protections & Controls at the 345kV remote end Substation #2	\$350,000
345 kV Transmission Line Cut In	\$1,200,000
Total Non-Direct Connection Facility Costs	\$1,900,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

8 Schedule

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

9 Interconnection Customer Requirements

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to AEP's 345kV Facilities are not included in this report; these are assumed to be the Interconnection Customer's responsibility.

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

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.
2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

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

10.2 AEP Requirements

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

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

11 Network Impacts

The Queue Project AF1-215 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Reynolds to Olive 345kV line circuit 2 in the AEP area. Project AF1-215 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-215 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)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE T LOADIN G %	POST PROJE T LOADIN G %	AC DC	MW IMPACT
44792109	243229	05OLIVE	345.0	AEP	270771	GREENACRE; T	345.0	CE	1	COMED_P4_023-65-BT4-5	breaker	971.0	99.18	100.0	DC	16.64

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE T LOADIN G %	POST PROJE T LOADIN G %	AC DC	MW IMPACT
43535287	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_112-65-BT4-5	breaker	971.0	127.64	128.38	DC	15.19
43535288	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_112-65-BT3-4	breaker	971.0	127.64	128.38	DC	15.19
43535230	243918	05ELDERBERRY	345.0	AEP	938670	AE1-089 TAP	345.0	AEP	1	AEP_P4_#8165_05 OLIVE 345_B1	breaker	1409.0	123.56	130.79	DC	101.46
41031353	256583	18MOROCCO	345.0	METC	238530	02ALLEN	345.0	ATSI	1	ATSI-P7-1-TE-345-022T	tower	1793.0	173.91	174.49	DC	23.5
41627168	256583	18MOROCCO	345.0	METC	238530	02ALLEN	345.0	ATSI	1	ATSI-P2-3-TE-345-033T	breaker	1793.0	134.37	134.82	DC	18.04
41031330	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P7-1-TE-138-025T-A	tower	1244.0	239.33	239.39	DC	20.36
41626894	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P2-3-TE-345-023T	breaker	1244.0	215.04	215.3	DC	18.82
41626895	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P2-3-TE-345-022T	breaker	1244.0	214.96	215.17	DC	18.82
43535250	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8165_05 OLIVE 345_B1	breaker	1409.0	115.29	122.52	DC	101.46
43535251	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8167_05 OLIVE	breaker	1409.0	100.58	106.17	DC	78.56

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 LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
43535656	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P1-2_695_B2	operation	971.0	127.6	128.35	DC	15.18
43535713	243918	05ELDERBERRY	345.0	AEP	938670	AE1-089 TAP	345.0	AEP	1	AEP_P1-2_#671	operation	1409.0	94.97	101.19	DC	87.38
41307627	256583	18MOROCCO	345.0	METC	238530	02ALLEN	345.0	ATSI	1	ATSI-P1-2-TE-345-601T	operation	1793.0	134.33	134.79	DC	18.03
41307253	264612	19MON12	345.0	ITCT	241901	02LALLENDO RF	345.0	ATSI	1	ATSI-P1-2-TE-345-605T	operation	1244.0	214.95	215.16	DC	18.82
43535682	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P1-2_#11219	operation	1409.0	99.25	104.67	DC	76.33

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
41626894,41626895, 41031330	5	19MON12 345.0 kV - 02LALLENDORF 345.0 kV Ckt 1	TE-014B (135) : Reconductor the Lallendorf-Monroe 345 kV line and the line drop at Lallendorf with 1272 ACSS 45/7 bundled (2 conductor per phase) with OPGW. Replace the wave trap with a new 4500 Amp unit. Replace the substation conductor at Lallendorf with 1590 ACSS bundled (2 conductor per phase). Replace the bitronics meter with a 15 Amp SATEC PM174 unit. Change relay settings for the SEL 421 at Lallendorf to meet a Summer Normal rating of 3171 MVA and Summer emergency rating of 3171 MVA. ITC would need to replace their section of limiting conductor and provide estimates for their replacement. Project Type : FAC Cost : \$18,373,500 Time Estimate : 30.0 Months NonPJMArea (443) : The external (i.e. Non-PJM) Transmission Owner, ITCT, will not evaluate this violation until the impact study phase.	\$18,373,500
43535251,43535250	6	AE1-089 TAP 345.0 kV - 05DUMONT 345.0 kV Ckt 1	AEP_AE1_REF_r0040 (208) : 1) A Sag Study will be required on the 7.0 miles of conductor to mitigate the overload. The new ratings after sag study will be: S/N: 1409 MVA, S/E: 1888 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$28,000(no remediation required, just sag study) and \$14.0 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$28,000 Time Estimate : 6-12 Months	\$28,000
43535230	3	05ELDERBRYSS 345.0 kV - AE1-089 TAP 345.0 kV Ckt 1	AEP_AE1_REF_r0021 (187) : A Sag Study will be required on the 7.2 miles of ACSR ~ 954 ~ 45/7 ~ RAIL - Conductor section 1 conductor to mitigate the overload. The new ratings after sag study will be: S/N: 1409 MVA, S/E: 1888 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$28,800 (no remediation required, just sag study) and \$14.4million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$28,000 Time Estimate : 6-12 Months	\$28,000

ID	Index	Facility	Upgrade Description	Cost
41031353,41627168	4	18MOROCCO 345.0 kV - 02ALLEN 345.0 kV Ckt 1	TE-007A (126) : Build new Line exit at Allen Junction 345kV substation for the new (2nd) Allen Junction-Morocco 345kV line. Install new 345kV Breaker, Metering, Disconnect Switches and Protection Relaying. New Line will be built and owned by ITC. ITC has indicated that the new line rating will be 2036 MVA SN / 2298 MVA SE and plans to use the same size conductor as the existing Allen Junction-Morocco 345kV line. Project Type : FAC Cost : \$3,343,900 Time Estimate : 9.0 Months NonPJMArea (443) : The external (i.e. Non-PJM) Transmission Owner, METC, will not evaluate this violation until the impact study phase.	\$3,343,900
44792109	1	05OLIVE 345.0 kV - GREENACRE; T 345.0 kV Ckt 1	AEP_AE1_REF_r0005: Replace ACSR/PE 1414 62/19 - Conductor Section 1. A Sag Study will be required on the 40.64 miles of conductor to mitigate the overload. The new ratings after sag study will be: S/N: 971 MVA, S/E: 1419 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$162,560 (no remediation required, just sag study) and \$81.28 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$162,560 Time Estimate : 6-12 Months	\$162,560
43535287,43535288	2	05OLIVE 345.0 kV - UNIV PK N;RP 345.0 kV Ckt 1	ce-001 (13) : AEP owns limit on L97008. CE has a sag limit on 2 types of conductors as well. CE would need to address sag limit of 2 types of conductors to reach required rating. A preliminary estimate for sag mitigation is \$21.4M with an estimated construction timeline of 30 months. Upon completion of the sag mitigation the new ratings will become 1091/1399/1483/1674 MVA SN/SLTE/SSTE/SLD. Project Type : FAC Cost : \$21,400,000 Time Estimate : 30.0 Months n4057 (173) : A Sag Study will be required on the 40.64 miles of ACSR/PE 1414 62/19 conductor to mitigate the overload. The new ratings after sag study will be: S/N: 971 MVA, S/E: 1419 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between \$162,560 (no remediation required, just sag study) and \$81.28 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$162,440 Time Estimate : 6-12 Months	\$21,562,440
			TOTAL COST	\$43,335,840

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
44792109	243229	05OLIVE	AEP	270771	GREENACRE; T	CE	1	COMED_P4_023-65-BT4-5	breaker	971.0	99.18	100.0	DC	16.64

Bus #	Bus	MW Impact
276165	Z1-106 BAT2	0.8459
276166	Z1-106 BAT1	0.8458
276171	Z1-107 BAT	1.7238
276172	Z1-108 BAT	1.6664
918052	AA1-018 E OP	-9.0237
920273	AA2-123 BAT	1.6350
938671	AE1-089 C	6.9519
938672	AE1-089 E	9.5432
939683	AE1-198 BAT	15.0188
939733	AE1-204 BAT (Withdrawn : 11/18/2019)	0.3706
940261	AE2-008	4.2568
941732	AE2-173 BAT	3.3820
942883	AE2-307 BAT	6.9690
942913	AE2-310 BAT	3.5524
943383	AF1-009 BAT	1.9980
943403	AF1-011 BAT	2.2137
943423	AF1-013 BAT	1.9980
943803	AF1-048 BAT	4.2611
943922	AF1-060 BAT	0.9379
945352	AF1-200 NFTW	96.4303
945501	AF1-215 C O1	4.4981
945502	AF1-215 E O1	2.9987
946163	AF1-281 BAT	1.5148
946533	AF1-317 BAT	3.8055
946683	AF1-332 BAT	3.8055
950311	G934 C	1.7769
950312	G934 E	7.1076
950351	J466	1.6725
950791	J201 C	0.2266
950792	J201 E	0.9064
950871	J246 C	0.0822
950872	J246 E	0.3287
950942	J325 E	0.2219
951531	J533 C	2.3476
951532	J533 E	9.3904
951571	J538 C	1.6356
951572	J538 E	6.5424
951941	J602 C	1.7790
951942	J602 E	9.6250
952161	J571	0.3745
952201	J589 C	1.8165
952202	J589 E	9.8275

Bus #	Bus	MW Impact
952312	J646 E	0.0875
952401	J752 C	0.8727
952402	J752 E	4.7213
952611	J717 C	1.7946
952612	J717 E	9.7092
952761	J728 C	1.6689
952762	J728 E	9.0415
952881	J758	11.5300
952971	J793	72.3002
953071	J794 C	0.1129
953072	J794 E	0.6107
953271	J701 C	0.4281
953272	J701 E	2.3159
953291	J796	13.6732
953321	J799	10.0397
953361	J806	8.4736
953421	J841	40.1404
953771	J832	5.8490
953781	J833	5.3030
953811	J839	5.4970
953941	J857	7.1509
954111	J875	8.1195
954381	J906 C	0.9469
954382	J906 E	5.1231
954591	J937	32.1160
955021	J978 C	0.9301
955022	J978 E	5.0319
955071	J984 C	1.8480
955072	J984 E	9.9980
955121	J989	4.4888
955181	J996	4.2360
955261	J1005	11.4440
955341	J1013	4.4664
955351	J1014 C	2.7800
955352	J1014 E	1.6680
955591	J1043 C	1.2060
955592	J1043 E	21.3703
955621	J1046	2.5865
955721	J1056 C	1.6389
955722	J1056 E	8.8671
955781	J1062	10.3460
955801	J1064 C	1.8923
955802	J1064 E	10.2377
955811	J1065 C	1.8374
955812	J1065 E	9.9406
955831	J1068 C	1.6639
955832	J1068 E	9.0021
955861	J1071	6.0450
955961	J1083	3.9543
956011	J1088	8.5575
956021	J1089	9.6900
956031	J1090	5.0310

Bus #	Bus	MW Impact
956161	J1103	1.1200
956291	J1117	4.5160
956301	J1119	33.4680
956741	J1172	2.8245
956751	J1173	4.3088
956801	J1178	3.6719
DUCKCREEK	DUCKCREEK	7.4157
LGEE	LGEE	0.3737
NEWTON	NEWTON	1.5827
CPL	CPL	0.4439
FARMERCITY	FARMERCITY	0.2600
G-007A	G-007A	3.1215
VFT	VFT	8.4044
PRAIRIE	PRAIRIE	6.2999
COFFEEN	COFFEEN	1.5152
CBM-S2	CBM-S2	2.8149
EDWARDS	EDWARDS	2.4455
TILTON	TILTON	0.8385

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
43535288	243229	05OLIVE	AEP	274804	UNIV PK N;RP	CE	1	COMED_P4_112-65-BT3-4__	breaker	971.0	127.64	128.38	DC	15.19

Bus #	Bus	MW Impact
276153	W2-048 E	-0.6480
276165	Z1-106 BAT2	1.0368
276166	Z1-106 BAT1	1.0367
276171	Z1-107 BAT	2.2022
276172	Z1-108 BAT	2.0414
909052	X2-022 E	-9.3707
918052	AA1-018 E OP	-12.3149
920273	AA2-123 BAT	2.0020
938671	AE1-089 C	6.2578
938672	AE1-089 E	8.5904
939683	AE1-198 BAT	5.5402
939733	AE1-204 BAT (Withdrawn : 11/18/2019)	0.4539
940261	AE2-008	3.8318
941732	AE2-173 BAT	4.0990
942883	AE2-307 BAT	8.2642
942913	AE2-310 BAT	4.2988
943383	AF1-009 BAT	2.4450
943403	AF1-011 BAT	2.7042
943423	AF1-013 BAT	2.4450
943803	AF1-048 BAT	5.2174
943922	AF1-060 BAT	1.1471
945352	AF1-200 NFTW	222.1800
945501	AF1-215 C O1	4.1048
945502	AF1-215 E O1	2.7365
946163	AF1-281 BAT	1.8510
946533	AF1-317 BAT	4.6475
946683	AF1-332 BAT	4.6475
950311	G934 C	1.9947
950312	G934 E	7.9788
950351	J466	1.8999
950791	J201 C	0.2566
950792	J201 E	1.0266
950871	J246 C	0.0924
950872	J246 E	0.3696
950942	J325 E	0.2522
951531	J533 C	2.6400
951532	J533 E	10.5600
951571	J538 C	1.8837
951572	J538 E	7.5348
951811	J513 C	0.8217
951812	J513 E	4.4455

Bus #	Bus	MW Impact
951941	J602 C	2.0124
951942	J602 E	10.8876
952161	J571	0.4273
952201	J589 C	2.0467
952202	J589 E	11.0733
952312	J646 E	0.0997
952401	J752 C	0.9906
952402	J752 E	5.3594
952581	J740 C	1.8458
952582	J740 E	9.9862
952611	J717 C	2.0268
952612	J717 E	10.9657
952761	J728 C	1.8849
952762	J728 E	10.2115
952881	J758	13.1480
952971	J793	82.4267
953071	J794 C	0.1273
953072	J794 E	0.6888
953161	J837 C	1.8467
953162	J837 E	9.9912
953171	J838 C	0.9229
953172	J838 E	4.9931
953271	J701 C	0.4858
953272	J701 E	2.6282
953291	J796	15.4561
953321	J799	11.5120
953361	J806	9.6671
953421	J841	45.3773
953771	J832	6.5860
953781	J833	6.0830
953811	J839	6.2610
953941	J857	8.1580
954111	J875	9.3045
954381	J906 C	1.0594
954382	J906 E	5.7316
954421	J913 C	9.4656
954591	J937	36.3372
954751	J351	36.4626
954941	J968 C	1.8458
954942	J968 E	9.9862
955021	J978 C	1.0433
955022	J978 E	5.6447
955071	J984 C	2.0745
955072	J984 E	11.2235
955121	J989	5.0952
955141	J992	10.6440
955181	J996	4.8688
955261	J1005	12.9340
955341	J1013	5.1880
955351	J1014 C	3.1735
955352	J1014 E	1.9041
955591	J1043 C	1.3484

Bus #	Bus	MW Impact
955592	J1043 E	23.8936
955621	J1046	2.9770
955721	J1056 C	1.8826
955722	J1056 E	10.1854
955781	J1062	11.9080
955801	J1064 C	2.1141
955802	J1064 E	11.4379
955811	J1065 C	2.0658
955812	J1065 E	11.1762
955821	J1067	12.4248
955831	J1068 C	1.9069
955832	J1068 E	10.3171
955841	J1069 C	1.8458
955842	J1069 E	9.9862
955861	J1071	6.7680
955961	J1083	4.5045
956011	J1088	9.6855
956021	J1089	10.9667
956031	J1090	5.7375
956161	J1103	1.2710
956251	J1112	8.3070
956291	J1117	5.1400
956301	J1119	38.1720
956741	J1172	3.2005
956751	J1173	4.9400
956801	J1178	4.1828
DUCKCREEK	DUCKCREEK	9.0174
LGEE	LGEE	0.5209
NEWTON	NEWTON	1.7933
CPL	CPL	0.5854
FARMERCITY	FARMERCITY	0.3148
G-007A	G-007A	3.9343
VFT	VFT	10.5909
PRAIRIE	PRAIRIE	7.4494
COFFEEN	COFFEEN	1.7943
CBM-S2	CBM-S2	3.8379
EDWARDS	EDWARDS	2.9792
TILTON	TILTON	0.9072

17.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
43535230	243918	05ELDERBERRY	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	123.56	130.79	DC	101.46

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
945421	AF1-207 C O1	2.3133
945422	AF1-207 E O1	9.8619
945501	AF1-215 C O1	60.8760
945502	AF1-215 E O1	40.5840
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

17.4 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
41031353	256583	18MOROCCO	METC	238530	02ALLEN	ATSI	1	ATSI-P7-1-TE-345-022T	tower	1793.0	173.91	174.49	DC	23.5

Bus #	Bus	MW Impact
243071	05BERRINSP G	0.0939
243440	05CKG1	15.5230
244357	05GRANGER EL	-0.2443
244412	05WTRV SLR C	0.0387
247528	05COVRT1	4.9078
247529	05COVRT2	4.9078
247530	05COVRT3	4.9078
247531	05COVRT4	2.9456
247532	05COVRT5	2.9456
247533	05COVRT6	2.9456
247604	X1-042	0.0519
247651	AA2-116	102.6603
247966	05WTRV SLR E	0.2773
247967	05OLIV SLR E	0.1969
247969	Z2-116 E	0.1056
274788	SE CHICAG;5U (Deativation : 06/01/20)	2.4316
274789	SE CHICAG;6U (Deativation : 06/01/20)	2.4380
274790	SE CHICAG;7U (Deativation : 06/01/20)	2.4701
274791	SE CHICAG;8U (Deativation : 06/01/20)	2.4701
274792	SE CHICAG;9U (Deativation : 06/01/20)	2.4753
274793	SE CHICAG;0U (Deativation : 06/01/20)	2.4753
274794	SE CHICAG;1U (Deativation : 06/01/20)	2.4753
274795	SE CHICAG;2U (Deativation : 06/01/20)	2.4753
910542	X3-005 E	0.3542
925961	AC1-072	0.4553
926581	AC1-141	7.9887
931951	AB1-107 1	-41.7460
931961	AB1-107 2	-73.4084
932931	AC2-117	2.9348
933281	AC2-140 C	2.7416
933282	AC2-140 E	0.1443
934252	AD1-052 E1	-0.7146
934262	AD1-052 E2	-0.7146
936141	AD2-020 C O1	6.8517
936142	AD2-020 E O1	4.2173
936601	AD2-075	23.6466
936631	AD2-079 C O1	0.9733
936632	AD2-079 E O1	0.6489
938261	AE1-039	0.0991
938671	AE1-089 C	9.6216

Bus #	Bus	MW Impact
938672	AE1-089 E	13.2081
939391	AE1-170 C O1	6.6244
939392	AE1-170 E O1	9.1480
939631	AE1-193 C	4.2183
939632	AE1-193 E	28.2304
939641	AE1-194 C	4.2183
939642	AE1-194 E	28.2304
939651	AE1-195 C	4.2183
939652	AE1-195 E	28.2304
939681	AE1-198 C	12.5252
939682	AE1-198 E	10.6432
940261	AE2-008	5.8915
942681	AE2-284	7.8862
943001	AE2-323 C	4.4122
943002	AE2-323 E	2.1634
943021	AE2-325 C	3.4701
943022	AE2-325 E	2.3079
943781	AF1-046 C	1.0915
943782	AF1-046 E	0.7277
944161	AF1-084 C	6.1972
944162	AF1-084 E	3.5396
944931	AF1-158 C O1	3.7816
944932	AF1-158 E O1	2.5211
944961	AF1-161 C	2.7672
944962	AF1-161 E	2.7672
945101	AF1-175 C O1	9.4529
945102	AF1-175 E O1	6.3019
945111	AF1-176 C O1	16.1253
945112	AF1-176 E O1	14.9487
945501	AF1-215 C O1	6.3526
945502	AF1-215 E O1	4.2351
950311	G934 C	4.8675
950312	G934 E	19.4700
950351	J466	7.5000
950791	J201 C	0.9061
950792	J201 E	3.6243
950871	J246 C	0.2458
950872	J246 E	0.9834
950942	J325 E	1.0296
951531	J533 C	7.0240
951532	J533 E	28.0960
951571	J538 C	8.5143
951572	J538 E	34.0572
951941	J602 C	6.7673
951942	J602 E	36.6127
952161	J571	0.7224
952201	J589 C	5.7910
952202	J589 E	31.3310
952312	J646 E	0.4450
952401	J752 C	3.8226
952402	J752 E	20.6814
952611	J717 C	6.3908

Bus #	Bus	MW Impact
952612	J717 E	34.5757
952761	J728 C	5.9433
952762	J728 E	32.1979
952881	J758	31.2960
952971	J793	366.8550
953071	J794 C	0.3791
953072	J794 E	2.0509
953271	J701 C	1.8618
953272	J701 E	10.0727
953291	J796	50.7803
953321	J799	65.8930
953361	J806	28.6110
953421	J841	149.6243
953771	J832	17.7620
953781	J833	36.0610
953811	J839	27.0090
953941	J857	22.0487
954111	J875	49.4355
954381	J906 C	1.8486
954382	J906 E	10.0014
954591	J937	47.3368
955021	J978 C	2.3359
955022	J978 E	12.6381
955071	J984 C	5.0622
955072	J984 E	27.3878
955121	J989	19.1864
955181	J996	32.4176
955261	J1005	42.4780
955341	J1013	11.2056
955351	J1014 C	12.5440
955352	J1014 E	7.5264
955591	J1043 C	2.7668
955592	J1043 E	49.0277
955621	J1046	14.6265
955721	J1056 C	12.5901
955722	J1056 E	68.1159
955781	J1062	58.5060
955801	J1064 C	3.9970
955802	J1064 E	21.6250
955811	J1065 C	5.2485
955812	J1065 E	28.3955
955831	J1068 C	10.4938
955832	J1068 E	56.7742
955861	J1071	12.4790
955961	J1083	14.7707
956011	J1088	32.1165
956021	J1089	36.7030
956031	J1090	21.3102
956161	J1103	4.8712
956291	J1117	17.4264
956301	J1119	142.8540
956741	J1172	11.5315

Bus #	Bus	MW Impact
956751	J1173	27.5824
956801	J1178	13.7156
LGEE	LGEE	1.6579
CPL	CPL	0.3222
WEC	WEC	2.1568
CBM-W2	CBM-W2	31.8181
NY	NY	1.1934
CBM-W1	CBM-W1	197.2577
TVA	TVA	3.6946
O-066	O-066	12.9360
CBM-S2	CBM-S2	5.1789
CBM-S1	CBM-S1	22.9103
G-007	G-007	1.9874
MADISON	MADISON	7.8120
MEC	MEC	9.0621

17.5 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
41031330	264612	19MON12	ITCT	241901	02LALLENDORF	ATSI	1	ATSI-P7-1-TE-138-025T-A	tower	1244.0	239.33	239.39	DC	20.36

Bus #	Bus	MW Impact
244357	05GRANGER EL	-0.1884
244412	05WTRV SLR C	0.0333
247528	05COVRT1	4.2120
247529	05COVRT2	4.2120
247530	05COVRT3	4.2120
247531	05COVRT4	2.5280
247532	05COVRT5	2.5280
247533	05COVRT6	2.5280
247604	X1-042	0.0446
247651	AA2-116	75.1876
247966	05WTRV SLR E	0.2383
247967	05OLIV SLR E	0.1700
247969	Z2-116 E	0.0911
274788	SE CHICAG;5U (Deativation : 06/01/20)	2.1081
274789	SE CHICAG;6U (Deativation : 06/01/20)	2.1137
274790	SE CHICAG;7U (Deativation : 06/01/20)	2.1415
274791	SE CHICAG;8U (Deativation : 06/01/20)	2.1415
274792	SE CHICAG;9U (Deativation : 06/01/20)	2.1461
274793	SE CHICAG;0U (Deativation : 06/01/20)	2.1461
274794	SE CHICAG;1U (Deativation : 06/01/20)	2.1461
274795	SE CHICAG;2U (Deativation : 06/01/20)	2.1461
274881	PILOT HIL;1E	7.5410
275149	KELLYCK ;1E	7.5410
276169	Z1-107 E	1.0639
294392	P-010 E	2.4582
910542	X3-005 E	0.3072
925961	AC1-072	0.3907
926581	AC1-141	6.8834
927091	AC1-204 1	29.5652
927101	AC1-204 2	29.5605
927451	AC1-142A 1	1.7038
927461	AC1-142A 2	1.7038
930501	AB1-091 O1	29.6442
931951	AB1-107 1	-33.9244
931961	AB1-107 2	-110.3845
932601	AC2-080 C O1	1.3835
932602	AC2-080 E O1	9.2585
932931	AC2-117	2.5446
933281	AC2-140 C	2.3734
933282	AC2-140 E	0.1249

Bus #	Bus	MW Impact
933411	AC2-154 C	1.0234
933412	AC2-154 E	1.6698
934252	AD1-052 E1	-0.5409
934262	AD1-052 E2	-0.5409
934721	AD1-100 C	7.9535
934722	AD1-100 E	37.1161
936141	AD2-020 C O1	4.9995
936142	AD2-020 E O1	3.0772
936371	AD2-047 C O1	1.8314
936372	AD2-047 E O1	8.9415
936461	AD2-060	0.5710
936601	AD2-075	20.2942
936631	AD2-079 C O1	0.8397
936632	AD2-079 E O1	0.5598
937041	AD2-138 C	1.8730
937042	AD2-138 E	8.7690
937321	AD2-175 C (Withdrawn : 12/10/2019)	6.6295
937322	AD2-175 E (Withdrawn : 12/10/2019)	4.4197
937401	AD2-194 1	3.1793
937411	AD2-194 2	3.1788
938261	AE1-039	0.0852
938511	AE1-070 1	3.7357
938521	AE1-070 2	3.4172
938671	AE1-089 C	8.3201
938672	AE1-089 E	11.4214
939351	AE1-166 C O1	2.2032
939352	AE1-166 E O1	2.0337
939391	AE1-170 C O1	4.8447
939392	AE1-170 E O1	6.6903
939631	AE1-193 C	3.6564
939632	AE1-193 E	24.4701
939641	AE1-194 C	3.6564
939642	AE1-194 E	24.4701
939651	AE1-195 C	3.6564
939652	AE1-195 E	24.4701
939681	AE1-198 C	10.8568
939682	AE1-198 E	9.2255
940261	AE2-008	5.0946
940581	AE2-045 C O1	6.2788
940582	AE2-045 E O1	8.6200
940621	AE2-049 C O1	1.9652
940622	AE2-049 E O1	1.3101
940631	AE2-050 C O1	2.5604
940632	AE2-050 E O1	1.7069
940752	AE2-062 E	0.0283
940762	AE2-063 E	0.0283
941551	AE2-152 C O1	2.5422
941552	AE2-152 E O1	1.6948
941561	AE2-153 C O1	1.8900
941562	AE2-153 E O1	8.8489
942681	AE2-284	3.0568
942881	AE2-307 C O1	4.6941

Bus #	Bus	MW Impact
942882	AE2-307 E O1	1.7069
942911	AE2-310 C O1	1.9082
942912	AE2-310 E O1	0.5127
943001	AE2-323 C	3.8881
943002	AE2-323 E	1.9064
943021	AE2-325 C	1.3420
943022	AE2-325 E	0.8925
943781	AF1-046 C	0.9619
943782	AF1-046 E	0.6412
944161	AF1-084 C	2.3965
944162	AF1-084 E	1.3688
944911	AF1-156 C	2.5612
944912	AF1-156 E	1.7075
944931	AF1-158 C O1	3.2647
944932	AF1-158 E O1	2.1765
944961	AF1-161 C	1.0702
944962	AF1-161 E	1.0702
945101	AF1-175 C O1	3.6698
945102	AF1-175 E O1	2.4465
945111	AF1-176 C O1	6.2118
945112	AF1-176 E O1	5.7585
945351	AF1-200 FTIR	67.1721
945501	AF1-215 C O1	5.5044
945502	AF1-215 E O1	3.6696
946521	AF1-316 C O1	1.4743
946522	AF1-316 E O1	2.2114
950311	G934 C	4.3998
950312	G934 E	17.5992
950351	J466	7.2879
950791	J201 C	0.8608
950792	J201 E	3.4430
950871	J246 C	0.2252
950872	J246 E	0.9007
950942	J325 E	1.0051
951531	J533 C	6.4336
951532	J533 E	25.7344
951941	J602 C	6.3289
951942	J602 E	34.2411
952161	J571	0.4900
952201	J589 C	5.3352
952202	J589 E	28.8648
952312	J646 E	0.4419
952401	J752 C	3.7023
952402	J752 E	20.0307
952611	J717 C	5.9975
952612	J717 E	32.4478
952761	J728 C	5.5775
952762	J728 E	30.2163
952881	J758	20.3460
952971	J793	363.3782
953071	J794 C	0.3523
953072	J794 E	1.9059

Bus #	Bus	MW Impact
953271	J701 C	1.8013
953272	J701 E	9.7455
953291	J796	47.7904
953321	J799	53.4001
953361	J806	17.9590
953421	J841	141.4319
953771	J832	16.2900
953781	J833	27.4140
953811	J839	26.5970
953941	J857	13.1222
954111	J875	13.9350
954381	J906 C	1.5403
954382	J906 E	8.3337
954591	J937	34.0956
955021	J978 C	2.0531
955022	J978 E	11.1079
955071	J984 C	4.5758
955072	J984 E	24.7562
955121	J989	17.9504
955261	J1005	40.1780
955351	J1014 C	7.6465
955352	J1014 E	4.5879
955591	J1043 C	2.4246
955592	J1043 E	42.9639
955621	J1046	12.5920
955721	J1056 C	9.3597
955722	J1056 E	50.6383
955781	J1062	50.3680
955801	J1064 C	3.3790
955802	J1064 E	18.2810
955811	J1065 C	4.7365
955812	J1065 E	25.6255
955831	J1068 C	8.6050
955832	J1068 E	46.5550
955861	J1071	10.5550
955961	J1083	11.5626
956011	J1088	29.1885
956021	J1089	33.6532
956031	J1090	14.8194
956161	J1103	4.7130
956291	J1117	13.4128
956301	J1119	107.7900
956741	J1172	10.9190
956751	J1173	6.6416
956801	J1178	10.7367
LGEE	LGEE	1.4793
CPL	CPL	0.3036
WEC	WEC	1.8730
CBM-W2	CBM-W2	27.9443
NY	NY	1.0474
CBM-W1	CBM-W1	184.8102
TVA	TVA	3.2718

Bus #	Bus	MW Impact
O-066	O-066	11.3098
CBM-S2	CBM-S2	4.7280
CBM-S1	CBM-S1	20.3117
G-007	G-007	1.7368
MADISON	MADISON	6.6024
MEC	MEC	7.8942

17.6 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 LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
43535250	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	115.29	122.52	DC	101.46

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;OU	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
945421	AF1-207 C O1	2.3133
945422	AF1-207 E O1	9.8619
945501	AF1-215 C O1	60.8760
945502	AF1-215 E O1	40.5840
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

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_#671	CONTINGENCY 'AEP_P1-2_#671' OPEN BRANCH FROM BUS 243215 TO BUS 243229 CKT 1 / 243215 05COOK 345 243229 05OLIVE 345 1 END
ATSI-P2-3-TE-345-022T	CONTINGENCY 'ATSI-P2-3-TE-345-022T' /* ALLEN JCT BK-34531 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 /* 02ALLEN 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 239018 CKT 1 /* 02ALLEN 345 02FULTON 345 END
ATSI-P2-3-TE-345-023T	CONTINGENCY 'ATSI-P2-3-TE-345-023T' /* ALLEN JCT BK-34532 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 /* 02ALLEN 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 239344 CKT 3 /* 02ALLEN 345 02ALLEN-2 138 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_P4_#8165_05OLIVE 345_B1	CONTINGENCY 'AEP_P4_#8165_05OLIVE 345_B1' OPEN BRANCH FROM BUS 243215 TO BUS 243229 CKT 1 / 243215 05COOK 345 243229 05OLIVE 345 1 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2 / 243229 05OLIVE 345 243353 05OLIVE 138 2 END
ATSI-P7-1-TE-345-022T	CONTINGENCY 'ATSI-P7-1-TE-345-022T' /* Y1-069-MONROE/LEMOYNE-MAJ 345 DISCONNECT BRANCH FROM BUS 241901 TO BUS 264612 CKT 1 /* 02_Y1-069 345 19MON12 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 955620 CKT 1 /* 02LEMOYN 345 19MAJTC 345 END
COMED_P1-2_695_B2	CONTINGENCY 'COMED_P1-2_695_B2' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1 END
ATSI-P1-2-TE-345-601T	CONTINGENCY 'ATSI-P1-2-TE-345-601T' /*LINE OUTAGE: LALLEN
COMED_P4_112-65-BT3-4__	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END

Contingency Name	Contingency Definition
COMED_P4_023-65-BT4-5__	CONTINGENCY 'COMED_P4_023-65-BT4-5__' TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 / COLLI;2M 345 COLLI; 765 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 / COLLI;2M 345 COLLI; R 345 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 / COLLI;2M 345 COLLI;2C 33 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 END
ATSI-P1-2-TE-345-605T	CONTINGENCY 'ATSI-P1-2-TE-345-605T' /*LINE OUTAGE: AJ TO ITC MOROCCO DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 END
ATSI-P2-3-TE-345-033T	CONTINGENCY 'ATSI-P2-3-TE-345-033T' /* LALLEND
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
ATSI-P7-1-TE-138-025T-A	CONTINGENCY 'ATSI-P7-1-TE-138-025T-A' /* ALLEN-MAJ-MONROE & LEMO-MAJESTIC 345KV DISCONNECT BRANCH FROM BUS 264594 TO BUS 256583 CKT 1 /* 19LULU 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1 /* 19LULU 345 19MILAN 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 955720 CKT 1 /* 19LULU 345 J1056 TAP 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 955620 CKT 1 /* 02LEMOYN 345 19MAJTC 345 END
COMED_P4_112-65-BT4-5__	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END

Short Circuit

20 Short Circuit

The following Breakers are overduty

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

Secondary Point of Interconnection

21 Network Impacts – Secondary POI

The Queue Project AF1-215 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Reynolds to Olive 345 kV line circuit 1 in the AEP area. Project AF1-215 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-215 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

22 Generation Deliverability

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

None

23 Multiple Facility Contingency

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

None

24 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
43535286	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_023-65-BT2-3	breaker	971.0	116.34	117.11	DC	15.15
43535287	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_112-65-BT4-5	breaker	971.0	116.26	117.04	DC	15.15
43535288	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_112-65-BT3-4	breaker	971.0	116.26	117.04	DC	15.15
43535289	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P4_023-65-BT4-5	breaker	971.0	116.24	117.02	DC	15.15
43535230	243918	05ELDERBERRY	345.0	AEP	938670	AE1-089 TAP	345.0	AEP	1	AEP_P4_#8165_05 OLIVE 345_B1	breaker	1409.0	124.34	131.57	DC	101.13
41031353	256583	18MOROCCO	345.0	METC	238530	02ALLEN	345.0	ATSI	1	ATSI-P7-1-TE-345-022T	tower	1793.0	173.36	173.94	DC	23.49
41627168	256583	18MOROCCO	345.0	METC	238530	02ALLEN	345.0	ATSI	1	ATSI-P2-3-TE-345-033T	breaker	1793.0	134.3	134.75	DC	18.02
41031330	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P7-1-TE-138-025T-A	tower	1244.0	239.11	239.26	DC	20.35
41626894	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P2-3-TE-345-023T	breaker	1244.0	214.76	215.28	DC	18.8
41626895	264612	19MON12	345.0	ITCT	241901	02LALLEND ORF	345.0	ATSI	1	ATSI-P2-3-TE-345-022T	breaker	1244.0	214.6	215.12	DC	18.81
43535250	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8165_05 OLIVE 345_B1	breaker	1409.0	116.07	123.29	DC	101.13
43535251	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P4_#8167_05 OLIVE	breaker	1409.0	105.51	111.08	DC	78.3

25 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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
43535656	243229	05OLIVE	345.0	AEP	274804	UNIV PK N;RP	345.0	CE	1	COMED_P1-2_695_B2	operation	971.0	116.24	117.02	DC	15.14
51936031	243918	05ELDERBERRY	345.0	AEP	938670	AE1-089 TAP	345.0	AEP	1	AEP_P1-2_#671-B	operation	1409.0	95.86	102.08	DC	87.09
41307627	256583	18MOROCCO	345.0	MET C	238530	02ALLEN	345.0	ATSI	1	ATSI-P1-2-TE-345-601T	operation	1793.0	134.27	134.72	DC	18.02
41307253	264612	19MON12	345.0	ITCT	241901	02LALLENDO RF	345.0	ATSI	1	ATSI-P1-2-TE-345-605T	operation	1244.0	214.6	215.11	DC	18.81
43535682	938670	AE1-089 TAP	345.0	AEP	243219	05DUMONT	345.0	AEP	1	AEP_P1-2_#11219	operation	1409.0	103.6	109.02	DC	76.15

26 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.

26.1 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
43535289	243229	05OLIVE	AEP	274804	UNIV PK N;RP	CE	1	COMED_P4_023-65-BT4-5__	breaker	971.0	116.24	117.02	DC	15.15

Bus #	Bus	MW Impact
276153	W2-048 E	-0.6480
276165	Z1-106 BAT2	1.0363
276166	Z1-106 BAT1	1.0363
276171	Z1-107 BAT	2.2020
276172	Z1-108 BAT	2.0406
909052	X2-022 E	-9.3707
918052	AA1-018 E OP	-12.3149
920273	AA2-123 BAT	2.0012
938671	AE1-089 C	6.2578
938672	AE1-089 E	8.5904
939683	AE1-198 BAT	5.5402
939733	AE1-204 BAT (Withdrawn : 11/18/2019)	0.4538
940261	AE2-008	3.8318
941732	AE2-173 BAT	4.0995
942883	AE2-307 BAT	8.2635
942913	AE2-310 BAT	4.2988
943383	AF1-009 BAT	2.4438
943403	AF1-011 BAT	2.7033
943423	AF1-013 BAT	2.4438
943803	AF1-048 BAT	5.2153
943922	AF1-060 BAT	1.1467
945101	AF1-175 C O2	3.0264
945102	AF1-175 E O2	2.0176
945352	AF1-200 NFTW	107.4601
945501	AF1-215 C O2	4.0942
945502	AF1-215 E O2	2.7295
946163	AF1-281 BAT	1.8636
946533	AF1-317 BAT	4.6460
946683	AF1-332 BAT	4.6460
950311	G934 C	1.9944
950312	G934 E	7.9776
950351	J466	1.8993
950791	J201 C	0.2566
950792	J201 E	1.0262
950871	J246 C	0.0924
950872	J246 E	0.3695
950942	J325 E	0.2522
951531	J533 C	2.6396
951532	J533 E	10.5584
951571	J538 C	1.8834
951572	J538 E	7.5336

Bus #	Bus	MW Impact
951811	J513 C	0.8215
951812	J513 E	4.4447
951941	J602 C	2.0121
951942	J602 E	10.8859
952161	J571	0.4272
952201	J589 C	2.0464
952202	J589 E	11.0716
952312	J646 E	0.0997
952401	J752 C	0.9904
952402	J752 E	5.3586
952581	J740 C	1.8455
952582	J740 E	9.9845
952611	J717 C	2.0262
952612	J717 E	10.9623
952761	J728 C	1.8843
952762	J728 E	10.2084
952881	J758	13.1460
952971	J793	82.4135
953071	J794 C	0.1273
953072	J794 E	0.6887
953161	J837 C	1.8464
953162	J837 E	9.9895
953171	J838 C	0.9227
953172	J838 E	4.9923
953271	J701 C	0.4857
953272	J701 E	2.6278
953291	J796	15.4537
953321	J799	11.5101
953361	J806	9.6656
953421	J841	45.3703
953771	J832	6.5850
953781	J833	6.0810
953811	J839	6.2600
953941	J857	8.1567
954111	J875	9.3030
954381	J906 C	1.0592
954382	J906 E	5.7308
954421	J913 C	9.4640
954591	J937	36.3319
954751	J351	36.4555
954941	J968 C	1.8455
954942	J968 E	9.9845
955021	J978 C	1.0432
955022	J978 E	5.6438
955071	J984 C	2.0742
955072	J984 E	11.2218
955121	J989	5.0944
955141	J992	10.6420
955181	J996	4.8680
955261	J1005	12.9320
955341	J1013	5.1864
955351	J1014 C	3.1730

Bus #	Bus	MW Impact
955352	J1014 E	1.9038
955591	J1043 C	1.3482
955592	J1043 E	23.8901
955621	J1046	2.9765
955721	J1056 C	1.8823
955722	J1056 E	10.1837
955781	J1062	11.9060
955801	J1064 C	2.1138
955802	J1064 E	11.4362
955811	J1065 C	2.0654
955812	J1065 E	11.1746
955821	J1067	12.4224
955831	J1068 C	1.9066
955832	J1068 E	10.3154
955841	J1069 C	1.8455
955842	J1069 E	9.9845
955861	J1071	6.7670
955961	J1083	4.5031
956011	J1088	9.6840
956021	J1089	10.9650
956031	J1090	5.7366
956161	J1103	1.2708
956251	J1112	8.3055
956291	J1117	5.1392
956301	J1119	38.1660
956741	J1172	3.2000
956751	J1173	4.9392
956801	J1178	4.1814
DUCKCREEK	DUCKCREEK	9.0162
LGEE	LGEE	0.5209
NEWTON	NEWTON	1.7944
CPLE	CPLE	0.5854
FARMERCITY	FARMERCITY	0.3148
G-007A	G-007A	3.9343
VFT	VFT	10.5909
PRAIRIE	PRAIRIE	7.4494
COFFEEN	COFFEEN	1.7943
CBM-S2	CBM-S2	3.8379
EDWARDS	EDWARDS	2.9792
TILTON	TILTON	0.9072

26.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
43535230	243918	05ELDERBERRY	AEP	938670	AE1-089 TAP	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	124.34	131.57	DC	101.13

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;OU	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

26.3 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
41031353	256583	18MOROCCO	METC	238530	02ALLEN	ATSI	1	ATSI-P7-1-TE-345-022T	tower	1793.0	173.36	173.94	DC	23.49

Bus #	Bus	MW Impact
243071	05BERRINSP G	0.0939
243440	05CKG1	15.5230
244357	05GRANGER EL	-0.2443
244412	05WTRV SLR C	0.0387
247528	05COVRT1	4.9078
247529	05COVRT2	4.9078
247530	05COVRT3	4.9078
247531	05COVRT4	2.9456
247532	05COVRT5	2.9456
247533	05COVRT6	2.9456
247604	X1-042	0.0519
247651	AA2-116	102.6603
247966	05WTRV SLR E	0.2773
247967	05OLIV SLR E	0.1969
247969	Z2-116 E	0.1056
274788	SE CHICAG;5U (Deativation : 06/01/20)	2.4316
274789	SE CHICAG;6U (Deativation : 06/01/20)	2.4380
274790	SE CHICAG;7U (Deativation : 06/01/20)	2.4701
274791	SE CHICAG;8U (Deativation : 06/01/20)	2.4701
274792	SE CHICAG;9U (Deativation : 06/01/20)	2.4753
274793	SE CHICAG;0U (Deativation : 06/01/20)	2.4753
274794	SE CHICAG;1U (Deativation : 06/01/20)	2.4753
274795	SE CHICAG;2U (Deativation : 06/01/20)	2.4753
910542	X3-005 E	0.3542
925961	AC1-072	0.4553
926581	AC1-141	7.9887
931951	AB1-107 1	-41.7460
931961	AB1-107 2	-73.4084
932931	AC2-117	2.9348
933281	AC2-140 C	2.7416
933282	AC2-140 E	0.1443
934252	AD1-052 E1	-0.7146
934262	AD1-052 E2	-0.7146
936141	AD2-020 C O1	6.8517
936142	AD2-020 E O1	4.2173
936601	AD2-075	23.6466
936631	AD2-079 C O1	0.9733
936632	AD2-079 E O1	0.6489
938261	AE1-039	0.0991
938671	AE1-089 C	9.6216

Bus #	Bus	MW Impact
938672	AE1-089 E	13.2081
939391	AE1-170 C O1	6.6244
939392	AE1-170 E O1	9.1480
939631	AE1-193 C	4.2183
939632	AE1-193 E	28.2304
939641	AE1-194 C	4.2183
939642	AE1-194 E	28.2304
939651	AE1-195 C	4.2183
939652	AE1-195 E	28.2304
939681	AE1-198 C	12.5252
939682	AE1-198 E	10.6432
940261	AE2-008	5.8915
942681	AE2-284	7.8862
943001	AE2-323 C	4.4122
943002	AE2-323 E	2.1634
943021	AE2-325 C	3.4701
943022	AE2-325 E	2.3079
943781	AF1-046 C	1.0915
943782	AF1-046 E	0.7277
944161	AF1-084 C	6.1972
944162	AF1-084 E	3.5396
944931	AF1-158 C O2	3.7768
944932	AF1-158 E O2	2.5178
944961	AF1-161 C	2.7672
944962	AF1-161 E	2.7672
945101	AF1-175 C O2	3.7047
945102	AF1-175 E O2	2.4698
945111	AF1-176 C O2	16.2219
945112	AF1-176 E O2	15.0381
945501	AF1-215 C O2	6.3485
945502	AF1-215 E O2	4.2324
950311	G934 C	4.8675
950312	G934 E	19.4700
950351	J466	7.5000
950791	J201 C	0.9061
950792	J201 E	3.6243
950871	J246 C	0.2458
950872	J246 E	0.9834
950942	J325 E	1.0296
951531	J533 C	7.0240
951532	J533 E	28.0960
951571	J538 C	8.5143
951572	J538 E	34.0572
951941	J602 C	6.7673
951942	J602 E	36.6127
952161	J571	0.7224
952201	J589 C	5.7910
952202	J589 E	31.3310
952312	J646 E	0.4450
952401	J752 C	3.8226
952402	J752 E	20.6814
952611	J717 C	6.3908

Bus #	Bus	MW Impact
952612	J717 E	34.5757
952761	J728 C	5.9433
952762	J728 E	32.1979
952881	J758	31.2960
952971	J793	366.8550
953071	J794 C	0.3791
953072	J794 E	2.0509
953271	J701 C	1.8618
953272	J701 E	10.0727
953291	J796	50.7803
953321	J799	65.8930
953361	J806	28.6110
953421	J841	149.6243
953771	J832	17.7620
953781	J833	36.0610
953811	J839	27.0090
953941	J857	22.0487
954111	J875	49.4355
954381	J906 C	1.8486
954382	J906 E	10.0014
954591	J937	47.3368
955021	J978 C	2.3359
955022	J978 E	12.6381
955071	J984 C	5.0622
955072	J984 E	27.3878
955121	J989	19.1864
955181	J996	32.4176
955261	J1005	42.4780
955341	J1013	11.2056
955351	J1014 C	12.5440
955352	J1014 E	7.5264
955591	J1043 C	2.7670
955592	J1043 E	49.0312
955621	J1046	14.6265
955721	J1056 C	12.5901
955722	J1056 E	68.1159
955781	J1062	58.5060
955801	J1064 C	3.9970
955802	J1064 E	21.6250
955811	J1065 C	5.2485
955812	J1065 E	28.3955
955831	J1068 C	10.4938
955832	J1068 E	56.7742
955861	J1071	12.4790
955961	J1083	14.7707
956011	J1088	32.1180
956021	J1089	36.7030
956031	J1090	21.3102
956161	J1103	4.8712
956291	J1117	17.4264
956301	J1119	142.8540
956741	J1172	11.5315

Bus #	Bus	MW Impact
956751	J1173	27.5824
956801	J1178	13.7156
LGEE	LGEE	1.6579
CPL	CPL	0.3222
WEC	WEC	2.1568
CBM-W2	CBM-W2	31.8181
NY	NY	1.1934
CBM-W1	CBM-W1	197.2577
TVA	TVA	3.6946
O-066	O-066	12.9360
CBM-S2	CBM-S2	5.1789
CBM-S1	CBM-S1	22.9103
G-007	G-007	1.9874
MADISON	MADISON	7.8120
MEC	MEC	9.0621

26.4 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
41031330	264612	19MON12	ITCT	241901	02LALLENDORF	ATSI	1	ATSI-P7-1-TE-138-025T-A	tower	1244.0	239.11	239.26	DC	20.35

Bus #	Bus	MW Impact
244357	05GRANGER EL	-0.1884
244412	05WTRV SLR C	0.0333
247528	05COVRT1	4.2120
247529	05COVRT2	4.2120
247530	05COVRT3	4.2120
247531	05COVRT4	2.5280
247532	05COVRT5	2.5280
247533	05COVRT6	2.5280
247604	X1-042	0.0446
247651	AA2-116	75.1876
247966	05WTRV SLR E	0.2383
247967	05OLIV SLR E	0.1700
247969	Z2-116 E	0.0911
274788	SE CHICAG;5U (Deativation : 06/01/20)	2.1081
274789	SE CHICAG;6U (Deativation : 06/01/20)	2.1137
274790	SE CHICAG;7U (Deativation : 06/01/20)	2.1415
274791	SE CHICAG;8U (Deativation : 06/01/20)	2.1415
274792	SE CHICAG;9U (Deativation : 06/01/20)	2.1461
274793	SE CHICAG;0U (Deativation : 06/01/20)	2.1461
274794	SE CHICAG;1U (Deativation : 06/01/20)	2.1461
274795	SE CHICAG;2U (Deativation : 06/01/20)	2.1461
274881	PILOT HIL;1E	7.5410
275149	KELLYCK ;1E	7.5410
276161	W4-086	0.0999
276169	Z1-107 E	1.0639
293061	N-015 E	6.3220
293644	O22 E1	3.2112
293645	O22 E2	6.2336
294392	P-010 E	8.0289
910542	X3-005 E	0.3072
925961	AC1-072	0.3907
926311	AC1-109 1	0.7860
926321	AC1-109 2	0.7860
926331	AC1-110 1	0.7839
926341	AC1-110 2	0.7839
926351	AC1-111 1	0.3143
926361	AC1-111 2	0.3143
926371	AC1-111 3	0.3143
926381	AC1-111 4	0.3143
926391	AC1-111 5	0.3143

Bus #	Bus	MW Impact
926401	AC1-111 6	0.3143
926581	AC1-141	6.8834
927091	AC1-204 1	29.5652
927101	AC1-204 2	29.5605
927451	AC1-142A 1	1.7038
927461	AC1-142A 2	1.7038
930501	AB1-091 O1	29.6442
930751	AB1-122 2O1	30.2732
931951	AB1-107 1	-33.9244
931961	AB1-107 2	-110.3845
932601	AC2-080 C O1	1.3835
932602	AC2-080 E O1	9.2585
932931	AC2-117	2.5446
933281	AC2-140 C	2.3734
933282	AC2-140 E	0.1249
933411	AC2-154 C	1.0234
933412	AC2-154 E	1.6698
934111	AD1-039 2	2.9668
934252	AD1-052 E1	-0.5409
934262	AD1-052 E2	-0.5409
934721	AD1-100 C	7.9535
934722	AD1-100 E	37.1161
936141	AD2-020 C O1	4.9995
936142	AD2-020 E O1	3.0772
936371	AD2-047 C O1	1.8314
936372	AD2-047 E O1	8.9415
936461	AD2-060	0.5710
936601	AD2-075	20.2942
936631	AD2-079 C O1	0.8397
936632	AD2-079 E O1	0.5598
937041	AD2-138 C	1.8730
937042	AD2-138 E	8.7690
937321	AD2-175 C (Withdrawn : 12/10/2019)	6.6295
937322	AD2-175 E (Withdrawn : 12/10/2019)	4.4197
937401	AD2-194 1	3.1793
937411	AD2-194 2	3.1788
938261	AE1-039	0.0852
938511	AE1-070 1	3.7357
938521	AE1-070 2	3.4172
938671	AE1-089 C	8.3212
938672	AE1-089 E	11.4229
939351	AE1-166 C O1	2.2032
939352	AE1-166 E O1	2.0337
939391	AE1-170 C O1	4.8447
939392	AE1-170 E O1	6.6903
939631	AE1-193 C	3.6564
939632	AE1-193 E	24.4701
939641	AE1-194 C	3.6564
939642	AE1-194 E	24.4701
939651	AE1-195 C	3.6564
939652	AE1-195 E	24.4701
939681	AE1-198 C	10.8568

Bus #	Bus	MW Impact
939682	AE1-198 E	9.2255
940261	AE2-008	5.0952
940581	AE2-045 C O1	6.2788
940582	AE2-045 E O1	8.6200
940621	AE2-049 C O1	1.9652
940622	AE2-049 E O1	1.3101
940631	AE2-050 C O1	2.5604
940632	AE2-050 E O1	1.7069
940752	AE2-062 E	0.0283
940762	AE2-063 E	0.0283
941551	AE2-152 C O1	2.5422
941552	AE2-152 E O1	1.6948
941561	AE2-153 C O1	1.8900
941562	AE2-153 E O1	8.8489
942681	AE2-284	3.0568
942881	AE2-307 C O1	4.6941
942882	AE2-307 E O1	1.7069
942911	AE2-310 C O1	1.9082
942912	AE2-310 E O1	0.5127
943001	AE2-323 C	3.8881
943002	AE2-323 E	1.9064
943021	AE2-325 C	1.3420
943022	AE2-325 E	0.8925
943121	AE2-341 C	5.2631
943122	AE2-341 E	2.5845
943591	AF1-030 C O2	1.8648
943592	AF1-030 E O2	0.9143
943781	AF1-046 C	0.9619
943782	AF1-046 E	0.6412
944161	AF1-084 C	2.3965
944162	AF1-084 E	1.3688
944911	AF1-156 C	2.5612
944912	AF1-156 E	1.7075
944931	AF1-158 C O2	3.2606
944932	AF1-158 E O2	2.1738
944961	AF1-161 C	1.0702
944962	AF1-161 E	1.0702
945101	AF1-175 C O2	3.2014
945102	AF1-175 E O2	2.1343
945111	AF1-176 C O2	6.2258
945112	AF1-176 E O2	5.7715
945501	AF1-215 C O2	5.5011
945502	AF1-215 E O2	3.6674
950311	G934 C	4.3998
950312	G934 E	17.5992
950351	J466	7.2879
950791	J201 C	0.8608
950792	J201 E	3.4430
950871	J246 C	0.2252
950872	J246 E	0.9007
950942	J325 E	1.0051
951531	J533 C	6.4336

Bus #	Bus	MW Impact
951532	J533 E	25.7344
951941	J602 C	6.3289
951942	J602 E	34.2411
952161	J571	0.4900
952201	J589 C	5.3352
952202	J589 E	28.8648
952312	J646 E	0.4419
952401	J752 C	3.7023
952402	J752 E	20.0307
952611	J717 C	5.9975
952612	J717 E	32.4478
952761	J728 C	5.5775
952762	J728 E	30.2163
952881	J758	20.3460
952971	J793	363.3782
953071	J794 C	0.3523
953072	J794 E	1.9059
953271	J701 C	1.8013
953272	J701 E	9.7455
953291	J796	47.7904
953321	J799	53.4001
953361	J806	17.9590
953421	J841	141.4319
953771	J832	16.2900
953781	J833	27.4140
953811	J839	26.5970
953941	J857	13.1222
954111	J875	13.9350
954381	J906 C	1.5403
954382	J906 E	8.3337
954591	J937	34.0956
955021	J978 C	2.0531
955022	J978 E	11.1079
955071	J984 C	4.5758
955072	J984 E	24.7562
955121	J989	17.9504
955261	J1005	40.1780
955351	J1014 C	7.6465
955352	J1014 E	4.5879
955591	J1043 C	2.4246
955592	J1043 E	42.9639
955621	J1046	12.5920
955721	J1056 C	9.3597
955722	J1056 E	50.6383
955781	J1062	50.3680
955801	J1064 C	3.3790
955802	J1064 E	18.2810
955811	J1065 C	4.7365
955812	J1065 E	25.6255
955831	J1068 C	8.6050
955832	J1068 E	46.5550
955861	J1071	10.5550

Bus #	Bus	MW Impact
955961	J1083	11.5626
956011	J1088	29.1885
956021	J1089	33.6532
956031	J1090	14.8194
956161	J1103	4.7130
956291	J1117	13.4128
956301	J1119	107.7900
956741	J1172	10.9190
956751	J1173	6.6416
956801	J1178	10.7367
LGEE	LGEE	1.4793
CPL	CPL	0.3036
WEC	WEC	1.8730
CBM-W2	CBM-W2	27.9443
NY	NY	1.0474
CBM-W1	CBM-W1	184.8102
TVA	TVA	3.2718
O-066	O-066	11.3098
CBM-S2	CBM-S2	4.7280
CBM-S1	CBM-S1	20.3117
G-007	G-007	1.7368
MADISON	MADISON	6.6024
MEC	MEC	7.8942

26.5 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 LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
43535250	938670	AE1-089 TAP	AEP	243219	05DUMONT	AEP	1	AEP_P4_#8165_05OLIVE 345_B1	breaker	1409.0	116.07	123.29	DC	101.13

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;OU	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

27 Affected Systems

27.1 LG&E

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

27.2 MISO

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

27.3 TVA

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

27.4 Duke Energy Progress

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

27.5 NYISO

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

28 Contingency Descriptions

Contingency Name	Contingency Definition
ATSI-P2-3-TE-345-022T	CONTINGENCY 'ATSI-P2-3-TE-345-022T' /* ALLEN JCT BK-34531 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 /* 02ALLEN 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 239018 CKT 1 /* 02ALLEN 345 02FULTON 345 END
ATSI-P2-3-TE-345-023T	CONTINGENCY 'ATSI-P2-3-TE-345-023T' /* ALLEN JCT BK-34532 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 /* 02ALLEN 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 238530 TO BUS 239344 CKT 3 /* 02ALLEN 345 02ALLEN-2 138 END
ATSI-P7-1-TE-138-025T-A	CONTINGENCY 'ATSI-P7-1-TE-138-025T-A' /* ALLEN-MAJ-MONROE & LEMO-MAJESTIC 345KV DISCONNECT BRANCH FROM BUS 264594 TO BUS 256583 CKT 1 /* 19LULU 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1 /* 19LULU 345 19MILAN 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 955720 CKT 1 /* 19LULU 345 J1056 TAP 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 955620 CKT 1 /* 02LEMOYN 345 19MAJTC 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_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_P1-2_#671-B	CONTINGENCY 'AEP_P1-2_#671-B' OPEN BRANCH FROM BUS 945100 TO BUS 243229 CKT 1 / 945100 AF1-175 TAP 345 243229 05OLIVE 345 1 END
ATSI-P7-1-TE-345-022T	CONTINGENCY 'ATSI-P7-1-TE-345-022T' /* Y1-069-MONROE/LEMOYNE-MAJ 345 DISCONNECT BRANCH FROM BUS 241901 TO BUS 264612 CKT 1 /* 02_Y1-069 345 19MON12 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 955620 CKT 1 /* 02LEMOYN 345 19MAJTC 345 END
COMED_P1-2_695_B2	CONTINGENCY 'COMED_P1-2_695_B2' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1 END
ATSI-P1-2-TE-345-601T	CONTINGENCY 'ATSI-P1-2-TE-345-601T' /*LINE OUTAGE: LALLEND

Contingency Name	Contingency Definition
COMED_P4_112-65-BT3-4__	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
COMED_P4_023-65-BT4-5__	CONTINGENCY 'COMED_P4_023-65-BT4-5__' TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 / COLLI;2M 345 COLLI; 765 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 / COLLI;2M 345 COLLI; R 345 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 / COLLI;2M 345 COLLI;2C 33 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 END
ATSI-P1-2-TE-345-605T	CONTINGENCY 'ATSI-P1-2-TE-345-605T' /*LINE OUTAGE: AJ TO ITC MOROCCO DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 END
ATSI-P2-3-TE-345-033T	CONTINGENCY 'ATSI-P2-3-TE-345-033T' /* LALLEND
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
COMED_P4_023-65-BT2-3__	CONTINGENCY 'COMED_P4_023-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765 END
COMED_P4_112-65-BT4-5__	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END

Short Circuit

29 Short Circuit

The following Breakers are overduty

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