Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-411

MADDOX CREEK-RP MONE 345 KV

100 MW Capacity / 100 MW Energy

January 2021

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is AEP.

2 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.

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

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

3 General

The Interconnection Customer (IC), has proposed a Storage generating facility located in Van Wert County, Ohio. The installed facilities will have a total capability of 100 MW with 100 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 25, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-411
Project Name	MADDOX CREEK-RP MONE 345 KV
State	Ohio
County	Van Wert
Transmission Owner	AEP
MFO	100
MWE	100
MWC	100
Fuel	Storage
Basecase Study Year	2024

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

4 Point of Interconnection – Primary POI

AG1-411 will interconnect with the AEP transmission system via a direct connection to the proposed AG1-410 345 kV switching station cut into RP Mone – Maddox Creek 345kV station as an uprate to the PJM project AG1-410.

Note: It is assumed that the existing 345 kV revenue metering system, generation lead and Protection & Control Equipment that will be installed for AG1-410 will be adequate for the increased generation of AG1-411. Depending on the timing of the completion of the AG1-410 interconnection construction relative to the AG1-411 completion, there may (or many not) be a need to review and revise the relay settings for the increased generation of AG1-411.

5 Point of Interconnection – Secondary POI

AG1-411 will interconnect with the AEP transmission system via a direct connection to the Maddox Creek 345 kV station as an uprate to the PJM project AG1-410.

Note: It is assumed that the existing 345 kV revenue metering system, generation lead and Protection & Control Equipment that will be installed for AG1-410 will be adequate for the increased generation of AG1-411. Depending on the timing of the completion of the AG1-410 interconnection construction relative to the AG1-411 completion, there may (or many not) be a need to review and revise the relay settings for the increased generation of AG1-411.

6 Cost Summary

The AG1-411 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$400,000
Total System Network Upgrade Costs	$45,000
Total Costs	$445,000

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine

final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

7 Transmission Owner Scope of Work

The total physical interconnection costs is given in the table below:

7.1 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
Total Attachment Facility Costs	**$0**

7.2 Direct Connection Cost Estimate

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

Description	Total Cost
Total Direct Connection Facility Costs	**$0**

7.3 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
Review line protection and control settings at the proposed 345 kV switching station	$45,000
Total Non-Direct Connection Facility Costs	**$45,000**

8 Schedule

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

9 Interconnection Customer Requirements

It is understood that the Interconnection Customer (IC) is responsible for all costs associated with this interconnection. The costs above are reimbursable to the Transmission Owner. The cost of the IC's generating plant and the costs for the line connecting the generating plant to the Point of Interconnection are not included in this report; these are assumed to be the IC's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for the Transmission Owner 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.

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 Meteorological Data Reporting Requirements

10.3 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/

11 Summer Peak - Load Flow Analysis - Primary POI

The Queue Project AG1-411 was evaluated as a 100.0 MW (Capacity 100.0 MW) injection tapping the RP Mone to Maddox 345 kV line in the AEP area. Project AG1-411 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-411 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 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
16742699 6	24293 5	05E LIMA	345. 0	AEP	24298 9	05E LIM A	138. 0	AEP	2	AEP_P4_#463_05 E	breake r	368.0	120.95	122.11	DC	9.47
16822725 1	24293 5	05E LIMA	345. 0	AEP	24298 9	05E LIM A	138. 0	AEP	2	AEP_P1-3_#57_05E LIMA 345_1	single	368.0	101.67	103.19	DC	5.62

11.4 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
16822710 7	24293 3	05RPMO NE	345. 0	AEP	24321 1	05ALLEN	345. 0	AEP	1	AEP_P1-2_#6463_1675 7	operatio n	897.0	141.95	153.07	DC	99.74
16822716 1	24293 5	05E LIMA	345. 0	AEP	24294 5	05SW LIM	345. 0	AEP	1	AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A	operatio n	971.0	123.27	125.05	DC	17.22
16822725 0	24293 5	05E LIMA	345. 0	AEP	24298 9	05E LIMA	138. 0	AEP	2	AEP_P1-3_#57_05E LIMA 345_1	operatio n	368.0	116.7	117.38	DC	5.62

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
168227278	242936	05FOSTOR	345.0	AEP	242935	05E LIMA	345.0	AEP	1	Base Case	operation	1025.0	111.9	112.68	DC	14.87
168227279	242936	05FOSTOR	345.0	AEP	242935	05E LIMA	345.0	AEP	1	AEP_P1-2_#2749_554-A	operation	1318.0	110.46	111.0	DC	13.26
168227112	243902	05HARDIN SS	345.0	AEP	242935	05E LIMA	345.0	AEP	1	Base Case	operation	897.0	105.56	107.04	DC	13.3
168227356	243903	05GUNNRD SS	345.0	AEP	966910	AG1-562 TAP	345.0	AEP	1	AEP_P1-2_#9115	operation	1151.0	101.75	103.97	DC	25.61
168227357	243903	05GUNNRD SS	345.0	AEP	966910	AG1-562 TAP	345.0	AEP	1	Base Case	operation	897.0	102.11	103.59	DC	13.25
170020669	945620	AF1-227 TAP	345.0	AEP	242939	05MARYSV	345.0	AEP	1	Base Case	operation	897.0	113.61	115.09	DC	13.25
170020809	965420	AG1-410 TAP	345.0	AEP	246929	05MADDOX	345.0	AEP	1	AEP_P1-2_#7441_100545-A	operation	1301.0	102.33	106.14	DC	49.84
170020811	965420	AG1-410 TAP	345.0	AEP	246929	05MADDOX	345.0	AEP	1	Base Case	operation	897.0	96.48	101.87	DC	48.24

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
168227251,167426996	1	05E LIMA 345.0 kV - 05E LIMA 138.0 kV Ckt 2	**AEP** **AEPO0051a (592) : Replace E Lima Riser Sub Cond 1000 MCM CU** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-18 Months** **AEPO0051b (593) : Replace three E Lima 138kV Riser Sub Cond 1590 AAC Str** **Project Type : FAC** **Cost : $300,000** **Time Estimate : 12-18 Months**	$400,000
			TOTAL COST	**$400,000**

11.6 Flow Gate Details - Primary POI

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

11.6.1 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
167426996	242935	05E LIMA	AEP	242989	05E LIMA	AEP	2	AEP_P4_#463_05E	breaker	368.0	120.95	122.11	DC	9.47

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
244357	05GRANGER EL	-0.2763	Adder	-0.33
246936	05BLCK-1 C	0.2675	50/50	0.2675
246937	05BLCK-2 C	0.2675	50/50	0.2675
246938	05BLCK-3 C	0.2691	50/50	0.2691
247540	U2-072 C	0.6165	50/50	0.6165
247549	V3-028 C	0.1377	50/50	0.1377
247908	05BLCK-1 E	9.5946	50/50	9.5946
247909	05BLCK-2 E	9.5946	50/50	9.5946
247910	05BLCK-3 E	9.7600	50/50	9.7600
247932	U2-072 E	26.1522	50/50	26.1522
247948	V3-028 E	1.4241	50/50	1.4241
925133	AB2-170 C	0.8952	50/50	0.8952
925135	AB2-170 E	9.2569	50/50	9.2569
932301	AC2-044 C	0.7858	50/50	0.7858
932302	AC2-044 E	1.2820	50/50	1.2820
934980	AD1-130 C	13.2077	50/50	13.2077
934984	AD1-130 E	6.6383	50/50	6.6383
936671	AD2-086 C	15.8493	50/50	15.8493
936672	AD2-086 E	10.5662	50/50	10.5662
936721	AD2-091	5.7425	50/50	5.7425
938681	AE1-090 C	2.4762	50/50	2.4762
938682	AE1-090 E	3.2663	50/50	3.2663
938761	AE1-102 C	1.6129	50/50	1.6129
938762	AE1-102 E	1.0753	50/50	1.0753
942041	AE2-216	6.3167	50/50	6.3167
942871	AE2-306 C O1	1.8036	50/50	1.8036
942872	AE2-306 E O1	1.2024	50/50	1.2024
946201	AF1-285 C	5.6112	50/50	5.6112
946202	AF1-285 E	4.4088	50/50	4.4088
957201	AF2-014 C	9.3051	50/50	9.3051
957202	AF2-014 E	6.2034	50/50	6.2034
965421	AG1-410 C O1	7.6808	Adder	17.05
965422	AG1-410 E O1	5.1206	Adder	11.37
965431	AG1-411 O1	4.2671	Adder	9.47
966911	AG1-562 C O1	5.1904	Adder	11.52
966912	AG1-562 E O1	3.4603	Adder	7.68
WEC	WEC	0.1732	Confirmed LTF	0.1732
LGEE	LGEE	0.0829	Confirmed LTF	0.0829
CPLE	CPLE	0.0778	Confirmed LTF	0.0778
CBM-W2	CBM-W2	2.8224	Confirmed LTF	2.8224
NY	NY	0.0924	Confirmed LTF	0.0924
TVA	TVA	0.3360	Confirmed LTF	0.3360

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
O-066	O-066	0.8345	Confirmed LTF	0.8345
SIGE	SIGE	0.0407	Confirmed LTF	0.0407
CBM-S2	CBM-S2	1.4825	Confirmed LTF	1.4825
CBM-S1	CBM-S1	0.0836	Confirmed LTF	0.0836
G-007	G-007	0.1292	Confirmed LTF	0.1292
MEC	MEC	0.7389	Confirmed LTF	0.7389
LAGN	LAGN	0.4917	Confirmed LTF	0.4917
CBM-W1	CBM-W1	0.3785	Confirmed LTF	0.3785

11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AB2-170	East Lima-Marysville 345kV	Partially in Service - Under Construction
AC2-044	Maddox Creek 345kV	Active
AD1-130	Hardin Switch 345 kV	Active
AD2-086	Marysville-East Lima Hardin Switch 345kV	Active
AD2-091	Hardin Tap 345kV	Active
AE1-090	Hardin Switch 345 kV	Active
AE1-102	Maddox Creek 345 kV	Active
AE2-216	Hardin Switch 345 kV	Active
AE2-306	Gunn Road 345 kV	Active
AF1-285	Gunn Road 345 kV	Active
AF2-014	Maddox Creek 345 kV	Active
AG1-410	Maddox Creek-RP Mone 345 kV	Active
AG1-411	Maddox Creek-RP Mone 345 kV	Active
AG1-562	Marysville-Gunn Road 345 kV	Active
U2-072	East Lima-Marysville 345kV	Partially in Service - Under Construction
V3-028	East Lima-Marysville 345kV	Partially in Service - Under Construction

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
AEP_P1-2_#7441_100545-A	CONTINGENCY 'AEP_P1-2_#7441_100545-A' OPEN BRANCH FROM BUS 242928 TO BUS 958430 CKT 1 / 242928 05MARYSV 765 958430 AF2-137 TAP 765 1 END
AEP_P1-3_#57_05E LIMA 345_1	CONTINGENCY 'AEP_P1-3_#57_05E LIMA 345_1' OPEN BRANCH FROM BUS 242935 TO BUS 242989 CKT 1 / 242935 05E LIMA 345 242989 05E LIMA 138 1 END
AEP_P1-2_#9115	CONTINGENCY 'AEP_P1-2_#9115' OPEN BRANCH FROM BUS 242933 TO BUS 243211 CKT 1 / 242933 05RPMONE 345 243211 05ALLEN 345 1 END
AEP_P1-2_#6463_16757	CONTINGENCY 'AEP_P1-2_#6463_16757' OPEN BRANCH FROM BUS 242935 TO BUS 246929 CKT 1 / 242935 05E LIMA 345 246929 05MADDOX 345 1 END
AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A	CONTINGENCY 'AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A' OPEN BRANCH FROM BUS 242939 TO BUS 945620 CKT 1 END
Base Case	
AEP_P4_#463_05E	CONTINGENCY '"AEP_P4_#463_05E' LIMA 345_P" / 1409 OPEN BRANCH FROM BUS 242935 TO BUS 242936 CKT 1 / 242935 05E LIMA 345 242936 05FOSTOR 345 1 OPEN BRANCH FROM BUS 242935 TO BUS 242945 CKT 1 / 242935 05E LIMA 345 242945 05SW LIM 345 1 END
AEP_P1-2_#2749_554-A	CONTINGENCY 'AEP_P1-2_#2749_554-A' OPEN BRANCH FROM BUS 238745 TO BUS 945640 CKT 1 / 238745 02GALION 345 945640 AF1-229 TAP 345 1 END

12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-411 was evaluated as a 100.1 MW (Capacity 100.0 MW) injection at the Maddox 345 kV substation in the AEP area. Project AG1-411 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-411 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

13.1 Generation Deliverability

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

None

13.2 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
174470257	242933	05RPMONE	345.0	AEP	246929	05MADDOX	345.0	AEP	1	AEP_P4_#7445_05MARYSV 765_B	breaker	1301.0	96.69	100.29	DC	46.77

13.3 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
168227251	242935	05E LIMA	345.0	AEP	242989	05E LIMA	138.0	AEP	2	AEP_P1-3_#57_05E LIMA 345_1	single	368.0	101.98	103.69	DC	6.26
174470219	243232	05SORENS	345.0	AEP	243231	05ROBPK	345.0	AEP	1	AEP_P4_#9391_05SORENS 345_F	breaker	1203.0	108.22	109.55	DC	16.03
170742922	243903	05GUNNRD SS	345.0	AEP	945620	AF1-227 TAP	345.0	AEP	1	AEP_P2-2_#5063_05SBERWI 345_1	bus	1151.0	100.73	102.03	DC	14.91
170743171	243903	05GUNNRD SS	345.0	AEP	945620	AF1-227 TAP	345.0	AEP	1	ATSI-P7-1-OEC-345-004_NON	tower	1151.0	105.33	106.63	DC	14.89
170743172	243903	05GUNNRD SS	345.0	AEP	945620	AF1-227 TAP	345.0	AEP	1	ATSI-P7-1-OEC-345-005_NON	tower	1151.0	104.78	106.08	DC	14.89
161803843	945620	AF1-227 TAP	345.0	AEP	242939	05MARYSV	345.0	AEP	1	AEP_P2-2_#5063_05SBERWI 345_1	bus	1151.0	118.1	119.4	DC	14.91
161804057	945620	AF1-227 TAP	345.0	AEP	242939	05MARYSV	345.0	AEP	1	ATSI-P7-1-OEC-345-004_NON	tower	1151.0	118.63	119.93	DC	14.89
161804058	945620	AF1-227 TAP	345.0	AEP	242939	05MARYSV	345.0	AEP	1	ATSI-P7-1-OEC-345-005_NON	tower	1151.0	123.42	124.71	DC	14.89

13.4 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
168227107	242933	05RPMONE	345.0	AEP	243211	05ALLEN	345.0	AEP	1	AEP_P1-2_#6463_16757	operation	897.0	141.95	153.07	DC	99.74
168227161	242935	05E LIMA	345.0	AEP	242945	05SW LIM	345.0	AEP	1	AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A	operation	971.0	123.86	125.78	DC	18.58
168227250	242935	05E LIMA	345.0	AEP	242989	05E LIMA	138.0	AEP	2	AEP_P1-3_#57_05E LIMA 345_1	operation	368.0	116.93	117.7	DC	6.26
168227278	242936	05FOSTOR	345.0	AEP	242935	05E LIMA	345.0	AEP	1	Base Case	operation	1025.0	111.9	112.73	DC	15.93
168227279	242936	05FOSTOR	345.0	AEP	242935	05E LIMA	345.0	AEP	1	AEP_P1-2_#2749_554-A	operation	1318.0	110.46	111.04	DC	14.25
175723110	242939	05MARYSV	345.0	AEP	963660	AG1-218 TAP	345.0	AEP	1	AEP_P1-3_#7222_05MA LIS 765_1	operation	1335.0	99.89	100.13	DC	7.28
168227112	243902	05HARDIN SS	345.0	AEP	242935	05E LIMA	345.0	AEP	1	Base Case	operation	897.0	105.42	107.01	DC	14.24
175297969	243903	05GUNNRD SS	345.0	AEP	945620	AF1-227 TAP	345.0	AEP	1	Base Case	operation	897.0	102.88	104.46	DC	14.18
170020669	945620	AF1-227 TAP	345.0	AEP	242939	05MARYSV	345.0	AEP	1	Base Case	operation	897.0	115.19	116.77	DC	14.18

13.5 Flow Gate Details - Secondary POI

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

13.5.1 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
1744702577	242933	05RPMONE	AEP	246929	05MADDOX	AEP	1	AEP_P4_#7445_05MARYSV 765_B	breaker	1301.0	96.69	100.29	DC	46.77

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
244357	05GRANGER EL	-0.2443	Adder	-0.29
247270	05RPMNG1	9.8922	50/50	9.8922
247271	05RPMNG2	9.8856	50/50	9.8856
247272	05RPMNG3	9.8922	50/50	9.8922
247521	T131	0.4904	50/50	0.4904
247911	05TIMB G E	9.3059	Adder	10.95
247969	Z2-116 E	0.0994	Adder	0.12
270164	T-131 E	12.4332	50/50	12.4332
926865	AC1-173 C	0.1618	50/50	0.1618
926866	AC1-173 E	6.8383	50/50	6.8383
936631	AD2-079 C O1	0.9248	Adder	1.09
936632	AD2-079 E O1	0.6166	Adder	0.73
936722	AD2-091 BAT	6.9955	50/50	6.9955
940981	AE2-089 C O1	7.2916	Adder	8.58
940982	AE2-089 E O1	4.8610	Adder	5.72
942042	AE2-216 BAT	7.6950	50/50	7.6950
942221	AE2-234 C O1	2.0444	Adder	2.41
942222	AE2-234 E O1	0.9246	Adder	1.09
942241	AE2-236 C O1	4.5368	50/50	4.5368
942242	AE2-236 E O1	1.9444	50/50	1.9444
943001	AE2-323 C	7.3850	50/50	7.3850
943002	AE2-323 E	3.6210	50/50	3.6210
943781	AF1-046 C	3.4471	50/50	3.4471
943782	AF1-046 E	2.2981	50/50	2.2981
944231	AF1-091 C O1	16.5263	50/50	16.5263
944232	AF1-091 E O1	4.9675	50/50	4.9675
944241	AF1-092 C O1	12.5891	50/50	12.5891
944242	AF1-092 E O1	3.8315	50/50	3.8315
944531	AF1-118 C O1	27.4977	50/50	27.4977
944532	AF1-118 E O1	8.2933	50/50	8.2933
944761	AF1-141 C O1	8.4001	50/50	8.4001
944762	AF1-141 E O1	4.4408	50/50	4.4408
944831	AF1-148 C O1	9.5429	50/50	9.5429
944832	AF1-148 E O1	6.3619	50/50	6.3619
945111	AF1-176 C O1	11.7828	Adder	13.86
945112	AF1-176 E O1	10.9224	Adder	12.85
945623	AF1-227 BAT	9.2210	Merchant Transmission	9.2210
946203	AF1-285 BAT	2.5852	50/50	2.5852
958001	AF2-094 C	2.8900	50/50	2.8900
958002	AF2-094 E	1.4888	50/50	1.4888
958311	AF2-125 C	4.7485	50/50	4.7485
958312	AF2-125 E	2.4746	50/50	2.4746

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958431	AF2-137 C	21.3423	50/50	21.3423
958432	AF2-137 E	29.4727	50/50	29.4727
958861	AF2-177 C O1	1.9762	Adder	2.32
958862	AF2-177 E O1	13.2252	Adder	15.56
959131	AF2-204 C	6.0655	Adder	7.14
959132	AF2-204 E	3.2013	Adder	3.77
959181	AF2-209 C	7.3581	Adder	8.66
959182	AF2-209 E	3.4400	Adder	4.05
959331	AF2-224 C O1	8.4365	50/50	8.4365
959332	AF2-224 E O1	11.6505	50/50	11.6505
960851	AF2-376 C	1.5407	Adder	1.81
960852	AF2-376 E	2.3111	Adder	2.72
960861	AF2-377 C	2.0722	50/50	2.0722
960862	AF2-377 E	3.1083	50/50	3.1083
960971	AF2-388 C	2.7404	Adder	3.22
960972	AF2-388 E	12.8299	Adder	15.09
961631	AG1-003 C	22.9684	50/50	22.9684
961632	AG1-003 E	17.6836	50/50	17.6836
961641	AG1-004	20.3260	50/50	20.3260
963701	AG1-222 C	9.1240	50/50	9.1240
963702	AG1-222 E	7.3850	50/50	7.3850
963731	AG1-225 C	21.9917	50/50	21.9917
963732	AG1-225 E	14.7674	50/50	14.7674
963791	AG1-232 C	10.2643	50/50	10.2643
963792	AG1-232 E	6.8429	50/50	6.8429
965011	AG1-365 C	12.0522	50/50	12.0522
965012	AG1-365 E	8.0348	50/50	8.0348
965021	AG1-366 C	4.0174	50/50	4.0174
965022	AG1-366 E	6.0261	50/50	6.0261
965041	AG1-368 C	7.2918	50/50	7.2918
965042	AG1-368 E	4.8612	50/50	4.8612
965051	AG1-369 C	3.1021	50/50	3.1021
965052	AG1-369 E	2.0681	50/50	2.0681
965101	AG1-375 C	2.4170	Adder	5.37
965102	AG1-375 E	1.6113	Adder	3.58
965111	AG1-376 C	0.4834	Adder	1.07
965112	AG1-376 E	0.7251	Adder	1.61
965432	AG1-411 BAT	46.7730	50/50	46.7730
965491	AG1-417 C O2	3.5610	50/50	3.5610
965492	AG1-417 E O2	2.3740	50/50	2.3740
965561	AG1-424 C	6.1770	50/50	6.1770
965562	AG1-424 E	4.1180	50/50	4.1180
965651	AG1-433 C	0.7262	Adder	1.61
965652	AG1-433 E	3.3999	Adder	7.55
965841	AG1-453 C O2	9.3240	50/50	9.3240
965842	AG1-453 E O2	6.2160	50/50	6.2160
965851	AG1-454 O2	5.5500	50/50	5.5500
WEC	WEC	2.2280	Confirmed LTF	2.2280
LGEE	LGEE	1.6342	Confirmed LTF	1.6342
CBM-W2	CBM-W2	33.9674	Confirmed LTF	33.9674
NY	NY	1.1602	Confirmed LTF	1.1602
TVA	TVA	3.3474	Confirmed LTF	3.3474

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
O-066	O-066	13.4331	Confirmed LTF	13.4331
SIGE	SIGE	0.6173	Confirmed LTF	0.6173
CBM-S2	CBM-S2	3.1842	Confirmed LTF	3.1842
CBM-S1	CBM-S1	0.9230	Confirmed LTF	0.9230
G-007	G-007	2.0906	Confirmed LTF	2.0906
MEC	MEC	9.3449	Confirmed LTF	9.3449
LAGN	LAGN	5.2640	Confirmed LTF	5.2640
CBM-W1	CBM-W1	67.8568	Confirmed LTF	67.8568

13.5.2 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
168227251	242935	05E LIMA	AEP	242989	05E LIMA	AEP	2	AEP_P1-3_#57_05E LIMA 345_1	single	368.0	101.98	103.69	DC	6.26

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246936	05BLCK-1 C	0.1621	80/20	0.1621
246937	05BLCK-2 C	0.1621	80/20	0.1621
246938	05BLCK-3 C	0.1631	80/20	0.1631
247540	U2-072 C	0.4169	80/20	0.4169
247549	V3-028 C	0.0925	80/20	0.0925
925133	AB2-170 C	0.6011	80/20	0.6011
932301	AC2-044 C	0.4761	80/20	0.4761
934980	AD1-130 C	8.8688	80/20	8.8688
936671	AD2-086 C	10.6426	80/20	10.6426
936721	AD2-091	3.8560	80/20	3.8560
938681	AE1-090 C	1.6627	80/20	1.6627
938761	AE1-102 C	0.9772	80/20	0.9772
942041	AE2-216	4.2416	80/20	4.2416
942871	AE2-306 C O1	1.2195	80/20	1.2195
946201	AF1-285 C	3.7940	80/20	3.7940
957201	AF2-014 C	5.6376	80/20	5.6376
965421	AG1-410 C O2	11.2752	80/20	11.2752
965431	AG1-411 O2	6.2640	80/20	6.2640
CPLE	CPLE	0.0485	Confirmed LTF	0.0485
G-007A	G-007A	0.0671	Confirmed LTF	0.0671
VFT	VFT	0.1806	Confirmed LTF	0.1806
PRAIRIE	PRAIRIE	0.0232	Confirmed LTF	0.0232
TVA	TVA	0.0336	Confirmed LTF	0.0336
CBM-S2	CBM-S2	0.6995	Confirmed LTF	0.6995
CBM-S1	CBM-S1	0.0042	Confirmed LTF	0.0042
CBM-N	CBM-N	0.0324	Confirmed LTF	0.0324
GIBSON	GIBSON	0.0257	Confirmed LTF	0.0257
BLUEG	BLUEG	0.0799	Confirmed LTF	0.0799
TRIMBLE	TRIMBLE	0.0256	Confirmed LTF	0.0256
LAGN	LAGN	0.0315	Confirmed LTF	0.0315

13.5.3 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
174470219	243232	05SORENS	AEP	243231	05ROB PK	AEP	1	AEP_P4_#9391_05SORENS 345_F	breaker	1203.0	108.22	109.55	DC	16.03

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.5888	50/50	0.5888
247292	05KEY G1	2.3554	50/50	2.3554
247293	05KEY G2	2.3676	50/50	2.3676
247294	05KEY G3	2.4328	50/50	2.4328
247295	05KEY G4	2.4409	50/50	2.4409
247543	V3-007 C	0.5888	50/50	0.5888
247935	V3-007 E	24.9760	50/50	24.9760
247958	05WLD G2 E	14.4232	Adder	16.97
247963	05HDWTR1G E	24.9760	50/50	24.9760
247968	Z2-115 E	0.0884	Adder	0.1
920501	AA2-148 C O1	1.7878	Adder	2.1
920502	AA2-148 E O1	11.9642	Adder	14.08
923881	AB2-028 C	3.1444	50/50	3.1444
923882	AB2-028 E	21.0436	50/50	21.0436
926881	AC1-175 C	10.9090	50/50	10.9090
926882	AC1-175 E	17.7990	50/50	17.7990
932681	AC2-090 C	5.4545	50/50	5.4545
932682	AC2-090 E	8.8995	50/50	8.8995
932841	AC2-111 C O1	1.6796	Adder	1.98
932842	AC2-111 E O1	2.7404	Adder	3.22
934161	AD1-043 C O1	3.7962	Adder	4.47
934162	AD1-043 E O1	6.1937	Adder	7.29
934961	AD1-128 C	6.4758	50/50	6.4758
934962	AD1-128 E	10.5657	50/50	10.5657
936561	AD2-071 C	5.3698	Adder	6.32
936562	AD2-071 E	2.6448	Adder	3.11
939761	AE1-207 C	6.8282	50/50	6.8282
939762	AE1-207 E	9.4294	50/50	9.4294
939771	AE1-208 C	7.3991	50/50	7.3991
939772	AE1-208 E	10.0897	50/50	10.0897
939781	AE1-209 C O1	2.0996	50/50	2.0996
939782	AE1-209 E O1	14.0514	50/50	14.0514
939791	AE1-210 C O1	2.0996	50/50	2.0996
939792	AE1-210 E O1	14.0514	50/50	14.0514
941691	AE2-169	4.4395	50/50	4.4395
941711	AE2-171	2.4975	Adder	2.94
941721	AE2-172	4.0644	50/50	4.0644
942081	AE2-220 C	7.5358	50/50	7.5358
942082	AE2-220 E	10.4066	50/50	10.4066
942241	AE2-236 C O1	4.8056	50/50	4.8056
942242	AE2-236 E O1	2.0595	50/50	2.0595
942791	AE2-297 C O1	7.2634	Adder	8.55

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942792	AE2-297 E O1	4.8423	Adder	5.7
943783	AF1-046 BAT	4.4448	Merchant Transmission	4.4448
943793	AF1-047 BAT	5.2941	50/50	5.2941
944031	AF1-071 C	0.4199	Adder	0.49
944032	AF1-071 E	0.6851	Adder	0.81
944241	AF1-092 C O1	18.5081	50/50	18.5081
944242	AF1-092 E O1	5.6329	50/50	5.6329
944531	AF1-118 C O1	72.7670	50/50	72.7670
944532	AF1-118 E O1	21.9465	50/50	21.9465
944541	AF1-119 C O1	30.8588	50/50	30.8588
944542	AF1-119 E O1	13.2252	50/50	13.2252
944831	AF1-148 C O1	25.0320	50/50	25.0320
944832	AF1-148 E O1	16.6880	50/50	16.6880
945371	AF1-202 C O1	7.1298	50/50	7.1298
945372	AF1-202 E O1	34.8102	50/50	34.8102
945561	AF1-221 C O1	7.4337	Adder	8.75
945562	AF1-221 E O1	2.2344	Adder	2.63
945581	AF1-223 C O1	18.8730	50/50	18.8730
945582	AF1-223 E O1	12.5820	50/50	12.5820
946031	AF1-268 C O1	6.7275	50/50	6.7275
946032	AF1-268 E O1	3.0515	50/50	3.0515
954351	J903	6.5810	PJM External (MISO)	6.5810
956561	J1152	13.1220	PJM External (MISO)	13.1220
958001	AF2-094 C	4.2488	50/50	4.2488
958002	AF2-094 E	2.1888	50/50	2.1888
958711	AF2-162 C	6.6126	50/50	6.6126
958712	AF2-162 E	3.3063	50/50	3.3063
958821	AF2-173 C	13.5668	50/50	13.5668
958822	AF2-173 E	18.7352	50/50	18.7352
958861	AF2-177 C O1	5.8045	50/50	5.8045
958862	AF2-177 E O1	38.8455	50/50	38.8455
959131	AF2-204 C	11.1326	50/50	11.1326
959132	AF2-204 E	5.8756	50/50	5.8756
959201	AF2-211 C	3.3150	Adder	3.9
959202	AF2-211 E	2.2100	Adder	2.6
960441	AF2-335 C	7.6746	50/50	7.6746
960442	AF2-335 E	2.5582	50/50	2.5582
960791	AF2-370	2.5582	50/50	2.5582
960853	AF2-376 BAT	7.9990	50/50	7.9990
960863	AF2-377 BAT	8.0675	50/50	8.0675
960971	AF2-388 C	8.1396	50/50	8.1396
960972	AF2-388 E	38.1084	50/50	38.1084
961161	AF2-407	31.5510	50/50	31.5510
961171	AF2-408	8.1144	50/50	8.1144
962051	AG1-049	0.5154	Adder	1.14
965023	AG1-366 BAT	13.0020	50/50	13.0020
965031	AG1-367 C	9.6906	50/50	9.6906
965032	AG1-367 E	6.4604	50/50	6.4604
965101	AG1-375 C	13.3950	50/50	13.3950
965102	AG1-375 E	8.9300	50/50	8.9300
965111	AG1-376 C	2.6790	50/50	2.6790
965112	AG1-376 E	4.0185	50/50	4.0185

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965432	AG1-411 BAT	16.0350	50/50	16.0350
965461	AG1-414 C O2	1.6066	Adder	3.57
965462	AG1-414 E O2	1.0711	Adder	2.38
965491	AG1-417 C O2	3.9816	50/50	3.9816
965492	AG1-417 E O2	2.6544	50/50	2.6544
965651	AG1-433 C	4.0698	50/50	4.0698
965652	AG1-433 E	19.0542	50/50	19.0542
965852	AG1-454 BAT	5.7480	50/50	5.7480
WEC	WEC	0.2271	Confirmed LTF	0.2271
LGEE	LGEE	1.9710	Confirmed LTF	1.9710
CPLE	CPLE	0.4300	Confirmed LTF	0.4300
CBM-W2	CBM-W2	18.7085	Confirmed LTF	18.7085
NY	NY	0.2500	Confirmed LTF	0.2500
TVA	TVA	2.2694	Confirmed LTF	2.2694
O-066	O-066	2.4295	Confirmed LTF	2.4295
SIGE	SIGE	0.4105	Confirmed LTF	0.4105
CBM-S2	CBM-S2	8.5817	Confirmed LTF	8.5817
CBM-S1	CBM-S1	0.7205	Confirmed LTF	0.7205
G-007	G-007	0.3748	Confirmed LTF	0.3748
MEC	MEC	1.8464	Confirmed LTF	1.8464
LAGN	LAGN	2.6705	Confirmed LTF	2.6705

13.5.4 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
170743172	243903	05GUNN RD SS	AEP	945620	AF1-227 TAP	AEP	1	ATSI-P7-1-OEC-345-005_NON	tower	1151.0	104.78	106.08	DC	14.89

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	2.7629	Adder	3.25
240968	02BG2 GEN	0.5334	Adder	0.63
240969	02BG4 G1	0.1330	Adder	0.16
240973	02BG6 AMPO	2.0704	Adder	2.44
240975	02PGE GEN	2.7377	Adder	3.22
240997	02BG10	1.4775	Adder	1.74
241946	**AB1-107 CT1 (Suspended)**	**19.9578**	**Adder**	**23.48**
241947	**AB1-107 CT2 (Suspended)**	**20.6219**	**Adder**	**24.26**
241948	**AB1-107 ST1 (Suspended)**	**23.2231**	**Adder**	**27.32**
244357	05GRANGER EL	0.4013	50/50	0.4013
246936	05BLCK-1 C	0.3854	50/50	0.3854
246937	05BLCK-2 C	0.3854	50/50	0.3854
246938	05BLCK-3 C	0.3877	50/50	0.3877
247270	05RPMNG1	2.8377	50/50	2.8377
247271	05RPMNG2	2.8358	50/50	2.8358
247272	05RPMNG3	2.8377	50/50	2.8377
247522	U1-059 C	0.1846	50/50	0.1846
247540	U2-072 C	3.2763	50/50	3.2763
247548	V4-010 C	1.7397	Adder	2.05
247549	V3-028 C	0.5609	50/50	0.5609
247551	**U4-028 C (Suspended)**	**0.8733**	**Adder**	**1.03**
247552	**U4-029 C (Suspended)**	**0.8733**	**Adder**	**1.03**
247555	W1-056 C	0.0461	50/50	0.0461
247607	V1-011 C	0.2074	50/50	0.2074
247908	05BLCK-1 E	13.8226	50/50	13.8226
247909	05BLCK-2 E	13.8226	50/50	13.8226
247910	05BLCK-3 E	14.0609	50/50	14.0609
247911	05TIMB G E	8.8212	Adder	10.38
247932	U2-072 E	138.9773	50/50	138.9773
247940	**U4-028 E (Suspended)**	**5.8443**	**Adder**	**6.88**
247941	**U4-029 E (Suspended)**	**5.8443**	**Adder**	**6.88**
247942	W1-056 E	1.9494	50/50	1.9494
247947	V4-010 E	11.6427	Adder	13.7
247948	V3-028 E	5.8002	50/50	5.8002
247959	V1-011 E	8.7974	50/50	8.7974
270164	T-131 E	7.9162	Adder	9.31
270165	U1-059 E	5.3000	50/50	5.3000
925133	AB2-170 C	3.6461	50/50	3.6461
925135	AB2-170 E	37.7015	50/50	37.7015
926811	AC1-167 C O1	2.4259	Adder	2.85
926812	AC1-167 E O1	1.1768	Adder	1.38

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
926866	AC1-173 E	4.3539	Adder	5.12
932301	AC2-044 C	1.1320	50/50	1.1320
932302	AC2-044 E	1.8470	50/50	1.8470
934461	AD1-070 C O1	3.8822	50/50	3.8822
934462	AD1-070 E O1	18.2250	50/50	18.2250
934741	AD1-101 C O1	2.1294	50/50	2.1294
934742	AD1-101 E O1	3.4749	50/50	3.4749
934791	AD1-106 C O1	1.4452	Adder	1.7
934792	AD1-106 E O1	2.3579	Adder	2.77
934891	AD1-118	5.3740	Adder	6.32
934901	AD1-119 C O1	1.4035	Adder	1.65
934902	AD1-119 E O1	2.2904	Adder	2.69
934980	AD1-130 C	53.7924	50/50	53.7924
934984	AD1-130 E	27.0365	50/50	27.0365
936671	AD2-086 C	64.5509	50/50	64.5509
936672	AD2-086 E	43.0339	50/50	43.0339
936721	AD2-091	23.3880	50/50	23.3880
936752	AD2-096 BAT	5.3215	50/50	5.3215
937021	AD2-136 C O1	3.1438	Adder	3.7
937022	AD2-136 E O1	21.0394	Adder	24.75
938681	AE1-090 C	10.0849	50/50	10.0849
938682	AE1-090 E	13.3031	50/50	13.3031
938691	AE1-091 C	6.5364	50/50	6.5364
938692	AE1-091 E	8.7844	50/50	8.7844
938761	AE1-102 C	2.3236	50/50	2.3236
938762	AE1-102 E	1.5491	50/50	1.5491
938911	AE1-119	42.2246	Adder	49.68
939161	AE1-146 C O1	9.7628	50/50	9.7628
939162	AE1-146 E O1	4.5592	50/50	4.5592
940031	AE1-245 C	1.9728	50/50	1.9728
940032	AE1-245 E	13.2027	50/50	13.2027
940841	AE2-072 C	10.9350	50/50	10.9350
940842	AE2-072 E	7.2900	50/50	7.2900
941741	AE2-174 C	2.3319	Adder	2.74
941742	AE2-174 E	10.9167	Adder	12.84
941781	AE2-181 C	2.2011	Adder	2.59
941782	AE2-181 E	1.4674	Adder	1.73
942041	AE2-216	25.7268	50/50	25.7268
942661	AE2-282 C	3.2550	Adder	3.83
942662	AE2-282 E	1.7128	Adder	2.02
942801	AE2-298 C	2.5089	Adder	2.95
942802	AE2-298 E	1.6726	Adder	1.97
942871	AE2-306 C O1	9.5846	50/50	9.5846
942872	AE2-306 E O1	6.3898	50/50	6.3898
943181	AE2-322 C	2.9096	Adder	3.42
943182	AE2-322 E	1.4223	Adder	1.67
943581	AF1-029 C O1	1.2545	Adder	1.48
943582	AF1-029 E O1	0.8363	Adder	0.98
943791	AF1-047 C	1.5075	Adder	1.77
943792	AF1-047 E	1.0050	Adder	1.18
943951	AF1-063 C O1	1.3063	Adder	1.54
943952	AF1-063 E O1	0.7242	Adder	0.85

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
943961	AF1-064 C O1	2.4969	Adder	2.94
943962	AF1-064 E O1	1.2410	Adder	1.46
944081	AF1-076 C O1	7.6193	50/50	7.6193
944082	AF1-076 E O1	4.7497	50/50	4.7497
944091	AF1-077 C O1	7.6193	50/50	7.6193
944092	AF1-077 E O1	4.7497	50/50	4.7497
944171	AF1-085 C O1	3.6399	50/50	3.6399
944172	AF1-085 E O1	5.0265	50/50	5.0265
944481	AF1-113 C O1	10.9143	Adder	12.84
944482	AF1-113 E O1	3.3943	Adder	3.99
944551	AF1-120 C	1.9723	Adder	2.32
944552	AF1-120 E	0.9935	Adder	1.17
944991	AF1-164 C O1	21.3389	50/50	21.3389
944992	AF1-164 E O1	11.4901	50/50	11.4901
945401	AF1-205 C	1.7921	Adder	2.11
945402	AF1-205 E	1.1948	Adder	1.41
945411	AF1-206 C O1	8.8530	Adder	10.42
945412	AF1-206 E O1	5.9020	Adder	6.94
945623	AF1-227 BAT	24.2380	50/50	24.2380
945641	AF1-229 C	5.1194	Adder	6.02
945642	AF1-229 E	3.4129	Adder	4.02
946201	AF1-285 C	29.8189	50/50	29.8189
946202	AF1-285 E	23.4291	50/50	23.4291
957201	AF2-014 C	13.4055	50/50	13.4055
957202	AF2-014 E	8.9370	50/50	8.9370
957651	AF2-059 C	0.9454	50/50	0.9454
957652	AF2-059 E	1.3056	50/50	1.3056
958091	AF2-103 C	0.1335	50/50	0.1335
958092	AF2-103 E	0.1850	50/50	0.1850
958321	AF2-126 C	2.5418	Adder	2.99
958322	AF2-126 E	1.2709	Adder	1.5
958331	AF2-127 C	1.6854	Adder	1.98
958332	AF2-127 E	0.8867	Adder	1.04
958951	AF2-186 C O1	1.4346	Adder	1.69
958952	AF2-186 E O1	1.9811	Adder	2.33
960301	AF2-321 C	6.7177	Adder	7.9
960302	AF2-321 E	4.4785	Adder	5.27
960841	AF2-375 C	8.7636	50/50	8.7636
960842	AF2-375 E	5.8424	50/50	5.8424
960851	AF2-376 C	1.4605	Adder	1.72
960852	AF2-376 E	2.1907	Adder	2.58
960861	AF2-377 C	1.3194	Adder	1.55
960862	AF2-377 E	1.9791	Adder	2.33
961831	AG1-025 C	0.9454	50/50	0.9454
961832	AG1-025 E	1.3056	50/50	1.3056
962121	AG1-056 C	1.2991	Adder	2.88
962122	AG1-056 E	0.8660	Adder	1.92
962281	AG1-076 C O1	8.8429	50/50	8.8429
962282	AG1-076 E O1	13.2643	50/50	13.2643
963501	AG1-199	11.3053	Adder	25.1
964561	AG1-319 C	3.9418	Adder	8.75
964562	AG1-319 E	2.6279	Adder	5.83

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965041	AG1-368 C	2.0381	Adder	4.52
965042	AG1-368 E	1.3587	Adder	3.02
965051	AG1-369 C	1.0468	Adder	2.32
965052	AG1-369 E	0.6979	Adder	1.55
965421	AG1-410 C O2	26.8110	50/50	26.8110
965422	AG1-410 E O2	17.8740	50/50	17.8740
965431	AG1-411 O2	14.8950	50/50	14.8950
966831	AG1-554 C O2	3.8230	50/50	3.8230
966832	AG1-554 E O2	2.0109	50/50	2.0109
WEC	WEC	0.6590	Confirmed LTF	0.6590
LGEE	LGEE	0.5604	Confirmed LTF	0.5604
CBM-W2	CBM-W2	9.0048	Confirmed LTF	9.0048
NY	NY	0.4579	Confirmed LTF	0.4579
TVA	TVA	0.6146	Confirmed LTF	0.6146
O-066	O-066	5.9560	Confirmed LTF	5.9560
SIGE	SIGE	0.2223	Confirmed LTF	0.2223
CHEOAH	CHEOAH	0.0040	Confirmed LTF	0.0040
CBM-S1	CBM-S1	0.1980	Confirmed LTF	0.1980
G-007	G-007	0.9303	Confirmed LTF	0.9303
HAMLET	HAMLET	0.2980	Confirmed LTF	0.2980
MEC	MEC	2.6902	Confirmed LTF	2.6902
LAGN	LAGN	1.1532	Confirmed LTF	1.1532
CATAWBA	CATAWBA	0.1565	Confirmed LTF	0.1565
CBM-W1	CBM-W1	45.9155	Confirmed LTF	45.9155

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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
161804058	945620	AF1-227 TAP	AEP	242939	05MARYSV	AEP	1	ATSI-P7-1-OEC-345-005_NON	tower	1151.0	123.42	124.71	DC	14.89

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	2.7629	Adder	3.25
240968	02BG2 GEN	0.5334	Adder	0.63
240969	02BG4 G1	0.1330	Adder	0.16
240973	02BG6 AMPO	2.0704	Adder	2.44
240975	02PGE GEN	2.7377	Adder	3.22
240997	02BG10	1.4775	Adder	1.74
241946	**AB1-107 CT1 (Suspended)**	**19.9578**	**Adder**	**23.48**
241947	**AB1-107 CT2 (Suspended)**	**20.6219**	**Adder**	**24.26**
241948	**AB1-107 ST1 (Suspended)**	**23.2231**	**Adder**	**27.32**
244357	05GRANGER EL	0.4013	50/50	0.4013
246936	05BLCK-1 C	0.3854	50/50	0.3854
246937	05BLCK-2 C	0.3854	50/50	0.3854
246938	05BLCK-3 C	0.3877	50/50	0.3877
247270	05RPMNG1	2.8377	50/50	2.8377
247271	05RPMNG2	2.8358	50/50	2.8358
247272	05RPMNG3	2.8377	50/50	2.8377
247522	U1-059 C	0.1846	50/50	0.1846
247540	U2-072 C	3.2763	50/50	3.2763
247548	V4-010 C	1.7397	Adder	2.05
247549	V3-028 C	0.5609	50/50	0.5609
247551	**U4-028 C (Suspended)**	**0.8733**	**Adder**	**1.03**
247552	**U4-029 C (Suspended)**	**0.8733**	**Adder**	**1.03**
247555	W1-056 C	0.0461	50/50	0.0461
247607	V1-011 C	0.2074	50/50	0.2074
247908	05BLCK-1 E	13.8226	50/50	13.8226
247909	05BLCK-2 E	13.8226	50/50	13.8226
247910	05BLCK-3 E	14.0609	50/50	14.0609
247911	05TIMB G E	8.8212	Adder	10.38
247932	U2-072 E	138.9773	50/50	138.9773
247940	**U4-028 E (Suspended)**	**5.8443**	**Adder**	**6.88**
247941	**U4-029 E (Suspended)**	**5.8443**	**Adder**	**6.88**
247942	W1-056 E	1.9494	50/50	1.9494
247947	V4-010 E	11.6427	Adder	13.7
247948	V3-028 E	5.8002	50/50	5.8002
247959	V1-011 E	8.7974	50/50	8.7974
270164	T-131 E	7.9162	Adder	9.31
270165	U1-059 E	5.3000	50/50	5.3000
925133	AB2-170 C	3.6461	50/50	3.6461
925135	AB2-170 E	37.7015	50/50	37.7015
926811	AC1-167 C O1	2.4259	Adder	2.85
926812	AC1-167 E O1	1.1768	Adder	1.38

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
926866	AC1-173 E	4.3539	Adder	5.12
932301	AC2-044 C	1.1320	50/50	1.1320
932302	AC2-044 E	1.8470	50/50	1.8470
934461	AD1-070 C O1	3.8822	50/50	3.8822
934462	AD1-070 E O1	18.2250	50/50	18.2250
934741	AD1-101 C O1	2.1294	50/50	2.1294
934742	AD1-101 E O1	3.4749	50/50	3.4749
934891	AD1-118	5.3740	Adder	6.32
934901	AD1-119 C O1	1.4035	Adder	1.65
934902	AD1-119 E O1	2.2904	Adder	2.69
934980	AD1-130 C	53.7924	50/50	53.7924
934984	AD1-130 E	27.0365	50/50	27.0365
936671	AD2-086 C	64.5509	50/50	64.5509
936672	AD2-086 E	43.0339	50/50	43.0339
936721	AD2-091	23.3880	50/50	23.3880
936752	AD2-096 BAT	5.3215	50/50	5.3215
937021	AD2-136 C O1	3.1438	Adder	3.7
937022	AD2-136 E O1	21.0394	Adder	24.75
938681	AE1-090 C	10.0849	50/50	10.0849
938682	AE1-090 E	13.3031	50/50	13.3031
938691	AE1-091 C	6.5364	50/50	6.5364
938692	AE1-091 E	8.7844	50/50	8.7844
938761	AE1-102 C	2.3236	50/50	2.3236
938762	AE1-102 E	1.5491	50/50	1.5491
938911	AE1-119	42.2246	Adder	49.68
939161	AE1-146 C O1	9.7628	50/50	9.7628
939162	AE1-146 E O1	4.5592	50/50	4.5592
940031	AE1-245 C	1.9728	50/50	1.9728
940032	AE1-245 E	13.2027	50/50	13.2027
940841	AE2-072 C	10.9350	50/50	10.9350
940842	AE2-072 E	7.2900	50/50	7.2900
941741	AE2-174 C	2.3319	Adder	2.74
941742	AE2-174 E	10.9167	Adder	12.84
941781	AE2-181 C	2.2011	Adder	2.59
941782	AE2-181 E	1.4674	Adder	1.73
942041	AE2-216	25.7268	50/50	25.7268
942661	AE2-282 C	3.2550	Adder	3.83
942662	AE2-282 E	1.7128	Adder	2.02
942801	AE2-298 C	2.5089	Adder	2.95
942802	AE2-298 E	1.6726	Adder	1.97
942871	AE2-306 C O1	9.5846	50/50	9.5846
942872	AE2-306 E O1	6.3898	50/50	6.3898
943181	AE2-322 C	2.9096	Adder	3.42
943182	AE2-322 E	1.4223	Adder	1.67
943581	AF1-029 C O1	1.2545	Adder	1.48
943582	AF1-029 E O1	0.8363	Adder	0.98
943791	AF1-047 C	1.5075	Adder	1.77
943792	AF1-047 E	1.0050	Adder	1.18
943951	AF1-063 C O1	1.3063	Adder	1.54
943952	AF1-063 E O1	0.7242	Adder	0.85
943961	AF1-064 C O1	2.4969	Adder	2.94
943962	AF1-064 E O1	1.2410	Adder	1.46

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944081	AF1-076 C O1	7.6193	50/50	7.6193
944082	AF1-076 E O1	4.7497	50/50	4.7497
944091	AF1-077 C O1	7.6193	50/50	7.6193
944092	AF1-077 E O1	4.7497	50/50	4.7497
944171	AF1-085 C O1	3.6399	50/50	3.6399
944172	AF1-085 E O1	5.0265	50/50	5.0265
944481	AF1-113 C O1	10.9143	Adder	12.84
944482	AF1-113 E O1	3.3943	Adder	3.99
944551	AF1-120 C	1.9723	Adder	2.32
944552	AF1-120 E	0.9935	Adder	1.17
944991	AF1-164 C O1	21.3389	50/50	21.3389
944992	AF1-164 E O1	11.4901	50/50	11.4901
945401	AF1-205 C	1.7921	Adder	2.11
945402	AF1-205 E	1.1948	Adder	1.41
945411	AF1-206 C O1	8.8530	Adder	10.42
945412	AF1-206 E O1	5.9020	Adder	6.94
945621	AF1-227 C O1	147.7359	50/50	147.7359
945622	AF1-227 E O1	98.4906	50/50	98.4906
945641	AF1-229 C	5.1194	Adder	6.02
945642	AF1-229 E	3.4129	Adder	4.02
946201	AF1-285 C	29.8189	50/50	29.8189
946202	AF1-285 E	23.4291	50/50	23.4291
957201	AF2-014 C	13.4055	50/50	13.4055
957202	AF2-014 E	8.9370	50/50	8.9370
957651	AF2-059 C	0.9454	50/50	0.9454
957652	AF2-059 E	1.3056	50/50	1.3056
958091	AF2-103 C	0.1335	50/50	0.1335
958092	AF2-103 E	0.1850	50/50	0.1850
958321	AF2-126 C	2.5418	Adder	2.99
958322	AF2-126 E	1.2709	Adder	1.5
958331	AF2-127 C	1.6854	Adder	1.98
958332	AF2-127 E	0.8867	Adder	1.04
958951	AF2-186 C O1	1.4346	Adder	1.69
958952	AF2-186 E O1	1.9811	Adder	2.33
960301	AF2-321 C	6.7177	Adder	7.9
960302	AF2-321 E	4.4785	Adder	5.27
960841	AF2-375 C	8.7636	50/50	8.7636
960842	AF2-375 E	5.8424	50/50	5.8424
960851	AF2-376 C	1.4605	Adder	1.72
960852	AF2-376 E	2.1907	Adder	2.58
960861	AF2-377 C	1.3194	Adder	1.55
960862	AF2-377 E	1.9791	Adder	2.33
961831	AG1-025 C	0.9454	50/50	0.9454
961832	AG1-025 E	1.3056	50/50	1.3056
962121	AG1-056 C	1.2991	Adder	2.88
962122	AG1-056 E	0.8660	Adder	1.92
962281	AG1-076 C O1	8.8429	50/50	8.8429
962282	AG1-076 E O1	13.2643	50/50	13.2643
963501	AG1-199	11.3053	Adder	25.1
964561	AG1-319 C	3.9418	Adder	8.75
964562	AG1-319 E	2.6279	Adder	5.83
965051	AG1-369 C	1.0468	Adder	2.32

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965052	AG1-369 E	0.6979	Adder	1.55
965421	AG1-410 C O2	26.8110	50/50	26.8110
965422	AG1-410 E O2	17.8740	50/50	17.8740
965431	AG1-411 O2	14.8950	50/50	14.8950
966831	AG1-554 C O2	3.8230	50/50	3.8230
966832	AG1-554 E O2	2.0109	50/50	2.0109
WEC	WEC	0.6590	Confirmed LTF	0.6590
LGEE	LGEE	0.5604	Confirmed LTF	0.5604
CBM-W2	CBM-W2	9.0048	Confirmed LTF	9.0048
NY	NY	0.4579	Confirmed LTF	0.4579
TVA	TVA	0.6146	Confirmed LTF	0.6146
O-066	O-066	5.9560	Confirmed LTF	5.9560
SIGE	SIGE	0.2223	Confirmed LTF	0.2223
CHEOAH	CHEOAH	0.0040	Confirmed LTF	0.0040
CBM-S1	CBM-S1	0.1980	Confirmed LTF	0.1980
G-007	G-007	0.9303	Confirmed LTF	0.9303
HAMLET	HAMLET	0.2980	Confirmed LTF	0.2980
MEC	MEC	2.6902	Confirmed LTF	2.6902
LAGN	LAGN	1.1532	Confirmed LTF	1.1532
CATAWBA	CATAWBA	0.1565	Confirmed LTF	0.1565
CBM-W1	CBM-W1	45.9155	Confirmed LTF	45.9155

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
AEP_P1-3_#7222_05MALIS 765_1	CONTINGENCY 'AEP_P1-3_#7222_05MALIS 765_1' / 485 OPEN BRANCH FROM BUS 242926 TO BUS 242928 CKT 1 / 242926 05MALIS 765 242928 05MARYSV 765 1 OPEN BRANCH FROM BUS 242926 TO BUS 246751 CKT 1 / 242926 05MALIS 765 246751 05VASSEL 765 1 OPEN BRANCH FROM BUS 242926 TO BUS 243538 CKT 1 / 242926 05MALIS 765 243538 05MALISX 138 1 OPEN BRANCH FROM BUS 243537 TO BUS 243538 CKT SR / 243537 05MALIS 138 243538 05MALISX 138 SR OPEN BRANCH FROM BUS 243537 TO BUS 243538 CKT ZB / 243537 05MALIS 138 243538 05MALISX 138 ZB END
AEP_P1-3_#57_05E LIMA 345_1	CONTINGENCY 'AEP_P1-3_#57_05E LIMA 345_1' / 119 OPEN BRANCH FROM BUS 242935 TO BUS 242989 CKT 1 / 242935 05E LIMA 345 242989 05E LIMA 138 1 END
ATSI-P7-1-OEC-345-004_NON	CONTINGENCY 'ATSI-P7-1-OEC-345-004_NON' /* DB - BAVER & DB - HAYES 345 DISCONNECT BRANCH FROM BUS 238654 TO BUS 907200 CKT 1 /* 02DAV-BE 345 AD1-103 345 DISCONNECT BRANCH FROM BUS 907200 TO BUS 238569 CKT 1 /* AD1-103 345 02BEAVER 345 DISCONNECT BRANCH FROM BUS 238654 TO BUS 239289 CKT 1 /* 02DAV-BE 345 02HAYES 345 END
ATSI-P7-1-OEC-345-005_NON	CONTINGENCY 'ATSI-P7-1-OEC-345-005_NON' /* DB - BEAVER & BEAVER - HAYES 345 DISCONNECT BRANCH FROM BUS 238654 TO BUS 907200 CKT 1 /* 02DAV-BE 345 AD1-103 345 DISCONNECT BRANCH FROM BUS 907200 TO BUS 238569 CKT 1 /* AD1-103 345 02BEAVER 345 DISCONNECT BRANCH FROM BUS 239289 TO BUS 238569 CKT 1 /* 02HAYES 345 02BEAVER 345 END
Base Case	

Contingency Name	Contingency Definition
AEP_P2-2_#5063_05SBERWI 345_1	CONTINGENCY 'AEP_P2-2_#5063_05SBERWI 345_1' OPEN BRANCH FROM BUS 242917 TO BUS 242942 CKT 1 / 242917 05SBERW EQ 999 242942 05SBERWI 345 1 OPEN BRANCH FROM BUS 242917 TO BUS 243180 CKT 1 / 242917 05SBERW EQ 999 243180 05SBERWICK 69.0 1 OPEN BRANCH FROM BUS 242917 TO BUS 243199 CKT 1 / 242917 05SBERW EQ 999 243199 05SBERW1-L 12.0 1 OPEN BRANCH FROM BUS 945640 TO BUS 242942 CKT 1 / 945640 AF1-229 TAP 345 242942 05SBERWI 345 1 OPEN BRANCH FROM BUS 242936 TO BUS 242942 CKT 1 / 242936 05FOSTOR 345 242942 05SBERWI 345 1 END
AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A	CONTINGENCY 'AEP_P2-1_242939 05MARYSV 345 945620 AF1-227 TAP 345 1-A'/ 1940 OPEN BRANCH FROM BUS 242939 TO BUS 945620 CKT 1 / 242939 05MARYSV 345 945620 AF1-227 TAP 345 1 END
AEP_P1-2_#6463_16757	CONTINGENCY 'AEP_P1-2_#6463_16757' / 473 OPEN BRANCH FROM BUS 242935 TO BUS 246929 CKT 1 / 242935 05E LIMA 345 246929 05MADDOX 345 1 END
AEP_P4_#9391_05SORENS 345_F	CONTINGENCY 'AEP_P4_#9391_05SORENS 345_F' / 2050 OPEN BRANCH FROM BUS 246999 TO BUS 243232 CKT 3 / 246999 05SORENS 765 243232 05SORENS 345 3 OPEN BRANCH FROM BUS 243211 TO BUS 243232 CKT 1 / 243211 05ALLEN 345 243232 05SORENS 345 1 END
AEP_P1-2_#2749_554-A	CONTINGENCY 'AEP_P1-2_#2749_554-A' / 2706 OPEN BRANCH FROM BUS 238745 TO BUS 945640 CKT 1 / 238745 02GALION 345 945640 AF1-229 TAP 345 1 END
AEP_P4_#7445_05MARYSV 765_B	CONTINGENCY 'AEP_P4_#7445_05MARYSV 765_B' / 2263 OPEN BRANCH FROM BUS 242928 TO BUS 962760 CKT 1 / 242928 05MARYSV 765 962760 AG1-125 TAP 765 1 OPEN BRANCH FROM BUS 242928 TO BUS 958430 CKT 1 / 242928 05MARYSV 765 958430 AF2-137 TAP 765 1 END

14 Affected Systems

14.1 TVA

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

14.2 Duke Energy Progress

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

14.3 MISO

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

14.4 LG&E

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