



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-353
ROCKPORT 765 KV
560 MW Capacity / 800 MW Energy**

July 2020

Table of Contents

1	Introduction.....	4
2	Preface.....	4
3	General.....	5
4	Point of Interconnection.....	6
5	Cost Summary.....	6
6	Transmission Owner Scope of Work.....	7
6.1	Attachment Facilities.....	7
6.2	Direct Connection Cost Estimate.....	7
6.3	Non-Direct Connection Cost Estimate.....	7
7	Incremental Capacity Transfer Rights (ICTRs).....	8
8	Schedule.....	8
9	Interconnection Customer Requirements.....	8
10	Revenue Metering and SCADA Requirements.....	8
10.1	PJM Requirements.....	8
10.2	Meteorological Data Reporting Requirements.....	9
10.3	Interconnected Transmission Owner Requirements.....	9
11	Summer Peak - Load Flow Analysis.....	10
11.1	Generation Deliverability.....	11
11.2	Multiple Facility Contingency.....	11
11.3	Contribution to Previously Identified Overloads.....	11
11.4	Potential Congestion due to Local Energy Deliverability.....	12
11.5	System Reinforcements.....	14
11.6	Flow Gate Details.....	20
11.6.1	Index 1.....	21
11.6.2	Index 2.....	23
11.6.3	Index 3.....	25
11.6.4	Index 4.....	26
11.6.5	Index 5.....	28
11.6.6	Index 6.....	31
11.6.7	Index 7.....	34
11.6.8	Index 8.....	35

11.6.9	Index 9	36
11.6.10	Index 10.....	38
11.6.11	Index 11.....	39
11.6.12	Index 12.....	41
11.6.13	Index 13.....	43
11.7	Queue Dependencies	48
11.8	Contingency Descriptions.....	53
12	Light Load Analysis	56
13	Short Circuit Analysis.....	56
14	Stability and Reactive Power Assessment.....	56
15	Affected Systems	56
15.1	TVA.....	56
15.2	Duke Energy Progress.....	56
15.3	MISO	56
15.4	LG&E.....	56

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.

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.

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 Solar; Storage generating facility located in Spencer County, Indiana. The installed facilities will have a total capability of 800 MW with 560 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 01, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-353
Project Name	ROCKPORT 765 KV
State	Indiana
County	Spencer
Transmission Owner	AEP
MFO	800
MWE	800
MWC	560
Fuel	Solar; Storage
Basecase Study Year	2023

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

AF2-353 will interconnect with the AEP transmission system via a direction connection to the Rockport 765 kV substation.

To accommodate the interconnection to the Rockport 765 kV substation, one (1) new 765 kV circuit breaker will be installed (Attachment 1). Installation of associated protection and control equipment, 765 kV line risers, SCADA, and 765 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.

5 Cost Summary

The AF2-353 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$ 7,852,000
Total System Network Upgrade Costs	\$299,405,000
Total Costs	\$307,257,000

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 88-129. 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.

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.

6 Transmission Owner Scope of Work

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

6.1 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
765 kV Revenue Metering	\$657,000
Generator lead first span exiting the POI station, including the first structure outside the fence	\$1,350,000
Total Attachment Facility Costs	\$2,007,000

6.2 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
One (1) new 765 kV circuit breakers will be installed (Attachment 1). Installation of associated protection and control equipment, 765 kV line risers, and SCADA will be required.	\$5,800,000
Total Direct Connection Facility Costs	\$5,800,000

6.3 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 Protection and Control Settings at the Rockport 765 kV substation	\$45,000
Total Non-Direct Connection Facility Costs	\$45,000

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 (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

Solar generation facilities shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter²)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)

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

The Queue Project AF2-353 was evaluated as an 800.0 MW (Capacity 560.0 MW) injection at the Rockport 765 kV substation in the AEP area. Project AF2-353 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-353 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)

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
95495487	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P1-2_#8905	single	3970.0	95.71	104.67	DC	355.7
95495453	247712	05SULLIVAN	345.0	AEP	254529	16PETE	345.0	IPL	1	AEP_P1-2_#363	single	1409.0	96.62	106.82	DC	143.74
95495519	247712	05SULLIVAN	345.0	AEP	243217	05DEQUIN	345.0	AEP	1	AEP_P1-2_#363	single	1318.0	98.8	105.01	DC	81.81

11.2 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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
95495289	243222	05FAL LC	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	AEP_P4_#8648_05JEFR SO 765_B	breaker	1195.0	99.3	101.71	DC	63.92

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
95495152	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#1760_05JEFR SO 765_A	breaker	2354.0	143.78	159.28	DC	382.2
95495153	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	2354.0	109.71	115.05	DC	252.15
95495254	243208	05JEFRSO	765.0	AEP	242865	05JEFRSO	345.0	AEP	2	AEP_P4_#1760_05JEFR SO 765_A	breaker	3039.0	111.37	123.37	DC	382.2
95495214	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P4_#8906_05SULLIVAN 345_C	breaker	3970.0	119.82	133.2	DC	531.2
95495215	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P4_#8910_05DEQUIN 345_C	breaker	3970.0	112.29	125.1	DC	508.54
95495907	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11042-B	tower	3970.0	123.5	136.27	DC	506.72
95495908	243209	05ROCKPT	765.0	AEP	243208	05JEFRSO	765.0	AEP	1	AEP_P7-1_#11042-A	tower	3970.0	122.99	135.76	DC	506.72
95495142	243216	05DARWIN	345.0	AEP	243221	05EUGEN	345.0	AEP	1	AEP_P4_#8648_05JEFR SO 765_B	breaker	1160.0	162.56	177.61	DC	174.54
95495397	243216	05DARWIN	345.0	AEP	243221	05EUGEN	345.0	AEP	1	AEP_P1-2_#363	single	1160.0	134.81	145.32	DC	122.01
95495398	243216	05DARWIN	345.0	AEP	243221	05EUGEN	345.0	AEP	1	AEP_P1-2_#10136	single	1160.0	110.69	121.28	DC	122.82
95495137	247712	05SULLIVAN	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P4_#8648_05JEFR SO 765_B	breaker	1160.0	162.56	177.61	DC	174.54

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 PROJE T LOADIN G %	POST PROJE T LOADIN G %	AC D C	MW IMPACT
95495190	247712	05SULLIVAN	345.0	AEP	254529	16PETE	345.0	IPL	1	AEP_P4_#8648_05JEF RSO 765_B	breaker	1409.0	130.24	144.75	DC	204.45
95495247	247712	05SULLIVAN	345.0	AEP	243217	05DEQUIN	345.0	AEP	1	AEP_P4_#8648_05JEF RSO 765_B	breaker	1318.0	116.13	125.03	DC	117.4
95495379	247712	05SULLIVAN	345.0	AEP	956820	J1180 TAP	345.0	AMI L	1	AEP_P1-2_#363	single	1466.0	137.88	151.85	DC	204.83
95495382	247712	05SULLIVAN	345.0	AEP	956820	J1180 TAP	345.0	AMI L	1	AEP_P1-2_#10136	single	1466.0	105.48	119.54	DC	206.21
95495406	247712	05SULLIVAN	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P1-2_#363	single	1160.0	134.81	145.32	DC	122.01
95495407	247712	05SULLIVAN	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P1-2_#10136	single	1160.0	110.69	121.28	DC	122.82
98900571	248000	06CLIFTY	345.0	OVE C	248001	06DEARB	345.0	OVE C	1	AEP_P4_#1760_05JEF RSO 765_A	breaker	1023.0	113.69	117.84	DC	94.1
98900794	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVE C	1	AEP_P1-2_#363	single	1451.0	126.02	128.48	DC	35.68
98900795	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVE C	1	AEP_P1-2_#10136	single	1451.0	120.42	122.9	DC	35.92
96639428	939400	AE1-172 TAP	345.0	CE	934720	AD1-100 TAP	345.0	CE	1	AEP_P1-2_#10136	single	1528.0	102.52	104.58	DC	31.47
95495185	956820	J1180 TAP	345.0	AMI L	247712	05SULLIVAN	345.0	AEP	1	AEP_P4_#3128_05EUG ENE 345_A2	breaker	1466.0	149.91	149.93	DC	31.81
95495186	956820	J1180 TAP	345.0	AMI L	247712	05SULLIVAN	345.0	AEP	1	COMED_P4_080-45-BT4-5__	breaker	1466.0	137.44	137.9	DC	28.46
95495187	956820	J1180 TAP	345.0	AMI L	247712	05SULLIVAN	345.0	AEP	1	COMED_P4_080-45-BT7-8__	breaker	1466.0	136.72	137.21	DC	28.5

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 PROJE T LOADIN G %	POST PROJE T LOADIN G %	AC D C	MW IMPACT
95495567	242865	05JEF RSO	345.0	AEP	248000	06CLIFTY	345.0	OVE C	Z1	AEP_P1 - 2_#709	operation	2354.0	108.22	113.45	DC	252.36
95495481	243209	05ROCKPT	765.0	AEP	243208	05JEF RSO	765.0	AEP	1	Base Case	operation	3452.0	119.91	134.28	DC	496.24
95495482	243209	05ROCKPT	765.0	AEP	243208	05JEF RSO	765.0	AEP	1	AEP_P1 - 2_#8905	operation	3970.0	111.93	124.73	DC	508.14
95495394	243216	05DARWIN	345.0	AEP	243221	05EUGENE	345.0	AEP	1	AEP_P1 - 2_#363	operation	1160.0	161.9	176.93	DC	174.3

ID	FROM BUS#	FROM BUS	kV	FRO M BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Ratin g MVA	PRE PROJEC T LOADIN G %	POST PROJEC T LOADIN G %	AC D C	MW IMPAC T
95495574	243222	05FALL C	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	AEP_P1 - 2_#363	operatio n	1195.0	98.37	100.77	DC	63.7
95495376	247712	05SULLIVA N	345.0	AEP	956820	J1180 TAP	345.0	AMI L	1	AEP_P1 - 2_#363	operatio n	1466.0	183.44	203.4	DC	292.62
95495403	247712	05SULLIVA N	345.0	AEP	243216	05DARWIN	345.0	AEP	1	AEP_P1 - 2_#363	operatio n	1160.0	161.9	176.93	DC	174.3
95495450	247712	05SULLIVA N	345.0	AEP	254529	16PETE	345.0	IPL	1	AEP_P1 - 2_#363	operatio n	1409.0	129.4	143.97	DC	205.34
95495516	247712	05SULLIVA N	345.0	AEP	243217	05DEQUIN	345.0	AEP	1	AEP_P1 - 2_#363	operatio n	1318.0	114.84	123.71	DC	116.87
98900791	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVE C	1	AEP_P1 - 2_#363	operatio n	1451.0	130.32	131.9	DC	50.97
95495464	956820	J1180 TAP	345.0	AMIL	247712	05SULLIVA N	345.0	AEP	1	AEP_P1 - 2_#286	operatio n	1466.0	138.22	138.24	DC	29.74
95495468	956820	J1180 TAP	345.0	AMIL	247712	05SULLIVA N	345.0	AEP	1	Base Case	operatio n	1334.0	134.69	134.71	DC	28.92

11.5 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost
95495142,95495398,95495397	7	05DARWIN 345.0 kV - 05EUGENE 345.0 kV Ckt 1	<p>AEP AEPI0036a (343) : Rebuild 3.83 miles of 2303.5 ACAR , conductor section 1 Project Type : FAC Cost : \$5,745,000 Time Estimate : 24- 36 Months</p> <p>AEPI0036b (344) : Rebuild 47.02 miles of 1414 ACSR/PE, conductor section 2 Project Type : FAC Cost : \$7,660,000 Time Estimate : 24- 36 Months</p> <p>AEPI0036c (345) : An engineering study will need to be conducted to determine if the Eugene T Relay Compliance Trip limits 2944 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$25,000 Time Estimate : 12- 18 Months</p> <p>AEPI0036d (346) : An engineering study will need to be conducted to determine if the Eugene CT Relay Thermal limits 2996 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$600,000 Time Estimate : 12-18 Months</p>	\$17,055,000
95495137,95495406,95495407	8	05SULLIVAN 345.0 kV - 05DARWIN 345.0 kV Ckt 1	<p>AEPI0036e (347) : An engineering study will need to be conducted to determine if the Eugene Relay Compliance Trip limits 3004 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$25,000 Time Estimate : 12- 18 Months</p> <p>AEPI0036f (348) : Replace 2 3000A CB's at Eugene Project Type : FAC Cost : \$2,000,000 Time Estimate : 12-18 Months</p> <p>AEPI0036g (349) : Replace all ten (10) 2-1700 AAC at Eugene Station Project Type : FAC Cost : \$1,000,000 Time Estimate : 12- 18 Months</p>	

ID	Idx	Facility	Upgrade Description	Cost
95495185,9549 5187,95495186	13	J1180 TAP 345.0 kV - 05SULLIVAN 345.0 kV Ckt 1	<u>AEP</u> AEPI0010a (282) : Reconductor/rebuild 0.82 miles of ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 5 Project Type : FAC Cost : \$1,640,000 Time Estimate : 24 - 36 Months AEPI0010b (283) : Reconductor/rebuild 1 miles of ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 6 Project Type : FAC Cost : \$2,000,000 Time Estimate : 24 - 36 Months AEPI0010c (284) : Replace two Sullivan 3000A Wavetrap Project Type : FAC Cost : \$400,000 Time Estimate : 12- 18 Months <u>AMIL</u> NonPJMArea (540) : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$4,040,000
95495382,9549 5379	9	05SULLIVAN 345.0 kV - J1180 TAP 345.0 kV Ckt 1		
98900571	10	06CLIFTY 345.0 kV - 06DEARB1 345.0 kV Ckt 1	<u>OVEC</u> b2943 (1673) : PJM Baseline Upgrade b2943. Perform a LIDAR study on the Clifty Creek - Dearborn 345 kV line to increase the Summer Emergency rating. The baseline project had a projected in-service date of 12/01/2020. Project Type : FAC Cost : \$127,896 Time Estimate : N/A Months	\$0
95495289	4	05FALL C 345.0 kV - AB2-028 TAP 345.0 kV Ckt 1	<u>IPL</u> NonPJMArea : The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase.	\$0

ID	Idx	Facility	Upgrade Description	Cost
95495152,95495153	5	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	<p>AEPI0045a : Replace 4 Clifty Switches Project Type : FAC Cost : \$ 2,000,000 Time Estimate : 12-18 Months</p> <p>AEPI0045b : A Sag Study will be required on the 0.75 mile section of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD line to mitigate the overload . New Rating after the Sag Study: S/N: 2354 MVA S/E: 3212 MVA. Depending on the sag study results, cost for this upgrade is expected to be between \$20,000 (No remediations required just sag study) and 1.96 million (complete line reconductor/rebuild required). 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 : \$20,000 Time Estimate : 12-18 Months</p> <p>AEPI0045c : Replace Clifty Bus 5"0 AL Tubular Sch 40 Project Type : FAC Cost : \$100,000 Time Estimate : 12-18 Months</p> <p>AEPI0045d : Rebuild 0.75 miles of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD conductor to mitigate the overload. Project Type : FAC Cost : \$1,960,000 Time Estimate : 24-36 Months</p> <p>AEPI0045e : Replace Jefferson Breaker (5000A) Project Type : FAC Cost : \$1,200,000 Time Estimate : 12-18 Months</p> <p>AEPI0045f : An engineering study will need to be conducted to determine if the Jefferson Relay Compliance Trip limits 5506 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$25,000 Time Estimate : 12-18 Months</p> <p>AEPI0045g : An engineering study will need to be conducted to determine if the Clifty Relay Thermal limits 5993 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$25,000 Time Estimate : 12-18 Months</p> <p>AEPI0045h : An engineering study will need to be conducted to determine if the Jefferson Relay Compliance Trip limits 5993 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Cost : \$25,000 Time Estimate : 12-18 Months</p> <p>AEPI0045i : Replace 2 Clifty Breaker (3000A) Cost : \$2,400,000 Time Estimate : 12-18 Months</p>	\$7,755,000

ID	Idx	Facility	Upgrade Description	Cost
95495247,95495519	3	05SULLIVAN 345.0 kV - 05DEQUIN 345.0 kV Ckt 1	<p><u>AEP</u> AEPI0041a (380) : Replace 5 Sub cond 2156 ACSR 84/19 STD Project Type : FAC Cost : \$5,000,000 Time Estimate : 24- 36 Months</p> <p>AEPI0041b (381) : Rebuild 97.19 Miles of ACSR/PE ~ 1414 ~ 62/19 ~ conductor section 1 Project Type : FAC Cost : \$194,380,000 Time Estimate : 24- 36 Months</p> <p>AEPI0041c (382) : Replace Sub cond 2874 ACSR (72/7) at Dequine Project Type : FAC Cost : \$1,000,000 Time Estimate : 24- 36 Months</p> <p>AEPI0041d (383) : Replace RCTL 2663 Amps at Dequine Project Type : FAC Cost : \$25,000 Time Estimate : 12- 18 Months</p> <p>AEPI0041e (384) : Replace RCTL 2729 Amps at Sullivan Project Type : FAC Cost : \$25,000 Time Estimate : 12- 18 Months</p>	\$200,430,000
95495190,95495453	2	05SULLIVAN 345.0 kV - 16PETE 345.0 kV Ckt 1	<p><u>AEP</u> AEPI0039a (374) : A Sag Study will be required on the ~0.5 miles section of 954 2x Rail Conductor section 2 to mitigate the overload. New Ratings after the sag study S/N: 1410 MVA S/E: 1888 MVA. Depending on the sag study results, cost for this upgrade is expected to be between \$25,000 (no remediations required just sag study) and \$0.75 million (complete line reconductor/rebuild required) Project Type : FAC Cost : \$25,000 Time Estimate : 6-12 Months</p> <p>AEPI0039c (376) : Upgrade RCTL rating Project Type : FAC Cost : \$25,000 Time Estimate : 12- 18 Months</p> <p>AEPI0039e (378) : Rebuild/Reconductor `0.5 miles of conductor section 2 Project Type : FAC Cost : \$750,000 Time Estimate : 24-36 Months</p> <p><u>IPL</u> NonPJMArea (1530) : The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months</p>	\$775,000

ID	Idx	Facility	Upgrade Description	Cost
96639428	12	AE1-172 TAP 345.0 kV - AD1- 100 TAP 345.0 kV Ckt 1	<p><u>ComEd</u> CE_NUN_Sta. 12 Dresden (840) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to confirm this proposal in study. Assuming this proposal is acceptable in solution, a preliminary estimate is \$4M with a 24 month estimated construction contingent upon outage scheduling with Station 12 Dresden. The ratings for L11212 will not change rather the contingency as stated above will be revised. Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months</p> <p>CE_NUN_L11212_2 (862) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to replace-2-345kV circuit breakers, upgrade a line relay scheme, station conductor upgrades at both terminals and reconductor the line. A preliminary estimate for the upgrades is \$41M with an estimated construction timeline of 24-30 months. Upon completion the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : \$41,000,000 Time Estimate : 24-30 Months</p>	\$45,000,000
98900794,9890 0795	11	7TRIMBL REAC 345.0 kV - 06CLIFTY 345.0 kV Ckt 1	<p><u>LGEE</u> NonPJM Area (1634) : The external (i.e. Non-PJM) Transmission Owner, LGEE, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months</p>	\$0
95495254	6	05JEFRSO 765.0 kV - 05JEFRSO 345.0 kV Ckt 2	<p><u>AEP</u> AEPI0025a (323) : Replace 765/345 Transformer Project Type : FAC Cost : \$6,000,000 Time Estimate : 12-18 Months</p> <p>AEPI0025b (324) : Replace Jefferson 345kV Circuit Breaker (5000A) Project Type : FAC Cost : \$1,200,000 Time Estimate : 12-18 Months</p> <p>AEPI0025c (325) : An engineering study will need to be conducted to determine if the Jefferson CT thermal Trip limits 2703 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: \$600,000. Project Type : FAC Cost : \$25,000 Time Estimate : 12-18 Months</p>	\$7,225,000

ID	Idx	Facility	Upgrade Description	Cost
95495907,9549 5908,95495215, 95495214,9549 5487	1	05ROCKPT 765.0 kV - 05JEFRSO 765.0 kV Ckt 1	<p>AEP</p> <p>AEPI0002a (263) : An engineering study will need to be conducted to determine if the Rockport Relay Thermal limits 2996 Amps settings can be adjusted to mitigate the overload, Estimated Cost \$25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: \$600,000 Project Type : FAC Cost : \$25,000 Time Estimate : 12-18 Months</p> <p>AEPI0002c (265) : Replace 6 Rockport Current Transformers 3000Amps Project Type : FAC Cost : \$4,800,000 Time Estimate : 12-18 Months</p> <p>AEPI0002d (266) : Replace 2 Rockport 3000A non-oil Breakers at Rockport Project Type : FAC Cost : \$6,000,000 Time Estimate : 12-18 Months</p> <p>AEPI0002e (267) : Replace 3 3000A Wavetraps at Rockport Project Type : FAC Cost : \$150,000 Time Estimate : 12-18 Months</p> <p>AEPI0002f (268) : Replace 3 3000A Wavetraps at Jefferson Project Type : FAC Cost : \$150,000 Time Estimate : 12-18 Months</p> <p>AEPI0002g (269) : Replace 12 3000A switches at Rockport Project Type : FAC Cost : \$6,000,000 Time Estimate : 12-18 Months</p>	\$17,125,000
			TOTAL COST	\$299,405,000

11.6 Flow Gate Details

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
95495907	243209	05ROCKPT	AEP	243208	05JEFRSO	AEP	1	AEP_P7-1_#11042-B	tower	3970.0	123.5	136.27	DC	506.72

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	144.2198	50/50	144.2198
243443	05RKG2	142.0347	50/50	142.0347
243859	05FR-11G C	0.6153	50/50	0.6153
243862	05FR-12G C	0.6059	50/50	0.6059
243864	05FR-21G C	0.6467	50/50	0.6467
243866	05FR-22G C	0.6184	50/50	0.6184
243870	05FR-3G C	1.2525	50/50	1.2525
243873	05FR-4G C	0.9700	50/50	0.9700
246909	05MDL-1G C	1.2556	50/50	1.2556
246910	05MDL-2G C	0.6215	50/50	0.6215
246976	05MDL-3G C	0.6341	50/50	0.6341
246979	05MDL-4G C	0.6184	50/50	0.6184
247556	T-127 C	0.6278	50/50	0.6278
247900	05FR-11G E	14.2498	50/50	14.2498
247901	05FR-12G E	14.0132	50/50	14.0132
247902	05FR-21G E	14.9778	50/50	14.9778
247903	05FR-22G E	14.3408	50/50	14.3408
247904	05FR-3G E	29.0456	50/50	29.0456
247905	05FR-4G E	22.7487	50/50	22.7487
247906	05MDL-1G E	29.0622	50/50	29.0622
247907	05MDL-2G E	14.5584	50/50	14.5584
247912	05MDL-3G E	14.5584	50/50	14.5584
247913	05MDL-4G E	14.5584	50/50	14.5584
247943	T-127 E	14.5584	50/50	14.5584
274650	KINCAID ;1U	10.4500	50/50	10.4500
930041	AB1-006 C	0.8161	50/50	0.8161
930042	AB1-006 E	31.6645	50/50	31.6645
930461	AB1-087	182.7540	50/50	182.7540
930471	AB1-088	182.7540	50/50	182.7540
933441	AC2-157 C	25.2533	50/50	25.2533
933442	AC2-157 E	41.2027	50/50	41.2027
936771	AD2-100 C	14.2090	50/50	14.2090
936772	AD2-100 E	9.4727	50/50	9.4727
936971	AD2-131 C	0.9360	50/50	0.9360
936972	AD2-131 E	4.7025	50/50	4.7025
941341	AE2-130 C	304.0320	50/50	304.0320
941342	AE2-130 E	202.6880	50/50	202.6880
941571	AE2-154 C	5.9143	50/50	5.9143
941572	AE2-154 E	39.5806	50/50	39.5806
942481	AE2-261 C	19.7322	50/50	19.7322
942482	AE2-261 E	13.1548	50/50	13.1548
942601	AE2-276	16.6140	50/50	16.6140

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944201	AF1-088 FTIR	332.2800	50/50	332.2800
944221	AF1-090 C O1	4.2564	50/50	4.2564
944222	AF1-090 E O1	19.9276	50/50	19.9276
945391	AF1-204 C O1	10.6074	50/50	10.6074
945392	AF1-204 E O1	31.8221	50/50	31.8221
945871	AF1-252 O1	7.5454	50/50	7.5454
945881	AF1-253 O1	5.2237	50/50	5.2237
946581	AF1-322 C	15.2863	50/50	15.2863
946582	AF1-322 E	21.1097	50/50	21.1097
954681	J949 C	18.7680	PJM External (MISO)	18.7680
954761	J468 C	3.1133	PJM External (MISO)	3.1133
954762	J468 E	17.6422	PJM External (MISO)	17.6422
957141	AF2-008 FTIR	166.1400	50/50	166.1400
957142	AF2-008 NFTI	332.2800	50/50	332.2800
957381	AF2-032 C	1.4819	50/50	1.4819
957382	AF2-032 E	0.6973	50/50	0.6973
958971	AF2-188 C O1	12.2291	50/50	12.2291
958972	AF2-188 E O1	8.1527	50/50	8.1527
960621	AF2-353 C	354.7040	50/50	354.7040
960622	AF2-353 E	152.0160	50/50	152.0160
WEC	WEC	1.3910	Confirmed LTF	1.3910
LGEE	LGEE	0.2567	Confirmed LTF	0.2567
CBM-W2	CBM-W2	60.9909	Confirmed LTF	60.9909
NY	NY	1.0623	Confirmed LTF	1.0623
CBM-W1	CBM-W1	41.1079	Confirmed LTF	41.1079
TVA	TVA	5.2388	Confirmed LTF	5.2388
O-066	O-066	12.5261	Confirmed LTF	12.5261
CBM-S1	CBM-S1	26.6676	Confirmed LTF	26.6676
G-007	G-007	1.9375	Confirmed LTF	1.9375
MADISON	MADISON	16.9284	Confirmed LTF	16.9284
MEC	MEC	10.3015	Confirmed LTF	10.3015
BLUEG	BLUEG	0.3871	Confirmed LTF	0.3871
TRIMBLE	TRIMBLE	0.4869	Confirmed LTF	0.4869
CATAWBA	CATAWBA	0.0525	Confirmed LTF	0.0525

11.6.2 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
95495190	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P4_#8648_05JEFRS O 765_B	breaker	1409.0	130.24	144.75	DC	204.45

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	58.1888	50/50	58.1888
243443	05RKG2	57.3072	50/50	57.3072
247900	05FR-11G E	3.5667	Adder	4.2
247901	05FR-12G E	3.5075	Adder	4.13
247902	05FR-21G E	3.7489	Adder	4.41
247903	05FR-22G E	3.5895	Adder	4.22
247904	05FR-3G E	7.2700	Adder	8.55
247905	05FR-4G E	5.6939	Adder	6.7
274882	W4-005 E	12.9808	Adder	15.27
276153	W2-048 E	2.6950	Adder	3.17
909052	X2-022 E	8.1067	Adder	9.54
925771	AC1-053 C	1.1068	Adder	1.3
925772	AC1-053 E	7.4068	Adder	8.71
930461	AB1-087	140.5965	50/50	140.5965
930471	AB1-088	140.5965	50/50	140.5965
933441	AC2-157 C	19.4279	50/50	19.4279
933442	AC2-157 E	31.6981	50/50	31.6981
935141	AD1-148	2.1129	Adder	2.49
936771	AD2-100 C	6.1101	Adder	7.19
936772	AD2-100 E	4.0734	Adder	4.79
936971	AD2-131 C	0.4025	Adder	0.47
936972	AD2-131 E	2.0221	Adder	2.38
937211	AD2-159 C	1.4028	Adder	1.65
937212	AD2-159 E	6.5676	Adder	7.73
941341	AE2-130 C	122.6688	50/50	122.6688
941342	AE2-130 E	81.7792	50/50	81.7792
942481	AE2-261 C	8.4952	Adder	9.99
942482	AE2-261 E	5.6635	Adder	6.66
942601	AE2-276	12.7815	50/50	12.7815
944201	AF1-088 FTIR	255.6300	50/50	255.6300
944221	AF1-090 C O1	1.8245	Adder	2.15
944222	AF1-090 E O1	8.5421	Adder	10.05
945391	AF1-204 C O1	3.4079	Adder	4.01
945392	AF1-204 E O1	10.2236	Adder	12.03
945871	AF1-252 O1	3.2344	Adder	3.81
945881	AF1-253 O1	2.2392	Adder	2.63
953401	J811	6.4914	PJM External (MISO)	6.4914
953651	J815	12.8275	PJM External (MISO)	12.8275
953881	J848 C	2.0615	PJM External (MISO)	2.0615
953882	J848 E	11.1535	PJM External (MISO)	11.1535
954411	J912	5.5220	PJM External (MISO)	5.5220
954681	J949 C	11.8167	PJM External (MISO)	11.8167

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
954761	J468 C	1.9389	PJM External (MISO)	1.9389
954762	J468 E	10.9871	PJM External (MISO)	10.9871
955031	J979 C	1.6492	PJM External (MISO)	1.6492
955032	J979 E	8.9228	PJM External (MISO)	8.9228
955131	J991	13.6800	PJM External (MISO)	13.6800
956451	J1139	8.5185	PJM External (MISO)	8.5185
957141	AF2-008 FTIR	127.8150	50/50	127.8150
957142	AF2-008 NFTI	255.6300	50/50	255.6300
957381	AF2-032 C	0.3383	Adder	0.75
957382	AF2-032 E	0.1592	Adder	0.35
960172	AF2-308 BAT	0.7738	Merchant Transmission	0.7738
960261	AF2-317	0.3583	Adder	0.8
960621	AF2-353 C	143.1136	50/50	143.1136
960622	AF2-353 E	61.3344	50/50	61.3344
WEC	WEC	0.8933	Confirmed LTF	0.8933
CALDERWOOD	CALDERWOOD	0.4697	Confirmed LTF	0.4697
NY	NY	0.4723	Confirmed LTF	0.4723
CBM-W1	CBM-W1	24.4320	Confirmed LTF	24.4320
O-066	O-066	5.5709	Confirmed LTF	5.5709
CHEOAH	CHEOAH	0.4690	Confirmed LTF	0.4690
G-007	G-007	0.8632	Confirmed LTF	0.8632
MADISON	MADISON	12.5617	Confirmed LTF	12.5617
MEC	MEC	4.8369	Confirmed LTF	4.8369
GIBSON	GIBSON	6.4575	Confirmed LTF	6.4575
BLUEG	BLUEG	9.3362	Confirmed LTF	9.3362
TRIMBLE	TRIMBLE	2.8927	Confirmed LTF	2.8927
CATAWBA	CATAWBA	0.2825	Confirmed LTF	0.2825

11.6.3 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 IMPACT
95495247	247712	05SULLIVAN	AEP	243217	05DEQUIN	AEP	1	AEP_P4_#8648_05JEFRS O765_B	breaker	1318.0	116.13	125.03	DC	117.4

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	33.4137	50/50	33.4137
243443	05RKG2	32.9075	50/50	32.9075
930461	AB1-087	80.7180	50/50	80.7180
930471	AB1-088	80.7180	50/50	80.7180
933441	AC2-157 C	11.1538	50/50	11.1538
933442	AC2-157 E	18.1982	50/50	18.1982
941341	AE2-130 C	70.4400	50/50	70.4400
941342	AE2-130 E	46.9600	50/50	46.9600
942601	AE2-276	7.3380	50/50	7.3380
944201	AF1-088 FTIR	146.7600	50/50	146.7600
957141	AF2-008 FTIR	73.3800	50/50	73.3800
957142	AF2-008 NFTI	146.7600	50/50	146.7600
957843	AF2-078 BAT	0.6549	Merchant Transmission	0.6549
960621	AF2-353 C	82.1800	50/50	82.1800
960622	AF2-353 E	35.2200	50/50	35.2200
LGEE	LGEE	0.9670	Confirmed LTF	0.9670
CPLE	CPLE	0.2547	Confirmed LTF	0.2547
CBM-W2	CBM-W2	20.1556	Confirmed LTF	20.1556
NY	NY	0.1183	Confirmed LTF	0.1183
TVA	TVA	2.3884	Confirmed LTF	2.3884
O-066	O-066	1.3373	Confirmed LTF	1.3373
CBM-S2	CBM-S2	3.2715	Confirmed LTF	3.2715
CBM-S1	CBM-S1	14.5181	Confirmed LTF	14.5181
G-007	G-007	0.2059	Confirmed LTF	0.2059
MADISON	MADISON	1.7096	Confirmed LTF	1.7096
MEC	MEC	1.9783	Confirmed LTF	1.9783

11.6.4 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
95495289	243222	05FALL C	AEP	923880	AB2-028 TAP	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1195.0	99.3	101.71	DC	63.92

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247285	05AND G1	1.1387	50/50	1.1387
247286	05AND G2	1.1387	50/50	1.1387
247287	05AND G3	2.3815	50/50	2.3815
920501	AA2-148 C OP	2.3771	50/50	2.3771
920502	AA2-148 E OP	15.9086	50/50	15.9086
930461	AB1-087	37.3673	Adder	43.96
930471	AB1-088	37.3673	Adder	43.96
933441	AC2-157 C	5.1635	Adder	6.07
933442	AC2-157 E	8.4246	Adder	9.91
933592	AC2-176 E O1	-10.9536	Adder	-12.89
934161	AD1-043 C O1	2.7454	Adder	3.23
934162	AD1-043 E O1	4.4793	Adder	5.27
941341	AE2-130 C	32.5992	Adder	38.35
941342	AE2-130 E	21.7328	Adder	25.57
941692	AE2-169 BAT	1.9526	Merchant Transmission	1.9526
941711	AE2-171	1.8062	Adder	2.12
941722	AE2-172 BAT	2.6404	Merchant Transmission	2.6404
942601	AE2-276	3.3970	Adder	4.0
942791	AE2-297 C O1	9.9360	50/50	9.9360
942792	AE2-297 E O1	6.6240	50/50	6.6240
944201	AF1-088 FTIR	79.9300	Merchant Transmission	79.9300
945391	AF1-204 C O1	4.5187	Adder	5.32
945392	AF1-204 E O1	13.5561	Adder	15.95
952801	J754 C	4.1304	PJM External (MISO)	4.1304
952802	J754 E	22.3466	PJM External (MISO)	22.3466
953351	J805	32.3216	PJM External (MISO)	32.3216
953761	J829	15.7675	PJM External (MISO)	15.7675
953931	J856	4.5296	PJM External (MISO)	4.5296
954351	J903	15.7020	PJM External (MISO)	15.7020
954772	J515 E	23.5320	PJM External (MISO)	23.5320
955151	J993	37.5440	PJM External (MISO)	37.5440
955451	J1027	10.2000	PJM External (MISO)	10.2000
955461	J1028	9.5805	PJM External (MISO)	9.5805
955891	J1074	12.2960	PJM External (MISO)	12.2960
956561	J1152	36.7840	PJM External (MISO)	36.7840
956911	J1189	0.3684	PJM External (MISO)	0.3684
957141	AF2-008 FTIR	21.1814	Merchant Transmission	21.1814
957142	AF2-008 NFTI	42.3629	Merchant Transmission	42.3629
957961	AF2-090 C	1.7125	Adder	3.8
957962	AF2-090 E	0.8470	Adder	1.88
960621	AF2-353 C	20.1572	Adder	44.74
960622	AF2-353 E	8.6388	Adder	19.18

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
961001	AF2-391 C O1	1.6328	Adder	3.62
961002	AF2-391 E O1	1.0886	Adder	2.42
961161	AF2-407	118.1370	50/50	118.1370
961171	AF2-408	19.6448	50/50	19.6448
WEC	WEC	0.4684	Confirmed LTF	0.4684
LGEE	LGEE	2.4885	Confirmed LTF	2.4885
CPL	CPL	0.5391	Confirmed LTF	0.5391
CBM-W2	CBM-W2	41.9983	Confirmed LTF	41.9983
NY	NY	0.2212	Confirmed LTF	0.2212
CBM-W1	CBM-W1	11.7344	Confirmed LTF	11.7344
TVA	TVA	4.3358	Confirmed LTF	4.3358
O-066	O-066	2.4326	Confirmed LTF	2.4326
CBM-S2	CBM-S2	6.6470	Confirmed LTF	6.6470
CBM-S1	CBM-S1	28.3886	Confirmed LTF	28.3886
G-007	G-007	0.3734	Confirmed LTF	0.3734
MADISON	MADISON	7.2677	Confirmed LTF	7.2677
MEC	MEC	4.3856	Confirmed LTF	4.3856

11.6.5 Index 5

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
95495152	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO765_A	breaker	2354.0	143.78	159.28	DC	382.2

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	108.7796	50/50	108.7796
243443	05RKG2	107.1315	50/50	107.1315
247900	05FR-11G E	5.2365	Adder	6.16
247901	05FR-12G E	5.1496	Adder	6.06
247902	05FR-21G E	5.5041	Adder	6.48
247903	05FR-22G E	5.2700	Adder	6.2
247904	05FR-3G E	10.6737	Adder	12.56
247905	05FR-4G E	8.3598	Adder	9.84
247906	05MDL-1G E	9.1451	Adder	10.76
247907	05MDL-2G E	4.5812	Adder	5.39
247912	05MDL-3G E	4.5812	Adder	5.39
247913	05MDL-4G E	4.5812	Adder	5.39
247943	T-127 E	4.5812	Adder	5.39
250163	Y3-099 BAT	0.1384	Merchant Transmission	0.1384
250167	Y3-100 BAT	0.1384	Merchant Transmission	0.1384
251823	Z1-065 BAT	0.3610	Merchant Transmission	0.3610
274882	W4-005 E	19.9501	Adder	23.47
274890	CAYUG;1U E	0.4333	Adder	0.51
274891	CAYUG;2U E	0.4333	Adder	0.51
276153	W2-048 E	4.1257	Adder	4.85
290261	S-027 E	9.6295	Adder	11.33
290265	S-028 E	9.6295	Adder	11.33
909052	X2-022 E	12.4101	Adder	14.6
913222	Y1-054 E	-1.0962	Adder	-1.29
917502	Z2-087 E	9.4937	Adder	11.17
924041	AB2-047 C O1	1.7732	Adder	2.09
924042	AB2-047 E O1	11.8671	Adder	13.96
924261	AB2-070 C O1	1.6953	Adder	1.99
924262	AB2-070 E O1	10.7455	Adder	12.64
925771	AC1-053 C	1.7021	Adder	2.0
925772	AC1-053 E	11.3913	Adder	13.4
926841	AC1-171 C O1	0.5453	Adder	0.64
926842	AC1-171 E O1	3.6427	Adder	4.29
930042	AB1-006 E	9.9640	Adder	11.72
930461	AB1-087	128.9145	50/50	128.9145
930471	AB1-088	128.9145	50/50	128.9145
933441	AC2-157 C	17.8136	50/50	17.8136
933442	AC2-157 E	29.0644	50/50	29.0644
935141	AD1-148	3.2345	Adder	3.81
936771	AD2-100 C	9.0071	Adder	10.6

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
936772	AD2-100 E	6.0047	Adder	7.06
936971	AD2-131 C	0.5933	Adder	0.7
936972	AD2-131 E	2.9809	Adder	3.51
937211	AD2-159 C	2.1559	Adder	2.54
937212	AD2-159 E	10.0936	Adder	11.87
939741	AE1-205 C O1	4.5832	Adder	5.39
939742	AE1-205 E O1	6.3291	Adder	7.45
941341	AE2-130 C	229.3200	50/50	229.3200
941342	AE2-130 E	152.8800	50/50	152.8800
941571	AE2-154 C	1.8611	Adder	2.19
941572	AE2-154 E	12.4550	Adder	14.65
941731	AE2-173 O1	2.7281	Adder	3.21
942111	AE2-223 C	1.0639	Adder	1.25
942112	AE2-223 E	7.1203	Adder	8.38
942481	AE2-261 C	12.6124	Adder	14.84
942482	AE2-261 E	8.4083	Adder	9.89
942601	AE2-276	11.7195	50/50	11.7195
944201	AF1-088 FTIR	234.3900	50/50	234.3900
944221	AF1-090 C O1	2.6383	Adder	3.1
944222	AF1-090 E O1	12.3523	Adder	14.53
945391	AF1-204 C O1	6.4375	50/50	6.4375
945392	AF1-204 E O1	19.3124	50/50	19.3124
945421	AF1-207 C	1.7973	Adder	2.11
945422	AF1-207 E	7.7178	Adder	9.08
945871	AF1-252 O1	4.6771	Adder	5.5
945881	AF1-253 O1	3.2380	Adder	3.81
946581	AF1-322 C	4.8102	Adder	5.66
946582	AF1-322 E	6.6427	Adder	7.81
954681	J949 C	0.0000	PJM External (MISO)	0.0000
957141	AF2-008 FTIR	117.1950	50/50	117.1950
957142	AF2-008 NFTI	234.3900	50/50	234.3900
957381	AF2-032 C	0.5036	Adder	1.12
957382	AF2-032 E	0.2370	Adder	0.53
957841	AF2-078 C O1	3.3620	Adder	7.46
957842	AF2-078 E O1	2.2413	Adder	4.98
958971	AF2-188 C O1	1.8930	Adder	4.2
958972	AF2-188 E O1	1.2620	Adder	2.8
959341	AF2-225 C	1.8218	Adder	4.04
959342	AF2-225 E	2.5158	Adder	5.58
959611	AF2-252 C	0.6444	Adder	1.43
959612	AF2-252 E	0.9666	Adder	2.15
960141	AF2-305	0.3179	Adder	0.71
960261	AF2-317	0.5486	Adder	1.22
960611	AF2-352 C	0.6444	Adder	1.43
960612	AF2-352 E	0.9666	Adder	2.15
960621	AF2-353 C	267.5400	50/50	267.5400
960622	AF2-353 E	114.6600	50/50	114.6600
WEC	WEC	1.6254	Confirmed LTF	1.6254
CALDERWOOD	CALDERWOOD	0.0900	Confirmed LTF	0.0900
LGE-0012019	LGE-0012019	3.5431	LTF	3.5431
CBM-W2	CBM-W2	34.7420	Confirmed LTF	34.7420
NY	NY	0.8782	Confirmed LTF	0.8782

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CBM-W1	CBM-W1	45.2487	Confirmed LTF	45.2487
TVA	TVA	1.8340	Confirmed LTF	1.8340
O-066	O-066	9.8851	Confirmed LTF	9.8851
CHEOAH	CHEOAH	0.0976	Confirmed LTF	0.0976
G-007	G-007	1.5298	Confirmed LTF	1.5298
MADISON	MADISON	23.2203	Confirmed LTF	23.2203
MEC	MEC	8.7109	Confirmed LTF	8.7109
BLUEG	BLUEG	14.8688	Confirmed LTF	14.8688
TRIMBLE	TRIMBLE	5.3168	Confirmed LTF	5.3168
CATAWBA	CATAWBA	0.2607	Confirmed LTF	0.2607

11.6.6 Index 6

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
95495254	243208	05JEFRS0	AEP	242865	05JEFRS0	AEP	2	AEP_P4_#1760_05JEFRS0765_A	breaker	3039.0	111.37	123.37	DC	382.2

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	108.7796	50/50	108.7796
243443	05RKG2	107.1315	50/50	107.1315
247900	05FR-11G E	5.2365	Adder	6.16
247901	05FR-12G E	5.1496	Adder	6.06
247902	05FR-21G E	5.5041	Adder	6.48
247903	05FR-22G E	5.2700	Adder	6.2
247904	05FR-3G E	10.6737	Adder	12.56
247905	05FR-4G E	8.3598	Adder	9.84
247906	05MDL-1G E	9.1451	Adder	10.76
247907	05MDL-2G E	4.5812	Adder	5.39
247912	05MDL-3G E	4.5812	Adder	5.39
247913	05MDL-4G E	4.5812	Adder	5.39
247943	T-127 E	4.5812	Adder	5.39
250163	Y3-099 BAT	0.1384	Merchant Transmission	0.1384
250167	Y3-100 BAT	0.1384	Merchant Transmission	0.1384
251823	Z1-065 BAT	0.3610	Merchant Transmission	0.3610
274882	W4-005 E	19.9501	Adder	23.47
274890	CAYUG;1U E	0.4333	Adder	0.51
274891	CAYUG;2U E	0.4333	Adder	0.51
276153	W2-048 E	4.1257	Adder	4.85
290261	S-027 E	9.6295	Adder	11.33
290265	S-028 E	9.6295	Adder	11.33
909052	X2-022 E	12.4101	Adder	14.6
913222	Y1-054 E	-1.0962	Adder	-1.29
917502	Z2-087 E	9.4937	Adder	11.17
924041	AB2-047 C O1	1.7732	Adder	2.09
924042	AB2-047 E O1	11.8671	Adder	13.96
924261	AB2-070 C O1	1.6953	Adder	1.99
924262	AB2-070 E O1	10.7455	Adder	12.64
925771	AC1-053 C	1.7021	Adder	2.0
925772	AC1-053 E	11.3913	Adder	13.4
926841	AC1-171 C O1	0.5453	Adder	0.64
926842	AC1-171 E O1	3.6427	Adder	4.29
930042	AB1-006 E	9.9640	Adder	11.72
930461	AB1-087	128.9145	50/50	128.9145
930471	AB1-088	128.9145	50/50	128.9145
933441	AC2-157 C	17.8136	50/50	17.8136
933442	AC2-157 E	29.0644	50/50	29.0644
935141	AD1-148	3.2345	Adder	3.81
936771	AD2-100 C	9.0071	Adder	10.6
936772	AD2-100 E	6.0047	Adder	7.06
936971	AD2-131 C	0.5933	Adder	0.7

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
936972	AD2-131 E	2.9809	Adder	3.51
937211	AD2-159 C	2.1559	Adder	2.54
937212	AD2-159 E	10.0936	Adder	11.87
939741	AE1-205 C O1	4.5832	Adder	5.39
939742	AE1-205 E O1	6.3291	Adder	7.45
941341	AE2-130 C	229.3200	50/50	229.3200
941342	AE2-130 E	152.8800	50/50	152.8800
941571	AE2-154 C	1.8611	Adder	2.19
941572	AE2-154 E	12.4550	Adder	14.65
941731	AE2-173 O1	2.7281	Adder	3.21
942111	AE2-223 C	1.0639	Adder	1.25
942112	AE2-223 E	7.1203	Adder	8.38
942481	AE2-261 C	12.6124	Adder	14.84
942482	AE2-261 E	8.4083	Adder	9.89
942601	AE2-276	11.7195	50/50	11.7195
944201	AF1-088 FTIR	234.3900	50/50	234.3900
944221	AF1-090 C O1	2.6383	Adder	3.1
944222	AF1-090 E O1	12.3523	Adder	14.53
945391	AF1-204 C O1	6.4375	50/50	6.4375
945392	AF1-204 E O1	19.3124	50/50	19.3124
945421	AF1-207 C	1.7973	Adder	2.11
945422	AF1-207 E	7.7178	Adder	9.08
945871	AF1-252 O1	4.6771	Adder	5.5
945881	AF1-253 O1	3.2380	Adder	3.81
946581	AF1-322 C	4.8102	Adder	5.66
946582	AF1-322 E	6.6427	Adder	7.81
954681	J949 C	0.0000	PJM External (MISO)	0.0000
957141	AF2-008 FTIR	117.1950	50/50	117.1950
957142	AF2-008 NFTI	234.3900	50/50	234.3900
957381	AF2-032 C	0.5036	Adder	1.12
957382	AF2-032 E	0.2370	Adder	0.53
957841	AF2-078 C O1	3.3620	Adder	7.46
957842	AF2-078 E O1	2.2413	Adder	4.98
958971	AF2-188 C O1	1.8930	Adder	4.2
958972	AF2-188 E O1	1.2620	Adder	2.8
959341	AF2-225 C	1.8218	Adder	4.04
959342	AF2-225 E	2.5158	Adder	5.58
959611	AF2-252 C	0.6444	Adder	1.43
959612	AF2-252 E	0.9666	Adder	2.15
960141	AF2-305	0.3179	Adder	0.71
960261	AF2-317	0.5486	Adder	1.22
960611	AF2-352 C	0.6444	Adder	1.43
960612	AF2-352 E	0.9666	Adder	2.15
960621	AF2-353 C	267.5400	50/50	267.5400
960622	AF2-353 E	114.6600	50/50	114.6600
WEC	WEC	1.6254	Confirmed LTF	1.6254
CALDERWOOD	CALDERWOOD	0.0900	Confirmed LTF	0.0900
LGE-0012019	LGE-0012019	3.5431	LTF	3.5431
CBM-W2	CBM-W2	34.7420	Confirmed LTF	34.7420
NY	NY	0.8782	Confirmed LTF	0.8782
CBM-W1	CBM-W1	45.2487	Confirmed LTF	45.2487
TVA	TVA	1.8340	Confirmed LTF	1.8340

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
O-066	O-066	9.8851	Confirmed LTF	9.8851
CHEOAH	CHEOAH	0.0976	Confirmed LTF	0.0976
G-007	G-007	1.5298	Confirmed LTF	1.5298
MADISON	MADISON	23.2203	Confirmed LTF	23.2203
MEC	MEC	8.7109	Confirmed LTF	8.7109
BLUEG	BLUEG	14.8688	Confirmed LTF	14.8688
TRIMBLE	TRIMBLE	5.3168	Confirmed LTF	5.3168
CATAWBA	CATAWBA	0.2607	Confirmed LTF	0.2607

11.6.7 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
95495142	243216	05DARWIN	AEP	243221	05EUGENE	AEP	1	AEP_P4_#8648_05JEFRS O 765_B	breaker	1160.0	162.56	177.61	DC	174.54

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	49.6755	50/50	49.6755
243443	05RKG2	48.9228	50/50	48.9228
930461	AB1-087	119.9935	50/50	119.9935
930471	AB1-088	119.9935	50/50	119.9935
933441	AC2-157 C	16.5809	50/50	16.5809
933442	AC2-157 E	27.0531	50/50	27.0531
941341	AE2-130 C	104.7216	50/50	104.7216
941342	AE2-130 E	69.8144	50/50	69.8144
942601	AE2-276	10.9085	50/50	10.9085
944201	AF1-088 FTIR	218.1700	50/50	218.1700
955131	J991	10.5340	PJM External (MISO)	10.5340
957141	AF2-008 FTIR	109.0850	50/50	109.0850
957142	AF2-008 NFTI	218.1700	50/50	218.1700
960621	AF2-353 C	122.1752	50/50	122.1752
960622	AF2-353 E	52.3608	50/50	52.3608
LGEE	LGEE	0.4022	Confirmed LTF	0.4022
CPLE	CPLE	0.1098	Confirmed LTF	0.1098
CBM-W2	CBM-W2	10.6470	Confirmed LTF	10.6470
NY	NY	0.1548	Confirmed LTF	0.1548
TVA	TVA	1.6478	Confirmed LTF	1.6478
O-066	O-066	1.7808	Confirmed LTF	1.7808
EDWARDS	EDWARDS	0.0469	Confirmed LTF	0.0469
CBM-S2	CBM-S2	1.7398	Confirmed LTF	1.7398
CBM-S1	CBM-S1	9.2868	Confirmed LTF	9.2868
TILTON	TILTON	4.7704	Confirmed LTF	4.7704
G-007	G-007	0.2746	Confirmed LTF	0.2746
MADISON	MADISON	1.7781	Confirmed LTF	1.7781
MEC	MEC	1.0901	Confirmed LTF	1.0901

11.6.8 Index 8

ID	FROM BUS#	FROM BUS	FRO M 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
95495137	247712	05SULLIVAN	AEP	243216	05DARWIN	AEP	1	AEP_P4_#8648_05JEFRS O 765_B	breake r	1160.0	162.56	177.61	DC	174.54

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	49.6755	50/50	49.6755
243443	05RKG2	48.9228	50/50	48.9228
930461	AB1-087	119.9935	50/50	119.9935
930471	AB1-088	119.9935	50/50	119.9935
933441	AC2-157 C	16.5809	50/50	16.5809
933442	AC2-157 E	27.0531	50/50	27.0531
941341	AE2-130 C	104.7216	50/50	104.7216
941342	AE2-130 E	69.8144	50/50	69.8144
942601	AE2-276	10.9085	50/50	10.9085
944201	AF1-088 FTIR	218.1700	50/50	218.1700
955131	J991	10.5340	PJM External (MISO)	10.5340
957141	AF2-008 FTIR	109.0850	50/50	109.0850
957142	AF2-008 NFTI	218.1700	50/50	218.1700
960621	AF2-353 C	122.1752	50/50	122.1752
960622	AF2-353 E	52.3608	50/50	52.3608
LGEE	LGEE	0.4022	Confirmed LTF	0.4022
CPL	CPL	0.1098	Confirmed LTF	0.1098
CBM-W2	CBM-W2	10.6470	Confirmed LTF	10.6470
NY	NY	0.1548	Confirmed LTF	0.1548
TVA	TVA	1.6478	Confirmed LTF	1.6478
O-066	O-066	1.7808	Confirmed LTF	1.7808
EDWARDS	EDWARDS	0.0469	Confirmed LTF	0.0469
CBM-S2	CBM-S2	1.7398	Confirmed LTF	1.7398
CBM-S1	CBM-S1	9.2868	Confirmed LTF	9.2868
TILTON	TILTON	4.7704	Confirmed LTF	4.7704
G-007	G-007	0.2746	Confirmed LTF	0.2746
MADISON	MADISON	1.7781	Confirmed LTF	1.7781
MEC	MEC	1.0901	Confirmed LTF	1.0901

11.6.9 Index 9

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
95495379	247712	05SULLIVAN	AEP	956820	J1180 TAP	AMIL	1	AEP_P1-2_#363	single	1466.0	137.88	151.85	DC	204.83

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	83.2827	80/20	83.2827
243443	05RKG2	82.0209	80/20	82.0209
243859	05FR-11G C	0.1739	80/20	0.1739
243862	05FR-12G C	0.1713	80/20	0.1713
243864	05FR-21G C	0.1828	80/20	0.1828
243866	05FR-22G C	0.1748	80/20	0.1748
243870	05FR-3G C	0.3541	80/20	0.3541
243873	05FR-4G C	0.2742	80/20	0.2742
924041	AB2-047 C O1	-1.5053	Adder	-1.77
930461	AB1-087	201.1295	80/20	201.1295
930471	AB1-088	201.1295	80/20	201.1295
933441	AC2-157 C	27.7924	80/20	27.7924
941341	AE2-130 C	175.5696	80/20	175.5696
942601	AE2-276	18.2845	80/20	18.2845
944201	AF1-088 FTIR	365.6900	80/20	365.6900
945872	AF1-252 BAT	7.6958	80/20	7.6958
951731	J446 C	1.7909	PJM External (MISO)	1.7909
951811	J513 C	0.9548	PJM External (MISO)	0.9548
952581	J740 C	2.1494	PJM External (MISO)	2.1494
952801	J754 C	3.2661	PJM External (MISO)	3.2661
952811	J759	4.3365	PJM External (MISO)	4.3365
952861	J783 C	4.1180	PJM External (MISO)	4.1180
953161	J837 C	2.1504	PJM External (MISO)	2.1504
953171	J838 C	1.0747	PJM External (MISO)	1.0747
953351	J805	14.0892	PJM External (MISO)	14.0892
953931	J856	5.3624	PJM External (MISO)	5.3624
954171	J883 C	0.6964	PJM External (MISO)	0.6964
954351	J903	6.7310	PJM External (MISO)	6.7310
954421	J913 C	11.0224	PJM External (MISO)	11.0224
954941	J968 C	2.1494	PJM External (MISO)	2.1494
955141	J992	10.0500	PJM External (MISO)	10.0500
955151	J993	14.0920	PJM External (MISO)	14.0920
955451	J1027	12.8565	PJM External (MISO)	12.8565
955461	J1028	12.1635	PJM External (MISO)	12.1635
955791	J1063	17.4750	PJM External (MISO)	17.4750
955821	J1067	13.8408	PJM External (MISO)	13.8408
955841	J1069 C	2.1494	PJM External (MISO)	2.1494
955891	J1074	14.6380	PJM External (MISO)	14.6380
956561	J1152	14.2560	PJM External (MISO)	14.2560
956911	J1189	0.2916	PJM External (MISO)	0.2916
957141	AF2-008 FTIR	182.8450	80/20	182.8450
960621	AF2-353 C	204.8312	80/20	204.8312

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
LGEE	LGEE	0.6738	Confirmed LTF	0.6738
NEWTON	NEWTON	26.3854	Confirmed LTF	26.3854
FARMERCITY	FARMERCITY	0.3819	Confirmed LTF	0.3819
CALDERWOOD	CALDERWOOD	1.1033	Confirmed LTF	1.1033
NY	NY	0.0133	Confirmed LTF	0.0133
PRAIRIE	PRAIRIE	31.2801	Confirmed LTF	31.2801
CHEOAH	CHEOAH	1.0991	Confirmed LTF	1.0991
EDWARDS	EDWARDS	1.8739	Confirmed LTF	1.8739
TILTON	TILTON	1.4578	Confirmed LTF	1.4578
CATAWBA	CATAWBA	0.4869	Confirmed LTF	0.4869
AC1-056	AC1-056	12.0080	LTF	12.0080

11.6.10 Index 10

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
9890057 1	24800 0	06CLIFT Y	OVEC	24800 1	06DEARB 1	OVE C	1	AEP_P4_#1760_05JEFRS O 765_A	breaker	1023. 0	113.69	117.84	DC	94.1

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
930461	AB1-087	28.5175	Adder	33.55
930471	AB1-088	28.5175	Adder	33.55
933441	AC2-157 C	3.9406	Adder	4.64
933442	AC2-157 E	6.4294	Adder	7.56
941341	AE2-130 C	47.9890	Adder	56.46
941342	AE2-130 E	31.9926	Adder	37.64
942601	AE2-276	2.5925	Adder	3.05
944201	AF1-088 FTIR	61.0000	Merchant Transmission	61.0000
957141	AF2-008 FTIR	16.1650	Merchant Transmission	16.1650
957142	AF2-008 NFTI	32.3300	Merchant Transmission	32.3300
957961	AF2-090 C	1.9473	Adder	4.32
957962	AF2-090 E	0.9631	Adder	2.14
959691	AF2-260 C O1	1.4280	Adder	3.17
959692	AF2-260 E O1	0.7140	Adder	1.58
960171	AF2-308	0.6878	Adder	1.53
960181	AF2-309 C	1.0318	Adder	2.29
960182	AF2-309 E	0.6878	Adder	1.53
960621	AF2-353 C	29.6732	Adder	65.87
960622	AF2-353 E	12.7171	Adder	28.23
961001	AF2-391 C O1	1.8495	Adder	4.11
961002	AF2-391 E O1	1.2330	Adder	2.74
WEC	WEC	0.3371	Confirmed LTF	0.3371
LGEE	LGEE	4.6724	Confirmed LTF	4.6724
CPLE	CPLE	0.3923	Confirmed LTF	0.3923
CBM-W2	CBM-W2	19.5168	Confirmed LTF	19.5168
NY	NY	0.0796	Confirmed LTF	0.0796
CBM-W1	CBM-W1	13.0104	Confirmed LTF	13.0104
TVA	TVA	3.0800	Confirmed LTF	3.0800
O-066	O-066	1.5926	Confirmed LTF	1.5926
CBM-S2	CBM-S2	4.8436	Confirmed LTF	4.8436
CBM-S1	CBM-S1	28.2268	Confirmed LTF	28.2268
G-007	G-007	0.2454	Confirmed LTF	0.2454
MADISON	MADISON	14.1281	Confirmed LTF	14.1281
MEC	MEC	2.7363	Confirmed LTF	2.7363

11.6.11 Index 11

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
98900794	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	126.02	128.48	DC	35.68

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	14.5062	80/20	14.5062
243443	05RKG2	14.2864	80/20	14.2864
342900	1COOPER1 G	2.4207	80/20	2.4207
342903	1COOPER2 G	4.6942	80/20	4.6942
342918	1JKCT 1G	1.8896	80/20	1.8896
342921	1JKCT 2G	1.3706	80/20	1.3706
342924	1JKCT 3G	1.8896	80/20	1.8896
342927	1JKCT 4G	1.2540	80/20	1.2540
342930	1JKCT 5G	1.2472	80/20	1.2472
342933	1JKCT 6G	1.2540	80/20	1.2540
342936	1JKCT 7G	1.2540	80/20	1.2540
342939	1JKCT 9G	1.2895	80/20	1.2895
342942	1JKCT 10G	1.2895	80/20	1.2895
342945	1LAUREL 1G	1.3659	80/20	1.3659
925981	AC1-074 C O1	3.9855	80/20	3.9855
930461	AB1-087	35.0735	80/20	35.0735
930471	AB1-088	35.0735	80/20	35.0735
932551	AC2-075 C	0.9466	80/20	0.9466
933441	AC2-157 C	4.8465	80/20	4.8465
936381	AD2-048 C	3.4301	80/20	3.4301
936571	AD2-072 C O1	10.1176	80/20	10.1176
939131	AE1-143 C	9.5735	80/20	9.5735
940041	AE1-246 C O1	11.9517	80/20	11.9517
940831	AE2-071 C	3.0314	80/20	3.0314
941341	AE2-130 C	30.5808	80/20	30.5808
941411	AE2-138 C	15.1422	80/20	15.1422
941981	AE2-210 C O1	5.2176	80/20	5.2176
942411	AE2-254 C O1	4.0278	80/20	4.0278
942591	AE2-275 C O1	6.8134	80/20	6.8134
942601	AE2-276	3.1885	80/20	3.1885
942891	AE2-308 C O1	11.5071	80/20	11.5071
943111	AE2-339 C	2.5623	80/20	2.5623
943701	AF1-038 C	4.6588	80/20	4.6588
943821	AF1-050 C	5.4126	80/20	5.4126
944151	AF1-083 C O1	4.9790	80/20	4.9790
944201	AF1-088 FTIR	63.7700	80/20	63.7700
944511	AF1-116 C	10.7366	80/20	10.7366
944621	AF1-127 C O1	4.4322	80/20	4.4322
945381	AF1-203 C	1.7322	80/20	1.7322
945541	AF1-219 C O1	3.2077	80/20	3.2077
945861	AF1-251 C	10.7144	80/20	10.7144
946021	AF1-267 C	3.8151	80/20	3.8151

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952811	J759	9.7391	PJM External (MISO)	9.7391
952821	J762	30.0320	PJM External (MISO)	30.0320
952861	J783 C	9.3334	PJM External (MISO)	9.3334
953611	J800	14.1350	PJM External (MISO)	14.1350
953931	J856	9.4496	PJM External (MISO)	9.4496
955451	J1027	13.7985	PJM External (MISO)	13.7985
955461	J1028	15.2805	PJM External (MISO)	15.2805
955891	J1074	23.0880	PJM External (MISO)	23.0880
956911	J1189	0.4479	PJM External (MISO)	0.4479
957141	AF2-008 FTIR	31.8850	80/20	31.8850
957961	AF2-090 C	16.4592	80/20	16.4592
959691	AF2-260 C O1	11.9778	80/20	11.9778
960151	AF2-306	1.6749	80/20	1.6749
960161	AF2-307 C	2.5510	80/20	2.5510
960171	AF2-308	5.7854	80/20	5.7854
960181	AF2-309 C	8.6780	80/20	8.6780
960621	AF2-353 C	35.6776	80/20	35.6776
960641	AF2-355 C O1	15.1214	80/20	15.1214
960741	AF2-365 C O1	4.7367	80/20	4.7367
961001	AF2-391 C O1	15.6096	80/20	15.6096
961281	AF2-419 C	1.8240	80/20	1.8240
961291	AF2-420 C	1.8240	80/20	1.8240
WEC	WEC	0.6634	Confirmed LTF	0.6634
LGEE	LGEE	18.1402	Confirmed LTF	18.1402
CPL	CPL	1.1986	Confirmed LTF	1.1986
CBM-W2	CBM-W2	56.1670	Confirmed LTF	56.1670
NY	NY	0.2737	Confirmed LTF	0.2737
CBM-W1	CBM-W1	19.6532	Confirmed LTF	19.6532
TVA	TVA	9.5130	Confirmed LTF	9.5130
CBM-S2	CBM-S2	14.7563	Confirmed LTF	14.7563
CBM-S1	CBM-S1	97.4858	Confirmed LTF	97.4858
MADISON	MADISON	12.3480	Confirmed LTF	12.3480
MEC	MEC	6.0890	Confirmed LTF	6.0890

11.6.12 Index 12

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
96639428	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	AEP_P1-2_#10136	single	1528.0	102.52	104.58	DC	31.47

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	12.7963	80/20	12.7963
274650	KINCAID ;1U	14.4032	80/20	14.4032
274651	KINCAID ;2U	14.3994	80/20	14.3994
274853	TWINGROVE;U1	1.8305	80/20	1.8305
274854	TWINGROVE;U2	1.8305	80/20	1.8305
274863	CAYUGA R;1U	2.5658	80/20	2.5658
274864	CAYUGA R;2U	2.5658	80/20	2.5658
274880	GENERATOR;	1.6928	80/20	1.6928
917501	Z2-087 C	1.5169	80/20	1.5169
924041	AB2-047 C O1	10.9922	80/20	10.9922
924261	AB2-070 C O1	5.3511	80/20	5.3511
925771	AC1-053 C	5.2598	80/20	5.2598
926841	AC1-171 C O1	0.6107	80/20	0.6107
930461	AB1-087	30.9320	80/20	30.9320
930471	AB1-088	30.9320	80/20	30.9320
933441	AC2-157 C	4.2742	80/20	4.2742
935001	AD1-133 C O1	31.4172	80/20	31.4172
935141	AD1-148	9.5467	80/20	9.5467
936771	AD2-100 C	18.1453	80/20	18.1453
936971	AD2-131 C	1.1953	80/20	1.1953
937211	AD2-159 C	7.1019	80/20	7.1019
939401	AE1-172 C O1	26.1417	80/20	26.1417
939741	AE1-205 C O1	28.4105	80/20	28.4105
940101	AE1-252 C O1	52.5168	80/20	52.5168
941341	AE2-130 C	26.9760	80/20	26.9760
941731	AE2-173 O1	16.9110	80/20	16.9110
942111	AE2-223 C	6.5953	80/20	6.5953
942481	AE2-261 C	26.6445	80/20	26.6445
942601	AE2-276	2.8120	80/20	2.8120
944201	AF1-088 FTIR	56.2400	80/20	56.2400
944221	AF1-090 C O1	4.6035	80/20	4.6035
945391	AF1-204 C O1	3.4329	80/20	3.4329
945871	AF1-252 O1	8.1607	80/20	8.1607
945881	AF1-253 O1	5.6497	80/20	5.6497
951741	J474 C	3.6340	PJM External (MISO)	3.6340
952251	J641	10.1542	PJM External (MISO)	10.1542
952271	J644	9.8934	PJM External (MISO)	9.8934
952651	J756 C	3.2891	PJM External (MISO)	3.2891
952871	J757 C	4.2355	PJM External (MISO)	4.2355
953401	J811	7.6230	PJM External (MISO)	7.6230
953651	J815	26.4700	PJM External (MISO)	26.4700
953741	J826 C	2.1406	PJM External (MISO)	2.1406

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
953851	J845 C	2.0661	PJM External (MISO)	2.0661
953881	J848 C	4.0490	PJM External (MISO)	4.0490
954411	J912	9.9960	PJM External (MISO)	9.9960
954721	J750 C	2.6250	PJM External (MISO)	2.6250
954821	J955	125.6112	PJM External (MISO)	125.6112
955031	J979 C	3.2392	PJM External (MISO)	3.2392
955401	J1022 C	3.2109	PJM External (MISO)	3.2109
955711	J1055 C	1.6769	PJM External (MISO)	1.6769
956151	J1102	8.1613	PJM External (MISO)	8.1613
956281	J1115 C	5.3308	PJM External (MISO)	5.3308
956451	J1139	12.1665	PJM External (MISO)	12.1665
957141	AF2-008 FTIR	28.1200	80/20	28.1200
957381	AF2-032 C	2.0424	80/20	2.0424
959341	AF2-225 C	21.3079	80/20	21.3079
959611	AF2-252 C	5.3596	80/20	5.3596
960141	AF2-305	1.8935	80/20	1.8935
960261	AF2-317	3.0549	80/20	3.0549
960611	AF2-352 C	5.3596	80/20	5.3596
960621	AF2-353 C	31.4720	80/20	31.4720
LGEE	LGEE	1.0149	Confirmed LTF	1.0149
CPL	CPL	0.7998	Confirmed LTF	0.7998
G-007A	G-007A	0.9134	Confirmed LTF	0.9134
VFT	VFT	2.4510	Confirmed LTF	2.4510
CBM-W2	CBM-W2	37.5675	Confirmed LTF	37.5675
CBM-W1	CBM-W1	0.7631	Confirmed LTF	0.7631
TVA	TVA	4.1538	Confirmed LTF	4.1538
CBM-S2	CBM-S2	8.4041	Confirmed LTF	8.4041
CBM-S1	CBM-S1	23.3959	Confirmed LTF	23.3959
MADISON	MADISON	4.7799	Confirmed LTF	4.7799
MEC	MEC	4.5175	Confirmed LTF	4.5175

11.6.13 Index 13

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
95495185	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGEN E 345_A2	breaker	1466.0	149.91	149.93	DC	31.81

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274650	KINCAID ;1U	16.4201	50/50	16.4201
274651	KINCAID ;2U	16.4134	50/50	16.4134
274830	U3-021 1	2.7006	Adder	3.18
274831	U3-021 2	2.7006	Adder	3.18
274853	TWINGROVE;U1	0.8780	50/50	0.8780
274854	TWINGROVE;U2	0.8780	50/50	0.8780
274859	EASYR;U1 E	5.8205	Adder	6.85
274860	EASYR;U2 E	5.8205	Adder	6.85
274880	GENERATOR;	1.1644	50/50	1.1644
274882	W4-005 E	45.2070	50/50	45.2070
274890	CAYUG;1U E	8.8046	Adder	10.36
274891	CAYUG;2U E	8.8046	Adder	10.36
276153	W2-048 E	9.4531	50/50	9.4531
290021	O50 E	9.3106	Adder	10.95
290051	GSG-6; E	4.7900	Adder	5.64
290108	LEEDK;1U E	10.5689	Adder	12.43
290261	S-027 E	20.3607	50/50	20.3607
290265	S-028 E	20.3607	50/50	20.3607
293516	O-009 E1	5.4128	Adder	6.37
293517	O-009 E2	2.7493	Adder	3.23
293518	O-009 E3	3.0277	Adder	3.56
293644	O22 E1	4.2351	Adder	4.98
293645	O22 E2	8.2211	Adder	9.67
293715	O-029 E	5.7868	Adder	6.81
293716	O-029 E	3.1728	Adder	3.73
293717	O-029 E	2.9162	Adder	3.43
293771	O-035 E	4.3577	Adder	5.13
294401	BSHIL;1U E	5.9235	Adder	6.97
294410	BSHIL;2U E	5.9235	Adder	6.97
294763	P-046 E	4.6158	Adder	5.43
909052	X2-022 E	28.4350	50/50	28.4350
917501	Z2-087 C	0.4565	50/50	0.4565
917502	Z2-087 E	17.7115	50/50	17.7115
918052	AA1-018 E OP	6.8407	Adder	8.05
919581	AA2-030	9.9554	Adder	11.71
920272	AA2-123 E	1.0469	Adder	1.23
924041	AB2-047 C O1	3.3082	50/50	3.3082
924042	AB2-047 E O1	22.1393	50/50	22.1393
924261	AB2-070 C O1	3.8212	50/50	3.8212
924262	AB2-070 E O1	24.2207	50/50	24.2207
924471	AB2-096	18.7544	Adder	22.06
925581	AC1-033 C	0.9699	Adder	1.14

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
925582	AC1-033 E	6.4929	Adder	7.64
925771	AC1-053 C	3.8568	50/50	3.8568
925772	AC1-053 E	25.8112	50/50	25.8112
926431	AC1-114	1.1133	Adder	1.31
926821	AC1-168 C O1	0.7021	Adder	0.83
926822	AC1-168 E O1	4.7116	Adder	5.54
926841	AC1-171 C O1	1.0395	50/50	1.0395
926842	AC1-171 E O1	6.9433	50/50	6.9433
927201	AC1-214 C O1	1.3986	Adder	1.65
927202	AC1-214 E O1	4.4460	Adder	5.23
927511	AC1-113 1	0.5567	Adder	0.65
927521	AC1-113 2	0.5567	Adder	0.65
930481	AB1-089	30.3080	Adder	35.66
930741	AB1-122 1O1	30.2194	Adder	35.55
932881	AC2-115 1	1.1133	Adder	1.31
932891	AC2-115 2	1.1133	Adder	1.31
932921	AC2-116	0.3897	Adder	0.46
933911	AD1-013 C	0.8324	Adder	0.98
933912	AD1-013 E	1.3297	Adder	1.56
933931	AD1-016 C	0.3978	Adder	0.47
933932	AD1-016 E	0.6491	Adder	0.76
934051	AD1-031 C O1	1.9693	Adder	2.32
934052	AD1-031 E O1	3.2131	Adder	3.78
934101	AD1-039 1	2.9615	Adder	3.48
934431	AD1-067 C	0.0601	Adder	0.07
934432	AD1-067 E	0.2529	Adder	0.3
934651	AD1-096 C (Withdrawn : 07/22/2020)	0.4384	Adder	0.52
934652	AD1-096 E (Withdrawn : 07/22/2020)	0.7153	Adder	0.84
934701	AD1-098 C O1	3.1831	Adder	3.74
934702	AD1-098 E O1	2.3240	Adder	2.73
934871	AD1-116 C	0.3984	Adder	0.47
934872	AD1-116 E	0.6500	Adder	0.76
934971	AD1-129 C	0.4056	Adder	0.48
934972	AD1-129 E	0.2704	Adder	0.32
935001	AD1-133 C O1	12.2446	Adder	14.41
935002	AD1-133 E O1	8.1631	Adder	9.6
935141	AD1-148	7.4113	50/50	7.4113
936291	AD2-038 C O1	1.1607	Adder	1.37
936292	AD2-038 E O1	7.7681	Adder	9.14
936511	AD2-066 C O1	4.0625	Adder	4.78
936512	AD2-066 E O1	2.7083	Adder	3.19
936771	AD2-100 C	22.4645	50/50	22.4645
936772	AD2-100 E	14.9764	50/50	14.9764
936791	AD2-102 C	6.7901	Adder	7.99
936792	AD2-102 E	4.5268	Adder	5.33
936971	AD2-131 C	1.4798	50/50	1.4798
936972	AD2-131 E	7.4347	50/50	7.4347
937001	AD2-134 C	1.2522	Adder	1.47
937002	AD2-134 E	5.1728	Adder	6.09
937211	AD2-159 C	4.8853	50/50	4.8853
937212	AD2-159 E	22.8722	50/50	22.8722

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
937311	AD2-172 C	1.2117	Adder	1.43
937312	AD2-172 E	1.6732	Adder	1.97
937531	AD2-214 C	2.7588	Adder	3.25
937532	AD2-214 E	1.8392	Adder	2.16
938851	AE1-113 C	3.8406	Adder	4.52
938852	AE1-113 E	13.6167	Adder	16.02
938861	AE1-114 C O1	2.0247	Adder	2.38
938862	AE1-114 E O1	6.9079	Adder	8.13
939051	AE1-134 1	0.7736	Adder	0.91
939061	AE1-134 2	0.7736	Adder	0.91
939321	AE1-163 C O1	2.9167	Adder	3.43
939322	AE1-163 E O1	17.9172	Adder	21.08
939401	AE1-172 C O1	2.9603	Adder	3.48
939402	AE1-172 E O1	13.8898	Adder	16.34
939741	AE1-205 C O1	8.5504	50/50	8.5504
939742	AE1-205 E O1	11.8076	50/50	11.8076
940101	AE1-252 C O1	5.9471	Adder	7.0
940102	AE1-252 E O1	3.9647	Adder	4.66
940501	AE2-035 C	1.2117	Adder	1.43
940502	AE2-035 E	1.6732	Adder	1.97
941131	AE2-107 C	3.1503	Adder	3.71
941132	AE2-107 E	2.1002	Adder	2.47
941343	AE2-130 BAT	31.8120	50/50	31.8120
941731	AE2-173 O1	5.0895	50/50	5.0895
942111	AE2-223 C	1.9849	50/50	1.9849
942112	AE2-223 E	13.2836	50/50	13.2836
942421	AE2-255 C O1	1.4548	Adder	1.71
942422	AE2-255 E O1	4.3643	Adder	5.13
942481	AE2-261 C	31.0577	50/50	31.0577
942482	AE2-261 E	20.7052	50/50	20.7052
942602	AE2-276 BAT	14.0105	50/50	14.0105
942651	AE2-281 C O1	0.4167	Adder	0.49
942652	AE2-281 E O1	2.5596	Adder	3.01
942991	AE2-321 C	3.5189	Adder	4.14
942992	AE2-321 E	1.7332	Adder	2.04
943381	AF1-009 C	0.2754	Adder	0.32
943382	AF1-009 E	1.1014	Adder	1.3
943401	AF1-011 C	0.7389	Adder	0.87
943402	AF1-011 E	1.2404	Adder	1.46
943411	AF1-012 C	6.4046	Adder	7.53
943412	AF1-012 E	4.2697	Adder	5.02
943801	AF1-048 C	1.6450	Adder	1.94
943802	AF1-048 E	1.0966	Adder	1.29
943921	AF1-060	0.5966	Adder	0.7
944202	AF1-088 FTWR	280.2100	50/50	280.2100
944221	AF1-090 C O1	6.8094	50/50	6.8094
944222	AF1-090 E O1	31.8806	50/50	31.8806
945871	AF1-252 O1	12.0713	50/50	12.0713
945881	AF1-253 O1	8.3570	50/50	8.3570
946151	AF1-280 C O1	8.4217	Adder	9.91
946152	AF1-280 E O1	3.8727	Adder	4.56
946161	AF1-281 C	0.1844	Adder	0.22

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
946162	AF1-281 E	1.0450	Adder	1.23
946321	AF1-296 C O1	2.6152	Adder	3.08
946322	AF1-296 E O1	12.2439	Adder	14.4
946501	AF1-314 C	2.1528	Adder	2.53
946502	AF1-314 E	10.0791	Adder	11.86
946531	AF1-317 C O1	1.2199	Adder	1.44
946541	AF1-318 C O1	3.8549	Adder	4.54
946542	AF1-318 E O1	18.0499	Adder	21.24
946661	AF1-330 C	0.8584	Adder	1.01
946662	AF1-330 E	0.1884	Adder	0.22
946671	AF1-331	1.0810	Adder	1.27
955131	J991	25.9737	PJM External (MISO)	25.9737
957021	AF2-003 C O1	1.5955	Adder	3.54
957022	AF2-003 E O1	7.4696	Adder	16.58
957381	AF2-032 C	2.3285	50/50	2.3285
957382	AF2-032 E	1.0957	50/50	1.0957
957471	AF2-041 C	5.3746	Adder	11.93
957472	AF2-041 E	3.5831	Adder	7.95
957751	AF2-069 C	0.0858	Adder	0.19
957752	AF2-069 E	0.2770	Adder	0.61
957761	AF2-070 C	0.1209	Adder	0.27
957762	AF2-070 E	0.5872	Adder	1.3
958341	AF2-128 C O1	0.5406	Adder	1.2
958342	AF2-128 E O1	2.5309	Adder	5.62
958481	AF2-142 C	2.5004	Adder	5.55
958482	AF2-142 E	1.6669	Adder	3.7
958491	AF2-143 C	2.8394	Adder	6.3
958492	AF2-143 E	1.8929	Adder	4.2
958911	AF2-182	5.8644	Adder	13.02
958921	AF2-183 C	1.0426	Adder	2.31
958922	AF2-183 E	1.5638	Adder	3.47
959081	AF2-199 C	1.7915	Adder	3.98
959082	AF2-199 E	1.1944	Adder	2.65
959091	AF2-200 C	3.5831	Adder	7.95
959092	AF2-200 E	2.3887	Adder	5.3
959101	AF2-201 C O1	1.5718	Adder	3.49
959102	AF2-201 E O1	4.5136	Adder	10.02
959341	AF2-225 C	6.4128	50/50	6.4128
959342	AF2-225 E	8.8557	50/50	8.8557
959351	AF2-226 C	0.5502	Adder	1.22
959352	AF2-226 E	0.8252	Adder	1.83
959611	AF2-252 C	2.5708	50/50	2.5708
959612	AF2-252 E	3.8562	50/50	3.8562
959761	AF2-267 C O1	1.1351	Adder	2.52
959762	AF2-267 E O1	5.3142	Adder	11.8
960141	AF2-305	1.3521	50/50	1.3521
960261	AF2-317	2.3716	50/50	2.3716
960281	AF2-319 C	0.5502	Adder	1.22
960282	AF2-319 E	0.8252	Adder	1.83
960551	AF2-346 C	1.4548	Adder	3.23
960552	AF2-346 E	0.9698	Adder	2.15
960581	AF2-349 C	5.0843	Adder	11.29

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960582	AF2-349 E	3.3896	Adder	7.52
960611	AF2-352 C	2.5708	50/50	2.5708
960612	AF2-352 E	3.8562	50/50	3.8562
960623	AF2-353 BAT	31.8120	50/50	31.8120
960721	AF2-363 C O1	1.3562	Adder	3.01
960722	AF2-363 E O1	0.9042	Adder	2.01
960751	AF2-366 C O1	1.5712	Adder	3.49
960752	AF2-366 E O1	1.0474	Adder	2.32
961011	AF2-392 C O1	1.1727	Adder	2.6
961012	AF2-392 E O1	5.4902	Adder	12.19
961021	AF2-393 O1	1.9989	Adder	4.44
961031	AF2-394 O1	1.3326	Adder	2.96
990901	L-005 E	9.1810	Adder	10.8
WEC	WEC	2.0201	Confirmed LTF	2.0201
CPL	CPL	0.5953	Confirmed LTF	0.5953
CBM-W2	CBM-W2	70.4668	Confirmed LTF	70.4668
NY	NY	0.4468	Confirmed LTF	0.4468
CBM-W1	CBM-W1	61.5742	Confirmed LTF	61.5742
TVA	TVA	7.7938	Confirmed LTF	7.7938
O-066	O-066	4.9930	Confirmed LTF	4.9930
CBM-S2	CBM-S2	8.6238	Confirmed LTF	8.6238
CBM-S1	CBM-S1	36.9257	Confirmed LTF	36.9257
G-007	G-007	0.7706	Confirmed LTF	0.7706
MADISON	MADISON	25.0367	Confirmed LTF	25.0367
MEC	MEC	15.7613	Confirmed LTF	15.7613
BLUEG	BLUEG	2.7151	Confirmed LTF	2.7151
TRIMBLE	TRIMBLE	1.0039	Confirmed LTF	1.0039

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
AA1-018	Powerton-Goodings Grove	In Service
AA2-030	Nelson	Active
AA2-123	Marengo 34kV	In Service
AA2-148	Madison-Tanners Creek 138kV	Active
AB1-006	Meadow Lake 345kV	In Service
AB1-087	Sullivan 345kV #1	Active
AB1-088	Sullivan 345kV #2	Active
AB1-089	Byron-Wayne 345kV #1	Active
AB1-122	Kendall-Tazewell & Dresden-Mole Creek	Active
AB2-047	Brokaw-Pontiac Midpoint	Under Construction
AB2-070	Brokaw-Lanesville	Active
AB2-096	Silver Lake-Cherry Valley	Active
AC1-033	Kewanee	Active
AC1-053	Lanesville-Brokaw	Active
AC1-056	PJM-AMIL	Confirmed
AC1-074	Jacksonville-Renaker 138kV I	Active
AC1-113	Rockford	Active
AC1-114	Rockford II	Active
AC1-168	Kewanee-Streator	Active
AC1-171	Powerton	Active
AC1-214	Crescent Ridge	Under Construction
AC2-075	Great Blue Heron Solar	Active
AC2-115	Rockford	Active
AC2-116	Rockford II	Active
AC2-157	Sullivan 345 kV	Active
AC2-176	Jay 138 kV	Under Construction
AD1-013	Twombly Road 138kV	Active
AD1-016	Marengo	Active
AD1-031	Kewanee 138 kV	Active
AD1-039	Kendall-Tazewell & Dresden-Mole Creek	Active
AD1-043	Makahoy 138 kV	Active
AD1-067	Mendota Hills	Active
AD1-096	Stillman Valley 34 kV	Withdrawn
AD1-098	Dixon-McGirr	Active
AD1-116	Nevada 345 kV	Active
AD1-129	Belvidere 34 kV	Active
AD1-133	Pontiac MidPoint-Dresden	Active
AD1-148	Brokaw-Lanesville	Active
AD2-038	Powerton	Active
AD2-048	Cynthia-Headquarters 69 kV	Active
AD2-066	Mazon-Crescent Ridge	Active
AD2-072	Van Arsdell-Mercer Industrial 69kV	Active
AD2-100	Kincaid-Pana	Active

Queue Number	Project Name	Status
AD2-102	Wempletown 345 kV	Active
AD2-131	Latham Kincaid	Active
AD2-134	Shady Oaks	Active
AD2-159	Chestnut 345kV	Active
AD2-172	Lena 138kV	Active
AD2-214	Rock Falls-Garden Plains	Active
AE1-113	Mole Creek 345 kV	Active
AE1-114	Maryland-Lancaster 138 kV	Active
AE1-134	Nelson 345 kV	Active
AE1-143	Marion County 161 kV	Active
AE1-163	Powerton-Nevada 345 kV	Active
AE1-172	Loretto-Wilton Center	Active
AE1-205	McLean 345 kV	Active
AE1-246	Barren County-Summer Shade 161 kV	Active
AE1-252	Loretto-Wilton Center	Active
AE2-035	Lena 138 kV	Active
AE2-071	Patton Rd-Summer Shade 69 kV	Active
AE2-107	Haumesser Road 138 kV	Active
AE2-130	Rockport 765 kV	Active
AE2-138	Avon-North Clark 345 kV	Active
AE2-154	Meadow Lake 345 kV (MLV VIII)	Active
AE2-169	Delaware-Van Buren 138 kV	Active
AE2-171	Makahoy 138 kV	Active
AE2-172	Mississinewa-Gaston 138 kV	Active
AE2-173	McLean 345 kV	Active
AE2-210	Avon-North Clark 345 kV	Active
AE2-223	McLean 345 kV	Active
AE2-254	Garrard County-Tommy-Gooch 69 kV	Active
AE2-255	Molecreek 345 kV	Active
AE2-261	Kincaid-Pana	Active
AE2-275	JK Smith-Fawkes 138 kV	Active
AE2-276	Sullivan 345kV	Active
AE2-281	Powerton-Nevada 345 kV	Active
AE2-297	Madison-Tanners Creek 138 kV	Active
AE2-308	Three Forks-Dale 138 kV	Active
AE2-321	Belvidere-Marengo 138 kV	Active
AE2-339	Avon 138 kV	Active
AF1-009	Dixon-McGirr	Active
AF1-011	Schauff Road	Active
AF1-012	Electric Junc-Nelson	Active
AF1-038	Sewellton Jct-Webbs Crossroads 69 kV	Active
AF1-048	Belvidere-Marengo	Active
AF1-050	Summer Shade - Green County 161 kV	Active
AF1-060	Lena 138 kV	Active
AF1-083	Green County-Saloma 161 kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-090	Kincaid-Pana	Active
AF1-116	Marion County 161 kV	Active
AF1-127	Avon 345 kV	Active
AF1-203	Patton Rd-Summer Shade 69 kV	Active
AF1-204	Eugene 345 kV	Active
AF1-207	Reynolds-Olive #1 345 kV	Active

Queue Number	Project Name	Status
AF1-219	Hunt Farm 69 kV	Active
AF1-251	Avon-North Clark 345 kV	Active
AF1-252	Kincaid-Pana	Active
AF1-253	Kincaid-Pana	Active
AF1-267	Union City Tap 138 kV	Active
AF1-280	Nelson-Lee County	Active
AF1-281	Nelson-Lee County	Active
AF1-296	Garden Plain 138 kV	Active
AF1-314	Lena 138 kV	Active
AF1-317	Electric Jct-Nelson	Active
AF1-318	Crescent Ridge-Corbin	Active
AF1-322	Meadow Lake 345 kV	Active
AF1-330	Marengo	Active
AF1-331	Twombly Road	Active
AF2-003	Powerton-Mole Creek	Active
AF2-008	Sullivan 345 kV	Active
AF2-032	Kincaid	Active
AF2-041	Nelson-Electric Junction 345 kV	Active
AF2-069	Crescent Ridge 138 kV	Active
AF2-070	Crescent Ridge 138 kV	Active
AF2-078	Reynolds-Olive #1 345 kV	Active
AF2-090	Central Hardin 138 kV	Active
AF2-128	Crescent Ridge-Corbin 138 kV	Active
AF2-142	Nevada 345 kV	Active
AF2-143	Powerton-Nevada 345 kV	Active
AF2-182	Nelson-Lee County 345 kV II	Active
AF2-183	Nelson-Lee County 345 kV	Active
AF2-188	Reynolds-Meadow Lake #1 345 kV	Active
AF2-199	Nelson-Electric Junction 345 kV	Active
AF2-200	Nelson-Electric Junction 345 kV	Active
AF2-201	Lena-Ecogrove 138 kV	Active
AF2-225	McLean 345 kV	Active
AF2-226	Katydid Road 345 kV	Active
AF2-252	Blue Mound 345 kV	Active
AF2-260	Stephensburg 69 kV	Active
AF2-267	Lancaster 138 kV	Active
AF2-305	Brokaw-Lanesville 345 kV	Active
AF2-306	Hope-Blevins Valley Tap 69 kV	Active
AF2-307	Hope-Blevins Valley Tap 69 kV	Active
AF2-308	Central Hardin-Stephensburg 69 kV	Active
AF2-309	Central Hardin-Stephensburg 69 kV	Active
AF2-317	Hill Topper 345 kV	Active
AF2-319	Katydid Road 345 kV	Active
AF2-346	Electric Junction-Nelson 345 kV	Active
AF2-349	Garden Prairie-Silver Lake 345 kV	Active
AF2-352	Blue Mound 34.5 kV	Active
AF2-353	Rockport 765 kV	Active
AF2-355	West Gerrard-J.K. Smith 345 nkV	Active
AF2-363	Glidden 138 kV	Active
AF2-365	Munfordville KU Tap-Horse Cave Jct. 69 kV	Active
AF2-366	Glidden-Waterman 138 kV	Active
AF2-391	Central Hardin 69 kV	Active

Queue Number	Project Name	Status
AF2-392	Nelson-Dixon 138 kV	Active
AF2-393	Nelson-Dixon 138 kV	Active
AF2-394	Nelson-Dixon 138 kV	Active
AF2-407	Fall Creek 345 kV	Active
AF2-408	Fall Creek 138 kV	Active
AF2-419	Hunt Farm-Ballard 69 kV	Active
AF2-420	Hunt Farm-Ballard 69 kV	Active
U3-021	Silver Lake-Cherry Valley	Active
W2-048	Brokaw-Lanesville	In Service
W4-005	Blue Mound-Latham	Partially in Service - Under Construction
X2-022	Brokaw-Lanesville	In Service
Y1-054	Rochelle 138kV	In Service
Y3-099	Beckjord 2 MW-1	In Service
Y3-100	Beckjord 2 MW-2	In Service
Z1-065	Wiley 34.5kV	In Service
Z2-087	Pontiac MidPoint-Brokaw 345kV	In Service
J1022	MISO	MISO
J1027	MISO	MISO
J1028	MISO	MISO
J1055	MISO	MISO
J1063	MISO	MISO
J1067	MISO	MISO
J1069	MISO	MISO
J1074	MISO	MISO
J1102	MISO	MISO
J1115	MISO	MISO
J1139	MISO	MISO
J1152	MISO	MISO
J1189	MISO	MISO
J446	MISO	MISO
J468	MISO	MISO
J474	MISO	MISO
J513	MISO	MISO
J515	MISO	MISO
J641	MISO	MISO
J644	MISO	MISO
J740	MISO	MISO
J750	MISO	MISO
J754	MISO	MISO
J756	MISO	MISO
J757	MISO	MISO
J759	MISO	MISO
J762	MISO	MISO
J783	MISO	MISO
J800	MISO	MISO
J805	MISO	MISO
J811	MISO	MISO
J815	MISO	MISO
J826	MISO	MISO
J829	MISO	MISO
J837	MISO	MISO
J838	MISO	MISO

Queue Number	Project Name	Status
J845	MISO	MISO
J848	MISO	MISO
J856	MISO	MISO
J883	MISO	MISO
J903	MISO	MISO
J912	MISO	MISO
J913	MISO	MISO
J949	MISO	MISO
J955	MISO	MISO
J968	MISO	MISO
J979	MISO	MISO
J991	MISO	MISO
J992	MISO	MISO
J993	MISO	MISO

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
COMED_P4_080-45-BT4-5__	CONTINGENCY 'COMED_P4_080-45-BT4-5__' TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1 / PONTI; B 345 LORET; B 345 END
AEP_P7-1_#11042-A	CONTINGENCY 'AEP_P7-1_#11042-A' OPEN BRANCH FROM BUS 243878 TO BUS 958970 CKT 1 / 243878 05MEADOW 345 255205 AF2-188 TAP 345 1 OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2 END
AEP_P7-1_#11042-B	CONTINGENCY 'AEP_P7-1_#11042-B' OPEN BRANCH FROM BUS 958970 TO BUS 255205 CKT 1 / 958970 AF2-188 TAP 345 255205 17REYNOLDS 345 1 OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2 END
AEP_P1-2_#10136	CONTINGENCY 'AEP_P1-2_#10136' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243209 TO BUS 243443 CKT 2 / 243209 05ROCKPT 765 243443 05RKG2 26.0 2 REMOVE UNIT 2H FROM BUS 243443 / 243443 05RKG2 26.0 REMOVE UNIT 2L FROM BUS 243443 / 243443 05RKG2 26.0 END
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#3128_05EUGENE 345_A2	CONTINGENCY 'AEP_P4_#3128_05EUGENE 345_A2' OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765 242934 05CORNU 345 1 REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 END
AEP_P1-2_#8905	CONTINGENCY 'AEP_P1-2_#8905' OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
COMED_P4_080-45-BT7-8__	CONTINGENCY 'COMED_P4_080-45-BT7-8__' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTIAC ; R 345 Z2-087 TAP 345 TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1 / PONTIAC ; R 345 AD1-133 TAP 345 END
AEP_P4_#8906_05SULLIVAN 345_C	CONTINGENCY 'AEP_P4_#8906_05SULLIVAN 345_C' OPEN BRANCH FROM BUS 243216 TO BUS 247712 CKT 1 / 243216 05DARWIN 345 247712 05SULLIVAN 345 1 OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
AEP_P4_#8648_05JEFRSO 765_B	CONTINGENCY 'AEP_P4_#8648_05JEFRSO 765_B' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243208 TO BUS 242865 CKT 2 / 243208 05JEFRSO 765 242865 05JEFRSO 345 2 OPEN BRANCH FROM BUS 242865 TO BUS 248000 CKT Z1 / 242865 05JEFRSO 345 248000 06CLIFTY 345 Z1 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
Base Case	

Contingency Name	Contingency Definition
AEP_P4_#8910_05DEQUIN 345_C	CONTINGENCY 'AEP_P4_#8910_05DEQUIN 345_C' OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2 OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1 END
AEP_P1-2_#286	CONTINGENCY 'AEP_P1-2_#286' OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
AEP_P4_#1760_05JEFRSO 765_A	CONTINGENCY 'AEP_P4_#1760_05JEFRSO 765_A' OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END

12 Light Load Analysis

Light Load Studies (As applicable).

To be determined during later study phases.

13 Short Circuit Analysis

The following Breakers are overdutied

To be determined during later study phases.

14 Stability and Reactive Power Assessment

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be determined during later study phases.

15 Affected Systems

15.1 TVA

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

15.2 Duke Energy Progress

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

15.3 MISO

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

15.4 LG&E

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