Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-408

FALL CREEK 138 KV

80 MW Capacity / 80 MW Energy

July 2020

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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 Madison County, Indiana. The installed facilities will have a total capability of 80 MW with 80 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-408
Project Name	FALL CREEK 138 KV
State	Indiana
County	Madison
Transmission Owner	AEP
MFO	80
MWE	80
MWC	80
Fuel	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

AF2-408 will interconnect with the AEP transmission system via a direct connection to the Fall Creek 138 kV station.

To accommodate the interconnection at the Fall Creek 138 kV substation, the substation will have to be expanded requiring the installation of one (1) 138 kV circuit breaker (see Attachment 1). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required.

Installation of the generator lead first span exiting the POI station, including the first structure outside the AEP fence, will also be included in AEP's scope. In the case where the generator lead is a single span, the structure in the customer station will be the customer's responsibility.

5 Cost Summary

The AF2-408 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$1,466,000
Total System Network Upgrade Costs	$1,884,400
Total Costs	**$3,350,400**

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.

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.

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

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
138kV Revenue Metering	$ 388,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$ 400,000
Total Attachment Facility Costs	**$788,000**

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
Installation of one (1) circuit breaker and associated protection and control equipment, 138 kV line risers, and SCADA equipment	$633,000
Total Direct Connection Facility Costs	**$633,000**

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
Upgrade Line Protections & Controls at the Fall Creek 138 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 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.

9 Revenue Metering and SCADA Requirements

9.1 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.

9.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter^2)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)

- Wind direction (decimal degrees from true north) – (Accepted, not required)

9.3 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/

10 Summer Peak - Load Flow Analysis

The Queue Project AF2-408 was evaluated as a 80.1 MW (Capacity 80.0 MW) injection at the Fall Creek 345 kV substation in the AEP area. Project AF2-408 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-408 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

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

None

10.2 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
95980872	243292	05FALL C	138.0	AEP	243333	05MADISO	138.0	AEP	1	AEP_P4_#10612_05FALL C 138_F	breaker	251.0	92.79	100.41	DC	19.12

10.3 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
95547081	243222	05FALL C	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1195.0	111.83	113.47	DC	19.64
95547367	243222	05FALL C	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	AEP_P1-2_#363	single	1195.0	105.78	107.42	DC	19.59
95980725	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	124.98	126.17	DC	5.41
95980726	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P4_#6959_05HOGAN 138_A	breaker	205.0	119.32	120.51	DC	5.41
95547094	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1318.0	108.92	110.42	DC	19.64
95547754	923880	AB2-028 TAP	345.0	AEP	243222	05FALL C	345.0	AEP	1	AEP_P7-1_#11019	tower	1195.0	112.47	113.59	DC	13.41
95547755	923880	AB2-028 TAP	345.0	AEP	243222	05FALL C	345.0	AEP	1	AEP_P7-1_#11087-F	tower	1195.0	105.82	106.94	DC	13.37
95980716	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	127.81	128.99	DC	5.41
95980717	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P4_#6959_05HOGAN 138_A	breaker	205.0	122.15	123.34	DC	5.41
95547184	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817	single	971.0	101.82	102.94	DC	11.18
95981443	946030	AF1-268 TAP	138.0	AEP	243319	05JAY	138.0	AEP	1	AEP_P7-1_#11019	tower	393.0	114.55	115.01	DC	4.06
95981444	946030	AF1-268 TAP	138.0	AEP	243319	05JAY	138.0	AEP	1	AEP_P7-1_#11087-F	tower	393.0	110.17	110.63	DC	4.07

10.4 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
95547292	243218	05DESOTO	345.0	AEP	945370	AF1-202 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	128.87	130.1	DC	11.13
95547300	243218	05DESOTO	345.0	AEP	958860	AF2-177 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	125.22	126.37	DC	11.18
95547366	243222	05FALL C	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	AEP_P1-2_#363	operation	1195.0	110.65	112.29	DC	19.59
95547370	243222	05FALL C	345.0	AEP	923880	AB2-028 TAP	345.0	AEP	1	Base Case	operation	1025.0	99.35	101.24	DC	19.4
95981079	243311	05HOGAN	138.0	AEP	243275	05DELAWR	138.0	AEP	1	AEP_P1-2_#673-A	operation	255.0	99.67	103.08	DC	8.69
95981003	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P1-2_#6957	operation	205.0	119.19	120.25	DC	4.82
95547380	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	Base Case	operation	1025.0	108.97	110.86	DC	19.4
95547381	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P1-2_#363	operation	1318.0	107.84	109.33	DC	19.59
95980983	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P1-2_#6957	operation	205.0	122.02	123.08	DC	4.82
95547178	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	176.68	177.83	DC	11.18
95547214	944540	AF1-119 TAP	345.0	AEP	243225	05KEYSTN	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	156.52	157.75	DC	11.13
95547220	944830	AF1-148 TAP	345.0	AEP	944530	AF1-118 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	154.96	156.1	DC	11.18
95547238	945370	AF1-202 TAP	345.0	AEP	944540	AF1-119 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	144.57	145.8	DC	11.13
95547268	958860	AF2-177 TAP	345.0	AEP	960970	AF2-388 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	134.43	135.58	DC	11.18
95547232	960970	AF2-388 TAP	345.0	AEP	944830	AF1-148 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	145.52	146.67	DC	11.18

10.5 System Reinforcements - Summer Peak Load Flow

ID	Idx	Facility	Upgrade Description	Cost
95980725,95980726	3	05PIPECK 138.0 kV - 05GRNTTA 138.0 kV Ckt 1	**AEPI0014a (293) : A Sag Study will be required on the 1.9 mile section of ACSR~556.5~ 26/7~ DOVE line to mitigate the overload. Ratings after sag study: S/N: 205 S/E: 284 MVA. Depending on the sag study results. The cost for this upgrade is expected to be between $20,000 (no remediations required, just sag study) and $2.85 million (complete line reconductor/rebuild required)** **Project Type : FAC** **Cost : $20,000** **Time Estimate : Sag study : 6-12 months**	$20,000
95547094	4	AB2-028 TAP 345.0 kV - 05DESOTO 345.0 kV Ckt 1	**AEPI0026a (321) : Replace 10 345 kV Desoto Risers (Sub Cond 22156 ACSR 84/19 STD)** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 12-18 Months** **AEPI0026b (322) : A Sag Study will be required on the ~18 mile section of ACSR ~954 ~45/7 ~ RAIL line to mitigate the overload . New Rating 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 $72,000 (No remediations required just sag study) and $54 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 : $72,000** **Time Estimate : 6-12 Months**	$1,072,000
95547081,95547367	2	05FALL C 345.0 kV - AB2-028 TAP 345.0 kV Ckt 1	**NonPJMArea: The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase.**	$0
95547754,95547755	5	AB2-028 TAP 345.0 kV - 05FALL C 345.0 kV Ckt 1		
95980872	1	05FALL C 138.0 kV - 05MADISO 138.0 kV Ckt 1	**AEPI0023a (315) : A Sag Study will be required on the 7.5 miles section of ACSR ~ 795 ~ 45/7 ~ TERN line to mitigate the overload. New Ratings afetr the sag study S/N : 251 MVA S/E: 335 MVA. Depending on the sag study results, cost for this upgrade is expected to be between $30,000 (no remediations required just sag study) and $11.25 million (complete line reconductor/rebuild required)** **Project Type : FAC** **Cost : $30,000** **Time Estimate : 6-12 Months**	$30,000

ID	Idx	Facility	Upgrade Description	Cost
95547184	7	AF1-118 TAP 345.0 kV - 05SORENS 345.0 kV Ckt 2	**AEPI0009a (276) : A Sag Study will be required on the 51.6 miles of ACSR/PE ~ 1414 ~ 62/19 - Conductor section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $206, 4000 (no remediations required, just sag study) and $103.2 million (complete line reconductor/rebuild). New rating after sag study: S/N: 971 S/E: 1419. 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 : $206,400** **Time Estimate : Sag study : 6-12 Months**	$206,400
95981444,95981443	8	AF1-268 TAP 138.0 kV - 05JAY 138.0 kV Ckt 1	**AEPI0019a (299) : Current AEP End Ratings are S/N :335MVA S/E: 392 MVA** **1) Replace 2 risers(Sub cond 1590 AAC 61 Str) at Jay Station** **Project Type : FAC** **Cost : $70,000** **Time Estimate : 24- 36 Months** **AEPI0027a (323) : A Sag Study will be required on the 8.3 mile section of ACSR ~ 556.5 26/7 ~ DOVE line to mitigate the overload . New Rating after the Sag Study: S/N: 410 MVA S/E: 568 MVA. Depending on the sag study results, cost for this upgrade is expected to be between $33,200 (No remediations required just sag study) and 9.96 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 : $33,200** **Time Estimate : 6-12 Months** **AEPI0027b (324) : A Sag Study will be required on the 0.06 mile section of ACSR ~ 1781~ 84/19 ~ CHUKAR line to mitigate the overload . New Rating after the Sag Study; S/N: 418 MVA S/E: 569 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 90,000 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 : 6-12 Months** **AEPI0027c (325) : Replace 4 Sub Cond 2000 AAC 91 Str at Jay** **Project Type : FAC** **Cost : $400,000** **Time Estimate : 12-18 months**	$523,200

ID	Idx	Facility	Upgrade Description	Cost
95980717,95980716	6	AD2-071 TAP 138.0 kV - 05PIPECK 138.0 kV Ckt 1	**AEPI0043a (157) : A Sag Study will be required on the 8.2 mile section of ACSR ~ 556.5 ~ 26/7 ~ DOVE line to mitigate the overload. Depending on the sag study results, cost for this upgrade is expected to be between $32,800 (no remediations required just sag study) New Ratings after the sag study, S/N: 205 MVA , S/E: 284 MVAand 12.3 million (complete line reconductor/rebuild required)** **Project Type : FAC** **Cost : $32,800** **Time Estimate : 6-12 months Months** **AEPI0015a (294) : A Sag Study will be required on the 5.5 mile section of ACSR ~ 556.5 ~ 26/7 ~ DOVE line to mitigate the overload. Depending on the sag study results, cost for this upgrade is expected to be between $22,000 (no remediations required just sag study) New Ratings after the sag study, S/N: 205 MVA , S/E: 284 MVAand $2.85 million (complete line reconductor/rebuild required)** **Project Type : FAC** **Cost : $22,000** **Time Estimate : Sag study : 6-12 months Months**	$32,800
			TOTAL COST	**$1,884,400**

10.6 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".

10.6.1 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
95980872	243292	05FALL C	AEP	243333	05MADISO	AEP	1	AEP_P4_#10612_05FALL C 138_F	breaker	251.0	92.79	100.41	DC	19.12

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
923881	AB2-028 C	1.1868	Adder	1.4
923882	AB2-028 E	7.9422	Adder	9.34
941692	AE2-169 BAT	3.7283	50/50	3.7283
941712	AE2-171 BAT	6.5076	50/50	6.5076
941722	AE2-172 BAT	2.5156	Merchant Transmission	2.5156
944122	AF1-080 BAT	3.7814	50/50	3.7814
954351	J903	6.0430	PJM External (MISO)	6.0430
961161	AF2-407	10.2309	Adder	22.71
961171	AF2-408	19.1232	50/50	19.1232
WEC	WEC	0.0684	Confirmed LTF	0.0684
LGEE	LGEE	0.4855	Confirmed LTF	0.4855
CPLE	CPLE	0.1131	Confirmed LTF	0.1131
CBM-W2	CBM-W2	7.2973	Confirmed LTF	7.2973
NY	NY	0.0177	Confirmed LTF	0.0177
CBM-W1	CBM-W1	1.8765	Confirmed LTF	1.8765
TVA	TVA	0.7700	Confirmed LTF	0.7700
O-066	O-066	0.1680	Confirmed LTF	0.1680
CBM-S2	CBM-S2	1.3121	Confirmed LTF	1.3121
CBM-S1	CBM-S1	5.1631	Confirmed LTF	5.1631
G-007	G-007	0.0260	Confirmed LTF	0.0260
MADISON	MADISON	1.4878	Confirmed LTF	1.4878
MEC	MEC	0.6896	Confirmed LTF	0.6896

10.6.2 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
95547081	243222	05FALL C	AEP	923880	AB2-028 TAP	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1195.0	111.83	113.47	DC	19.64

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
CPLE	CPLE	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

10.6.3 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
95980725	246763	05PIPECK	AEP	243303	05GRNTTA	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	124.98	126.17	DC	5.41

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246991	05WLD G1 C	1.1158	50/50	1.1158
247255	05WLD G2 C	1.1714	50/50	1.1714
247958	05WLD G2 E	88.7644	50/50	88.7644
920501	AA2-148 C OP	1.2596	Adder	1.48
920502	AA2-148 E OP	8.4299	Adder	9.92
934161	AD1-043 C O1	19.6892	50/50	19.6892
934162	AD1-043 E O1	32.1244	50/50	32.1244
936561	AD2-071 C	39.8945	50/50	39.8945
936562	AD2-071 E	19.6495	50/50	19.6495
941711	AE2-171	12.9534	50/50	12.9534
941722	AE2-172 BAT	3.4068	Merchant Transmission	3.4068
942791	AE2-297 C O1	5.2063	Adder	6.13
942792	AE2-297 E O1	3.4708	Adder	4.08
944121	AF1-080	10.2028	50/50	10.2028
961171	AF2-408	2.4356	Adder	5.41
LGEE	LGEE	0.2670	Confirmed LTF	0.2670
CPLE	CPLE	0.0549	Confirmed LTF	0.0549
FARMERCITY	FARMERCITY	0.0048	Confirmed LTF	0.0048
G-007A	G-007A	0.0647	Confirmed LTF	0.0647
VFT	VFT	0.1741	Confirmed LTF	0.1741
CBM-W2	CBM-W2	1.7117	Confirmed LTF	1.7117
TVA	TVA	0.2268	Confirmed LTF	0.2268
EDWARDS	EDWARDS	0.0847	Confirmed LTF	0.0847
CBM-S2	CBM-S2	0.5607	Confirmed LTF	0.5607
CBM-S1	CBM-S1	1.8659	Confirmed LTF	1.8659

10.6.4 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
95547094	923880	AB2-028 TAP	AEP	243218	05DESOTO	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	1318.0	108.92	110.42	DC	19.64

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
923881	AB2-028 C	12.9449	50/50	12.9449
923882	AB2-028 E	86.6311	50/50	86.6311
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

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960621	AF2-353 C	20.1572	Adder	44.74
960622	AF2-353 E	8.6388	Adder	19.18
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
CPLE	CPLE	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

10.6.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95547754	923880	AB2-028 TAP	AEP	243222	05FALL C	AEP	1	AEP_P7-1_#11019	tower	1195.0	112.47	113.59	DC	13.41

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	1.4152	50/50	1.4152
247292	05KEY G1	3.7709	50/50	3.7709
247293	05KEY G2	3.7709	50/50	3.7709
247294	05KEY G3	3.7709	50/50	3.7709
247295	05KEY G4	3.7709	50/50	3.7709
247536	05BLUFF P WF	0.6988	50/50	0.6988
247543	V3-007 C	1.4152	50/50	1.4152
247621	Y3-024	0.0867	50/50	0.0867
247929	S-071 E	16.2048	50/50	16.2048
247935	V3-007 E	54.9057	50/50	54.9057
247963	05HDWTR1G E	54.9057	50/50	54.9057
923881	AB2-028 C	15.6099	50/50	15.6099
923882	AB2-028 E	104.4661	50/50	104.4661
926881	AC1-175 C	23.9818	50/50	23.9818
926882	AC1-175 E	39.1282	50/50	39.1282
932681	AC2-090 C	11.9909	50/50	11.9909
932682	AC2-090 E	19.5641	50/50	19.5641
932841	AC2-111 C O1	2.5207	Adder	2.97
932842	AC2-111 E O1	4.1127	Adder	4.84
933591	AC2-176 C O1	0.5421	50/50	0.5421
933592	AC2-176 E O1	21.0332	50/50	21.0332
933601	AC2-177 C O1	8.2043	50/50	8.2043
933602	AC2-177 E O1	54.9057	50/50	54.9057
934961	AD1-128 C	12.4363	50/50	12.4363
934962	AD1-128 E	20.2907	50/50	20.2907
939761	AE1-207 C	8.5646	50/50	8.5646
939762	AE1-207 E	11.8274	50/50	11.8274
939771	AE1-208 C	6.7315	50/50	6.7315
939772	AE1-208 E	9.1793	50/50	9.1793
939781	AE1-209 C O1	4.7765	50/50	4.7765
939782	AE1-209 E O1	31.9655	50/50	31.9655
939791	AE1-210 C O1	4.7765	50/50	4.7765
939792	AE1-210 E O1	31.9655	50/50	31.9655
940981	AE2-089 C O1	13.0321	50/50	13.0321
940982	AE2-089 E O1	8.6881	50/50	8.6881
940991	AE2-090 C	12.5392	50/50	12.5392
940992	AE2-090 E	8.3595	50/50	8.3595
941691	AE2-169	4.0389	50/50	4.0389
941721	AE2-172	5.0980	50/50	5.0980
942071	AE2-219 C	6.7712	50/50	6.7712
942072	AE2-219 E	9.3508	50/50	9.3508
942081	AE2-220 C	16.5664	50/50	16.5664

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942082	AE2-220 E	22.8774	50/50	22.8774
942221	AE2-234 C O1	1.8535	Adder	2.18
942222	AE2-234 E O1	0.8383	Adder	0.99
944031	AF1-071 C	0.6302	Adder	0.74
944032	AF1-071 E	1.0282	Adder	1.21
944531	AF1-118 C O1	98.7965	50/50	98.7965
944532	AF1-118 E O1	29.7970	50/50	29.7970
944541	AF1-119 C O1	51.4388	50/50	51.4388
944542	AF1-119 E O1	22.0452	50/50	22.0452
944831	AF1-148 C O1	35.0509	50/50	35.0509
944832	AF1-148 E O1	23.3673	50/50	23.3673
945371	AF1-202 C O1	12.4923	50/50	12.4923
945372	AF1-202 E O1	60.9917	50/50	60.9917
945561	AF1-221 C O1	10.0900	Adder	11.87
945562	AF1-221 E O1	3.0328	Adder	3.57
945581	AF1-223 C O1	33.0678	50/50	33.0678
945582	AF1-223 E O1	22.0452	50/50	22.0452
946031	AF1-268 C O1	13.4613	50/50	13.4613
946032	AF1-268 E O1	6.1059	50/50	6.1059
946491	AF1-313 C O1	4.3598	50/50	4.3598
946492	AF1-313 E O1	2.9066	50/50	2.9066
957741	AF2-068 C O1	16.7373	50/50	16.7373
957742	AF2-068 E O1	11.1582	50/50	11.1582
958711	AF2-162 C	11.0226	50/50	11.0226
958712	AF2-162 E	5.5113	50/50	5.5113
958821	AF2-173 C	30.8633	50/50	30.8633
958822	AF2-173 E	42.6207	50/50	42.6207
958861	AF2-177 C	9.5529	50/50	9.5529
958862	AF2-177 E	63.9311	50/50	63.9311
959201	AF2-211 C	2.6368	Adder	5.85
959202	AF2-211 E	1.7579	Adder	3.9
960441	AF2-335 C	10.8996	50/50	10.8996
960442	AF2-335 E	7.2664	50/50	7.2664
960791	AF2-370	3.6332	50/50	3.6332
960971	AF2-388 C O1	12.9328	50/50	12.9328
960972	AF2-388 E O1	60.5492	50/50	60.5492
961162	AF2-407 BAT	92.7090	50/50	92.7090
961172	AF2-408 BAT	13.4088	50/50	13.4088
NEWTON	NEWTON	4.6913	Confirmed LTF	4.6913
FARMERCITY	FARMERCITY	0.1488	Confirmed LTF	0.1488
G-007A	G-007A	0.5251	Confirmed LTF	0.5251
VFT	VFT	1.4190	Confirmed LTF	1.4190
CALDERWOOD	CALDERWOOD	0.6148	Confirmed LTF	0.6148
PRAIRIE	PRAIRIE	8.8132	Confirmed LTF	8.8132
CHEOAH	CHEOAH	0.6096	Confirmed LTF	0.6096
EDWARDS	EDWARDS	0.9019	Confirmed LTF	0.9019
TILTON	TILTON	3.3245	Confirmed LTF	3.3245
GIBSON	GIBSON	3.8482	Confirmed LTF	3.8482
BLUEG	BLUEG	3.3331	Confirmed LTF	3.3331
TRIMBLE	TRIMBLE	0.9060	Confirmed LTF	0.9060
CATAWBA	CATAWBA	0.2194	Confirmed LTF	0.2194

10.6.6 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95980716	936560	AD2-071 TAP	AEP	246763	05PIPECK	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	127.81	128.99	DC	5.41

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246991	05WLD G1 C	1.1158	50/50	1.1158
247255	05WLD G2 C	1.1714	50/50	1.1714
247958	05WLD G2 E	88.7644	50/50	88.7644
920501	AA2-148 C OP	1.2596	Adder	1.48
920502	AA2-148 E OP	8.4299	Adder	9.92
934161	AD1-043 C O1	19.6892	50/50	19.6892
934162	AD1-043 E O1	32.1244	50/50	32.1244
936561	AD2-071 C	39.8945	50/50	39.8945
936562	AD2-071 E	19.6495	50/50	19.6495
941711	AE2-171	12.9534	50/50	12.9534
941722	AE2-172 BAT	3.4068	Merchant Transmission	3.4068
942791	AE2-297 C O1	5.2063	Adder	6.13
942792	AE2-297 E O1	3.4708	Adder	4.08
944121	AF1-080	10.2028	50/50	10.2028
961171	AF2-408	2.4356	Adder	5.41
LGEE	LGEE	0.2670	Confirmed LTF	0.2670
CPLE	CPLE	0.0549	Confirmed LTF	0.0549
FARMERCITY	FARMERCITY	0.0048	Confirmed LTF	0.0048
G-007A	G-007A	0.0647	Confirmed LTF	0.0647
VFT	VFT	0.1741	Confirmed LTF	0.1741
CBM-W2	CBM-W2	1.7117	Confirmed LTF	1.7117
TVA	TVA	0.2268	Confirmed LTF	0.2268
EDWARDS	EDWARDS	0.0847	Confirmed LTF	0.0847
CBM-S2	CBM-S2	0.5607	Confirmed LTF	0.5607
CBM-S1	CBM-S1	1.8659	Confirmed LTF	1.8659

10.6.7 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95547184	944530	AF1-118 TAP	AEP	243232	05SORENS	AEP	2	AEP_P1-2_#4817	single	971.0	101.82	102.94	DC	11.18

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243415	05WWVSTA	1.9346	80/20	1.9346
243795	05HDWTR1G C	0.9711	80/20	0.9711
246991	05WLD G1 C	0.2369	80/20	0.2369
247255	05WLD G2 C	0.2487	80/20	0.2487
247265	05LAWG1B	2.0910	80/20	2.0910
247266	05LAWG1S	3.3390	80/20	3.3390
247267	05LAWG2A	2.0910	80/20	2.0910
247268	05LAWG2B	2.0910	80/20	2.0910
247269	05LAWG2S	3.3390	80/20	3.3390
247285	05AND G1	0.6253	80/20	0.6253
247286	05AND G2	0.6253	80/20	0.6253
247287	05AND G3	1.3077	80/20	1.3077
247288	05RICHG1	0.6891	80/20	0.6891
247289	05RICHG2	0.6891	80/20	0.6891
247292	05KEY G1	2.5073	80/20	2.5073
247293	05KEY G2	2.5073	80/20	2.5073
247294	05KEY G3	2.5073	80/20	2.5073
247295	05KEY G4	2.5073	80/20	2.5073
247536	05BLUFF P WF	0.5182	80/20	0.5182
247543	V3-007 C	0.9711	80/20	0.9711
247621	Y3-024	0.0608	80/20	0.0608
920501	AA2-148 C OP	2.8003	80/20	2.8003
923881	AB2-028 C	4.6163	80/20	4.6163
926881	AC1-175 C	16.4570	80/20	16.4570
932681	AC2-090 C	8.2285	80/20	8.2285
932841	AC2-111 C O1	3.1330	80/20	3.1330
933591	AC2-176 C O1	0.3845	80/20	0.3845
933601	AC2-177 C O1	5.6300	80/20	5.6300
934161	AD1-043 C O1	5.1628	80/20	5.1628
934961	AD1-128 C	9.8154	80/20	9.8154
936561	AD2-071 C	6.4387	80/20	6.4387
939761	AE1-207 C	7.5828	80/20	7.5828
939771	AE1-208 C	6.3272	80/20	6.3272
939781	AE1-209 C O1	3.1772	80/20	3.1772
939791	AE1-210 C O1	3.1772	80/20	3.1772
940981	AE2-089 C O1	7.4456	80/20	7.4456
940991	AE2-090 C	10.4397	80/20	10.4397
941691	AE2-169	3.7963	80/20	3.7963
941711	AE2-171	3.3966	80/20	3.3966
941721	AE2-172	4.5136	80/20	4.5136
942071	AE2-219 C	5.2315	80/20	5.2315
942081	AE2-220 C	11.3683	80/20	11.3683

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942791	AE2-297 C O1	11.3863	80/20	11.3863
944031	AF1-071 C	0.7833	80/20	0.7833
944121	AF1-080	2.1658	80/20	2.1658
944531	AF1-118 C O1	162.3403	80/20	162.3403
944541	AF1-119 C O1	34.2076	80/20	34.2076
944831	AF1-148 C O1	55.0105	80/20	55.0105
945371	AF1-202 C O1	8.3079	80/20	8.3079
945561	AF1-221 C O1	13.7390	80/20	13.7390
945581	AF1-223 C O1	21.9915	80/20	21.9915
946031	AF1-268 C O1	9.9325	80/20	9.9325
946491	AF1-313 C O1	3.9823	80/20	3.9823
953351	J805	18.7239	PJM External (MISO)	18.7239
954351	J903	10.0700	PJM External (MISO)	10.0700
955151	J993	18.6840	PJM External (MISO)	18.6840
956561	J1152	20.1000	PJM External (MISO)	20.1000
957741	AF2-068 C O1	11.8719	80/20	11.8719
958711	AF2-162 C	7.3302	80/20	7.3302
958821	AF2-173 C	20.5296	80/20	20.5296
958861	AF2-177 C	11.6410	80/20	11.6410
959201	AF2-211 C	6.1836	80/20	6.1836
960441	AF2-335 C	9.9558	80/20	9.9558
960791	AF2-370	3.3186	80/20	3.3186
960971	AF2-388 C O1	18.9531	80/20	18.9531
961161	AF2-407	45.4650	80/20	45.4650
961171	AF2-408	11.1768	80/20	11.1768
LGEE	LGEE	2.3824	Confirmed LTF	2.3824
CPLE	CPLE	0.5444	Confirmed LTF	0.5444
FARMERCITY	FARMERCITY	0.0056	Confirmed LTF	0.0056
G-007A	G-007A	0.0456	Confirmed LTF	0.0456
VFT	VFT	0.1161	Confirmed LTF	0.1161
CBM-W2	CBM-W2	15.8640	Confirmed LTF	15.8640
NY	NY	0.0044	Confirmed LTF	0.0044
TVA	TVA	2.3142	Confirmed LTF	2.3142
EDWARDS	EDWARDS	0.4491	Confirmed LTF	0.4491
CBM-S2	CBM-S2	5.7049	Confirmed LTF	5.7049
CBM-S1	CBM-S1	18.0794	Confirmed LTF	18.0794

10.6.8 Index 8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95981443	946030	AF1-268 TAP	AEP	243319	05JAY	AEP	1	AEP_P7-1_#11019	tower	393.0	114.55	115.01	DC	4.06

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247935	V3-007 E	10.0128	Adder	11.78
247963	05HDWTR1G E	10.0128	Adder	11.78
923881	AB2-028 C	1.2800	Adder	1.51
923882	AB2-028 E	8.5664	Adder	10.08
926881	AC1-175 C	4.3734	Adder	5.15
926882	AC1-175 E	7.1356	Adder	8.39
927181	AC1-212 C	-0.1225	Adder	-0.14
927183	AC1-212 BAT	1.5090	Merchant Transmission	1.5090
932681	AC2-090 C	2.1867	Adder	2.57
932682	AC2-090 E	3.5678	Adder	4.2
933592	AC2-176 E O1	-53.8491	Adder	-63.35
933601	AC2-177 C O1	1.4962	Adder	1.76
933602	AC2-177 E O1	10.0128	Adder	11.78
934961	AD1-128 C	3.3886	Adder	3.99
934962	AD1-128 E	5.5288	Adder	6.5
939761	AE1-207 C	3.0188	Adder	3.55
939762	AE1-207 E	4.1688	Adder	4.9
939771	AE1-208 C	2.4698	Adder	2.91
939772	AE1-208 E	3.3679	Adder	3.96
939781	AE1-209 C O1	0.8570	Adder	1.01
939782	AE1-209 E O1	5.7356	Adder	6.75
939791	AE1-210 C O1	0.8570	Adder	1.01
939792	AE1-210 E O1	5.7356	Adder	6.75
941691	AE2-169	1.4819	Adder	1.74
941721	AE2-172	1.7969	Adder	2.11
942081	AE2-220 C	3.0211	Adder	3.55
942082	AE2-220 E	4.1720	Adder	4.91
944531	AF1-118 C O1	17.7206	Adder	20.85
944532	AF1-118 E O1	5.3445	Adder	6.29
944541	AF1-119 C O1	9.2285	Adder	10.86
944542	AF1-119 E O1	3.9551	Adder	4.65
944831	AF1-148 C O1	6.2877	Adder	7.4
944832	AF1-148 E O1	4.1918	Adder	4.93
945371	AF1-202 C O1	2.2412	Adder	2.64
945372	AF1-202 E O1	10.9423	Adder	12.87
945581	AF1-223 C O1	5.9326	Adder	6.98
945582	AF1-223 E O1	3.9551	Adder	4.65
946031	AF1-268 C O1	12.9400	50/50	12.9400
946032	AF1-268 E O1	5.8695	50/50	5.8695
946491	AF1-313 C O1	1.7444	Adder	2.05
946492	AF1-313 E O1	1.1629	Adder	1.37
958711	AF2-162 C	1.0481	Adder	2.33

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958712	AF2-162 E	0.5240	Adder	1.16
958821	AF2-173 C	2.9350	Adder	6.51
958822	AF2-173 E	4.0531	Adder	9.0
958861	AF2-177 C	0.9082	Adder	2.02
958862	AF2-177 E	6.0781	Adder	13.49
960441	AF2-335 C	2.3113	Adder	5.13
960442	AF2-335 E	1.5409	Adder	3.42
960791	AF2-370	0.7704	Adder	1.71
960971	AF2-388 C O1	1.2296	Adder	2.73
960972	AF2-388 E O1	5.7568	Adder	12.78
961161	AF2-407	6.7953	Adder	15.08
961171	AF2-408	1.8298	Adder	4.06
WEC	WEC	0.0148	Confirmed LTF	0.0148
LGEE	LGEE	0.6561	Confirmed LTF	0.6561
CPLE	CPLE	0.1429	Confirmed LTF	0.1429
CBM-W2	CBM-W2	6.5438	Confirmed LTF	6.5438
NY	NY	0.0453	Confirmed LTF	0.0453
TVA	TVA	0.8120	Confirmed LTF	0.8120
O-066	O-066	0.4771	Confirmed LTF	0.4771
CBM-S2	CBM-S2	1.6184	Confirmed LTF	1.6184
CBM-S1	CBM-S1	5.8447	Confirmed LTF	5.8447
G-007	G-007	0.0728	Confirmed LTF	0.0728
MEC	MEC	0.4910	Confirmed LTF	0.4910

10.7 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
AA2-148	Madison-Tanners Creek 138kV	Active
AB1-087	Sullivan 345kV #1	Active
AB1-088	Sullivan 345kV #2	Active
AB2-028	Fall Creek-Desoto 345kV	Active
AC1-175	Losantville 345kV	Active
AC1-212	Minster 69kV	Engineering and Procurement
AC2-090	Losantville 345kV	Active
AC2-111	College Corner 138kV	Active
AC2-157	Sullivan 345 kV	Active
AC2-176	Jay 138 kV	Under Construction
AC2-177	Desoto-Tanners Creek 345kV	Active
AD1-043	Makahoy 138 kV	Active
AD1-128	Modoc 138 kV	Active
AD2-071	Strawton-Pipe Creek 138 kV	Active
AE1-207	Mississinewa-Gaston 138 kV	Active
AE1-208	Delaware-Van Buren 138 kV	Active
AE1-209	Desoto 345 kV	Active
AE1-210	Desoto 345 kV	Active
AE2-089	Pennville-Adams 138 kV	Active
AE2-090	Randolph-Hodgin 138 kV	Active
AE2-130	Rockport 765 kV	Active
AE2-169	Delaware-Van Buren 138 kV	Active
AE2-171	Makahoy 138 kV	Active
AE2-172	Mississinewa-Gaston 138 kV	Active
AE2-219	Bluff Point-Randolph 138 kV	Active
AE2-220	Losantville 345 kV	Active
AE2-234	Liberty Center-Buckeye Tap 69 kV	Active
AE2-276	Sullivan 345kV	Active
AE2-297	Madison-Tanners Creek 138 kV	Active
AF1-071	College Corner 138 kV	Active
AF1-080	Deer Creek-Fisher Body-Mullin 138 kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-118	Sorenson-Desoto 345 kV	Active
AF1-119	Keystone-Desoto 345 kV	Active
AF1-148	Sorenson-Desoto 345 kV	Active
AF1-202	Keystone-Desoto 345 kV	Active
AF1-204	Eugene 345 kV	Active
AF1-221	College Corner-Drewersburg 138 kV	Active
AF1-223	Jay-Desoto 138 kV	Active
AF1-268	Desoto-Jay 138 kV	Active

Queue Number	Project Name	Status
AF1-313	Wes Del-Royerton 138 kV	Active
AF2-008	Sullivan 345 kV	Active
AF2-068	Jay 138 kV	Active
AF2-090	Central Hardin 138 kV	Active
AF2-162	Keystone-Desoto 345 kV	Active
AF2-173	Desoto 345 kV	Active
AF2-177	Sorenson-DeSoto #2 345 kV	Active
AF2-211	College Corner 138 kV	Active
AF2-335	West Del-Royerton 138 kV	Active
AF2-353	Rockport 765 kV	Active
AF2-370	West Del-Royerton 138 kV	Active
AF2-388	Desoto-Sorenson 345 kV	Active
AF2-391	Central Hardin 69 kV	Active
AF2-407	Fall Creek 345 kV	Active
AF2-408	Fall Creek 138 kV	Active
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
Y3-024	Bluff Point 12kV	In Service
J1027	MISO	MISO
J1028	MISO	MISO
J1074	MISO	MISO
J1152	MISO	MISO
J1189	MISO	MISO
J515	MISO	MISO
J754	MISO	MISO
J805	MISO	MISO
J829	MISO	MISO
J856	MISO	MISO
J903	MISO	MISO
J993	MISO	MISO

10.8 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_P4_#6959_05HOGAN 138_A	CONTINGENCY 'AEP_P4_#6959_05HOGAN 138_A' OPEN BRANCH FROM BUS 247420 TO BUS 243311 CKT 1 / 247420 05CROSS ST Z 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 247420 TO BUS 243333 CKT 1 / 247420 05CROSS ST Z 138 243333 05MADISO 138 1 OPEN BRANCH FROM BUS 243275 TO BUS 243311 CKT 1 / 243275 05DELAWR 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246046 CKT 1 / 243311 05HOGAN 138 246046 05HOGAN 34.5 1 OPEN BRANCH FROM BUS 243311 TO BUS 246047 CKT 1 / 243311 05HOGAN 138 246047 05HOGAN L 12.0 1 END
AEP_P7-1_#11087-F	CONTINGENCY 'AEP_P7-1_#11087-F' OPEN BRANCH FROM BUS 944540 TO BUS 243225 CKT 1 / 944540 AF1-119 TAP 345 243225 05KEYSTN 345 1 OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 END
AEP_P1-2_#4817	CONTINGENCY 'AEP_P1-2_#4817' OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END
AEP_P1-2_#8702-C	CONTINGENCY 'AEP_P1-2_#8702-C' OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 END
AEP_P1-2_#673-A	CONTINGENCY 'AEP_P1-2_#673-A' OPEN BRANCH FROM BUS 243218 TO BUS 923880 CKT 1 / 243218 05DESOTO 345 923880 AB2-028 TAP 345 1 END
Base Case	

Contingency Name	Contingency Definition
AEP_P1-2_#6957	CONTINGENCY 'AEP_P1-2_#6957' OPEN BRANCH FROM BUS 247116 TO BUS 246913 CKT 1 / 247116 05ALADDIN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 247116 TO BUS 246988 CKT 1 / 247116 05ALADDIN 138 246988 05STRWTN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 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_P4_#8781_05HOGAN 138_B	CONTINGENCY 'AEP_P4_#8781_05HOGAN 138_B' OPEN BRANCH FROM BUS 247116 TO BUS 246913 CKT 1 / 247116 05ALADDIN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 247116 TO BUS 246988 CKT 1 / 247116 05ALADDIN 138 246988 05STRWTN 138 1 OPEN BRANCH FROM BUS 247420 TO BUS 243311 CKT 1 / 247420 05CROSS ST Z 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243275 TO BUS 243311 CKT 1 / 243275 05DELAWR 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246046 CKT 1 / 243311 05HOGAN 138 246046 05HOGAN 34.5 1 OPEN BRANCH FROM BUS 243311 TO BUS 246047 CKT 1 / 243311 05HOGAN 138 246047 05HOGAN L 12.0 1 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
AEP_P4_#10612_05FALL C 138_F	CONTINGENCY 'AEP_P4_#10612_05FALL C 138_F' OPEN BRANCH FROM BUS 243276 TO BUS 243292 CKT 1 / 243276 05DELCOR 138 243292 05FALL C 138 1 OPEN BRANCH FROM BUS 243292 TO BUS 243357 CKT 1 / 243292 05FALL C 138 243357 05PEND

Contingency Name	Contingency Definition
AEP_P7-1_#11019	CONTINGENCY 'AEP_P7-1_#11019' OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 243218 05DESOTO 345 243232 05SORENS 345 2 OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END

11 Light Load Analysis

Light Load Studies (As applicable)

To be determined during later study phases.

12 Short Circuit Analysis

The following Breakers are overdutied:

To be determined during later study phases.

13 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.

14 Affected Systems

None