Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-297

HANNA-TANNERS CREEK 345 KV

200 MW Capacity / 500 MW Energy

January 2021

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1 Introduction

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

2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

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

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

3 General

The Interconnection Customer (IC), has proposed a Storage generating facility located in Shelby County, Indiana. The installed facilities will have a total capability of 500 MW with 200 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is December 31, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-297
Project Name	HANNA-TANNERS CREEK 345 KV
State	Indiana
County	Shelby
Transmission Owner	AEP
MFO	500
MWE	500
MWC	200
Fuel	Storage
Basecase Study Year	2024

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

4 Point of Interconnection

AG1-297 will interconnect with the AEP transmission system via a new station cut into the Tanners Creek (AEP) - Hanna (IPL) 345 kV circuit.

To accommodate the interconnection on the Tanners Creek (AEP) - Hanna (IPL) 345 kV circuit, a new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

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 AG1-297 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$19,777,000*
Total System Network Upgrade Costs	$12,885,000
Total Costs	**$32,662,000***

*Additional Physical Interconnection Costs to be provided by IP&L (Indianapolis Power & Light).

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

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

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the table 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
345 kV Revenue Metering	$431,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$651,000
Total Attachment Facility Costs	**$1,082,000**

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
A new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 345 kV line risers, and SCADA will also be required.	$17,440,000
Total Direct Connection Facility Costs	**$17,440,000**

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
Tanners Creek - Hanna (IPL) 345 kV T-Line Cut In	$1,210,000
Review Protection and Control Settings at the Tanners Creek 345 kV substation	$45,000
Review Protection and Control Settings at the Hanna 345 kV substation	To be provided by IP&L
Total Non-Direct Connection Facility Costs	**$1,255,000***

7 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.

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

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 AG1-297 was evaluated as a 500.0 MW (Capacity 200.0 MW) injection tapping the Hanna to Tanners Creek 345 kV line in the AEP area. Project AG1-297 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-297 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)

None

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
161674711	243233	05TANNER	345.0	AEP	249567	08M.FORT	345.0	DEO&K	1	AEP_P2-2_#9456_06DEARB1 345_1	bus	2151.0	108.1	115.36	DC	156.05
161674870	243233	05TANNER	345.0	AEP	248001	06DEARB1	345.0	OVEC	Z1	DEOK_P7_4504MFTANNERS4512 EBTANNERS	tower	1204.0	143.38	154.49	DC	139.1
161674972	243233	05TANNER	345.0	AEP	249567	08M.FORT	345.0	DEO&K	1	DEOK_P7_4519BUFFCLIFTYPIERC EDEAR1OVEC	tower	2151.0	104.72	109.83	DC	111.51
161674973	243233	05TANNER	345.0	AEP	249567	08M.FORT	345.0	DEO&K	1	AEP_P7-1_#485	tower	2151.0	104.68	109.79	DC	111.51
164488613	243233	05TANNER	345.0	AEP	248001	06DEARB1	345.0	OVEC	Z1	AEP_P4_#14920_05TANNER 345_T	breaker	1204.0	143.38	154.49	DC	139.1
164488614	243233	05TANNER	345.0	AEP	248001	06DEARB1	345.0	OVEC	Z1	DEOK_P2-3_1401_MIAMIFORT	breaker	1204.0	103.79	111.99	DC	107.24
164488713	243233	05TANNER	345.0	AEP	249567	08M.FORT	345.0	DEO&K	1	AEP_P4_#9456_06DEARB1 345_DC	breaker	2151.0	108.1	115.36	DC	156.05
164488618	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	AEP_P4_#14920_05TANNER 345_T	breaker	971.0	142.2	150.76	DC	82.71
164488619	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P2-3_1403_MIAMIFORT	breaker	971.0	109.25	115.81	DC	63.23
164489588	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P7_4504MFTANNERS4512 EBTANNERS	tower	971.0	142.2	150.76	DC	82.71
161674946	923880	AB2-028 TAP	345.0	AEP	243222	05FALLC	345.0	AEP	1	AEP_P7-1_#11019-D	tower	1318.0	106.46	108.1	DC	40.82
161674947	923880	AB2-028 TAP	345.0	AEP	243222	05FALLC	345.0	AEP	1	AEP_P7-1_#11087-H	tower	1318.0	100.54	102.18	DC	40.59

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
168178195	243218	05DESOTO	345.0	AEP	958860	AF2-177 TAP	345.0	AEP	2	AEP_P1-2_#4817_6341	operation	971.0	111.05	113.02	DC	42.31
168178244	243218	05DESOTO	345.0	AEP	945370	AF1-202 TAP	345.0	AEP	1	AEP_P1-2_#8702_2543-C	operation	897.0	105.23	107.32	DC	42.29
168178172	243225	05KEYSTN	345.0	AEP	243232	05SORENS	345.0	AEP	1	AEP_P1-2_#8702_2543-C	operation	1301.0	112.32	113.74	DC	41.67
164489067	243233	05TANNER	345.0	AEP	248001	06DEARB1	345.0	OVEC	Z1	AEP_P1-2_#144_1696	operation	1204.0	103.6	111.81	DC	107.31
164489100	243233	05TANNER	345.0	AEP	249567	08M.FORT	345.0	DEO&K	1	DEOK_P1_TERMINAL-EAST BEND 4516	operation	2151.0	102.13	106.95	DC	104.6
168178055	247712	05SULLIVAN	345.0	AEP	254529	16PETE	345.0	IPL	1	AEP_P1-2_#363_1682	operation	1409.0	137.08	138.27	DC	31.59
164489059	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	AEP_P1-2_#144_1696	operation	971.0	108.71	115.28	DC	63.24
169671651	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	AEP_P1-2_#363_1682	operation	1318.0	97.82	102.77	DC	65.24
169671652	923880	AB2-028 TAP	345.0	AEP	243218	05DESOTO	345.0	AEP	1	Base Case	operation	1025.0	95.78	102.0	DC	63.73
168178043	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817_6341	operation	971.0	151.54	153.47	DC	42.31
168178045	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	Base Case	operation	971.0	109.6	111.04	DC	31.22
169671438	944540	AF1-119 TAP	345.0	AEP	960970	AF2-388 TAP	345.0	AEP	1	AEP_P1-2_#8702_2543-C	operation	897.0	133.0	135.09	DC	42.29
169671430	944830	AF1-148 TAP	345.0	AEP	944530	AF1-118 TAP	345.0	AEP	2	AEP_P1-2_#4817_6341	operation	971.0	129.73	131.67	DC	42.31
169671520	945370	AF1-202 TAP	345.0	AEP	944540	AF1-119 TAP	345.0	AEP	1	AEP_P1-2_#8702_2543-C	operation	897.0	121.0	123.09	DC	42.29
169671503	958860	AF2-177 TAP	345.0	AEP	944830	AF1-148 TAP	345.0	AEP	2	AEP_P1-2_#4817_6341	operation	971.0	120.28	122.22	DC	42.31
168178063	960970	AF2-388 TAP	345.0	AEP	243225	05KEYSTN	345.0	AEP	1	AEP_P1-2_#8702_2543-C	operation	897.0	143.61	145.72	DC	42.29

10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
161674947,161674946	4	AB2-028 TAP 345.0 kV - 05FALL C 345.0 kV Ckt 1	**AEP** Not a violation for AEP portion (471) : Not a violation for AEP portion Project Type : FAC Cost : $0 Time Estimate : 0.0 Months **IPL** NonPJMArea (425) : 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 : 0.0 Months	$0
164488614,164488613,161674870	2	05TANNER 345.0 kV - 06DEARB1 345.0 kV Ckt Z1	**AEP** AEPI0024a (173) : Replace Tanner's Creek 345 kV Riser (Sub Cond 2870 MCM ACSR) Project Type : FAC Cost : $100,000 Time Estimate : 12-18 Months	$100,000
164489588,164488619,164488618	3	06DEARB1 345.0 kV - 06PIERCE 345.0 kV Ckt 1	**OVEC** OVEC0001a (492) : Perform a sag study. OVECs cost estimate for performing the sag study is $125K. Project Type : FAC Cost : $125,000 Time Estimate : 6-12 Months OVEC0001b (493) : Replace 2 1600 A switches at Dearborn 345 kV and 4 1600 A switches at Pierce 345kV Project Type : FAC Cost : $9,000,000 Time Estimate : 12 -18 Months OVEC0001c (494) : Replace 2156 KCM ACSR risers at Dearborn 345 kV Project Type : FAC Cost : $175,000 Time Estimate : 12 -18 Months OVEC0001d (495) : Replace/issue new settings for Dearborn line relays. Project Type : FAC Cost : $100,000 Time Estimate : 12-18 Months	$9,400,000

ID	Idx	Facility	Upgrade Description	Cost
164488713,161674711,161674972,161674973	1	05TANNER 345.0 kV - 08M.FORT 345.0 kV Ckt 1	**AEP** **AEPI0060a (417) : Replace the Tanner's Creek 345 kV 3000 A Non oil circuit breaker.** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 12-18 Months** **AEPI0060b (418) : Rebuild 0.28 miles line conductor 954 ACSR 45/7 two bundle line conductor.** **Project Type : FAC** **Cost : $560,000** **Time Estimate : 18-24 Months** **AEPI0060c (419) : Replace 7 Tanner 345 kV 2-1700 AAC 61 Str risers.** **Project Type : FAC** **Cost : $700,000** **Time Estimate : 12-18 Months** **AEPI0060d (420) : Replace Tanner 345 kV 3000 A wavetrap.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-18 Months** **AEPI0060e (421) : Replace 2 Tanner 345 kV 3000 A switches.** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 18-24 Months** **AEPI0060f (422) : An engineering study will need to be conducted to determine if the Tanner CT thermal limit 399A settings can be adjusted to mitigate the overload.** **Project Type : FAC** **Cost : $25,000** **Time Estimate : 12-18 Months** **b2968 (441) : Upgrade existing 345kV terminal equipment at Tanners Creek station on Tanners Creek - Miami Fort 345kV line, RIS: 6/1/2022** **Project Type : FAC** **Cost : $0** **Not a violation for DEOK portion (489) : Not a violation for DEOK portion** **Project Type : FAC** **Cost : $0** **Time Estimate : 0.0 Months** **DEOK** **AEP Project Resolves Overload (490) : AEP Project s2019 resolves DEOK Overload**	$3,385,000
			TOTAL COST	**$12,885,000**

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
164488713	243233	05TANNER	AEP	249567	08M.FORT	DEO&K	1	AEP_P4_#9456_06DEARB1 345_DC	breaker	2151.0	108.1	115.36	DC	156.05

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	1.2146	50/50	1.2146
246991	05WLD G1 C	0.3688	50/50	0.3688
247255	05WLD G2 C	0.3576	50/50	0.3576
247264	05LAWG1A	16.9191	50/50	16.9191
247265	05LAWG1B	16.9191	50/50	16.9191
247266	05LAWG1S	27.0225	50/50	27.0225
247267	05LAWG2A	16.9191	50/50	16.9191
247268	05LAWG2B	16.9191	50/50	16.9191
247269	05LAWG2S	27.0225	50/50	27.0225
247286	05AND G2	0.9007	50/50	0.9007
247287	05AND G3	1.8838	50/50	1.8838
247543	V3-007 C	1.2146	50/50	1.2146
247929	S-071 E	12.5966	Adder	14.82
247935	V3-007 E	51.5214	50/50	51.5214
247958	05WLD G2 E	30.8154	50/50	30.8154
247963	05HDWTR1G E	51.5214	50/50	51.5214
247968	Z2-115 E	0.1453	Adder	0.17
250163	Y3-099 BAT	0.2443	Merchant Transmission	0.2443
250167	08DEO_STUART	0.2410	Merchant Transmission	0.2410
251823	Z1-065 BAT	1.0316	50/50	1.0316
251831	Z1-080 BAT	0.6450	Merchant Transmission	0.6450
913222	Y1-054 E	-2.6938	Adder	-3.17
918803	AA1-099 BAT	0.4300	Merchant Transmission	0.4300
920501	AA2-148 C O1	6.3452	50/50	6.3452
920502	AA2-148 E O1	42.4640	50/50	42.4640
923881	AB2-028 C	5.4122	50/50	5.4122
923882	AB2-028 E	36.2198	50/50	36.2198
926881	AC1-175 C	22.5036	50/50	22.5036
926882	AC1-175 E	36.7164	50/50	36.7164
932661	AC2-088 C O1	-4.0255	Adder	-4.74
932681	AC2-090 C	11.2518	50/50	11.2518
932682	AC2-090 E	18.3582	50/50	18.3582
932841	AC2-111 C O1	5.1835	50/50	5.1835
932842	AC2-111 E O1	8.4573	50/50	8.4573
933596	AC2-176 E	14.4750	Adder	17.03
934161	AD1-043 C O1	8.3731	50/50	8.3731
934162	AD1-043 E O1	13.6613	50/50	13.6613
934961	AD1-128 C	11.2341	50/50	11.2341
934962	AD1-128 E	18.3294	50/50	18.3294
935031	AD1-136 C	-0.5661	Adder	-0.67
936561	AD2-071 C	11.2560	50/50	11.2560
936562	AD2-071 E	5.5440	50/50	5.5440

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939761	AE1-207 C	10.9684	50/50	10.9684
939762	AE1-207 E	15.1468	50/50	15.1468
939771	AE1-208 C	9.8912	50/50	9.8912
939772	AE1-208 E	13.4880	50/50	13.4880
939781	AE1-209 C O1	3.0417	50/50	3.0417
939782	AE1-209 E O1	20.3563	50/50	20.3563
939791	AE1-210 C O1	3.0417	50/50	3.0417
939792	AE1-210 E O1	20.3563	50/50	20.3563
940981	AE2-089 C O1	10.3974	Adder	12.23
940982	AE2-089 E O1	6.9316	Adder	8.15
941691	AE2-169	5.9347	50/50	5.9347
941711	AE2-171	5.5086	50/50	5.5086
941721	AE2-172	6.5288	50/50	6.5288
942071	AE2-219 C	5.6406	Adder	6.64
942072	AE2-219 E	7.7894	Adder	9.16
942081	AE2-220 C	15.5452	50/50	15.5452
942082	AE2-220 E	21.4672	50/50	21.4672
942221	AE2-234 C O1	2.7165	Adder	3.2
942222	AE2-234 E O1	1.2286	Adder	1.45
942791	AE2-297 C O1	24.9996	50/50	24.9996
942792	AE2-297 E O1	16.6664	50/50	16.6664
943773	AF1-045 BAT	6.7771	Merchant Transmission	6.7771
944031	AF1-071 C	1.2959	50/50	1.2959
944032	AF1-071 E	2.1143	50/50	2.1143
944531	AF1-118 C O1	34.9704	Adder	41.14
944532	AF1-118 E O1	10.5471	Adder	12.41
944541	AF1-119 C O1	26.6364	50/50	26.6364
944542	AF1-119 E O1	11.4156	50/50	11.4156
944831	AF1-148 C O1	12.9022	Adder	15.18
944832	AF1-148 E O1	8.6015	Adder	10.12
945371	AF1-202 C O1	6.7391	50/50	6.7391
945372	AF1-202 E O1	32.9029	50/50	32.9029
945561	AF1-221 C O1	34.5156	50/50	34.5156
945562	AF1-221 E O1	10.3746	50/50	10.3746
945581	AF1-223 C O1	17.8389	50/50	17.8389
945582	AF1-223 E O1	11.8926	50/50	11.8926
946031	AF1-268 C O1	11.3012	50/50	11.3012
946032	AF1-268 E O1	5.1261	50/50	5.1261
956561	J1152	23.4120	PJM External (MISO)	23.4120
957393	AF2-033 BAT	3.8252	50/50	3.8252
957741	AF2-068 C O1	11.5186	Adder	13.55
957742	AF2-068 E O1	7.6791	Adder	9.03
958711	AF2-162 C	5.7078	50/50	5.7078
958712	AF2-162 E	2.8539	50/50	2.8539
958821	AF2-173 C	19.6543	50/50	19.6543
958822	AF2-173 E	27.1417	50/50	27.1417
958861	AF2-177 C O1	4.8922	50/50	4.8922
958862	AF2-177 E O1	32.7398	50/50	32.7398
959131	AF2-204 C	8.5588	Adder	10.07
959132	AF2-204 E	4.5172	Adder	5.31
959201	AF2-211 C	10.2306	50/50	10.2306
959202	AF2-211 E	6.8204	50/50	6.8204

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960441	AF2-335 C	12.0006	50/50	12.0006
960442	AF2-335 E	4.0002	50/50	4.0002
960791	AF2-370	4.0002	50/50	4.0002
960971	AF2-388 C	6.4145	50/50	6.4145
960972	AF2-388 E	30.0315	50/50	30.0315
961161	AF2-407	59.4360	50/50	59.4360
961171	AF2-408	16.0304	50/50	16.0304
961761	AG1-017 C	0.1987	Adder	0.44
961762	AG1-017 E	0.9300	Adder	2.06
962031	AG1-047 C	4.0699	Adder	9.03
962032	AG1-047 E	2.7133	Adder	6.02
962051	AG1-049	3.0010	50/50	3.0010
963721	AG1-224 C O1	42.9559	50/50	42.9559
963722	AG1-224 E O1	28.6373	50/50	28.6373
963731	AG1-225 C	11.1186	Adder	24.68
963732	AG1-225 E	7.4661	Adder	16.57
964351	AG1-297 C	62.4180	50/50	62.4180
964352	AG1-297 E	93.6270	50/50	93.6270
964611	AG1-324 C O1	2.2753	Adder	5.05
964612	AG1-324 E O1	0.9751	Adder	2.16
965031	AG1-367 C	14.0388	50/50	14.0388
965032	AG1-367 E	9.3592	50/50	9.3592
965101	AG1-375 C	11.2896	50/50	11.2896
965102	AG1-375 E	7.5264	50/50	7.5264
965111	AG1-376 C	2.2579	50/50	2.2579
965112	AG1-376 E	3.3869	50/50	3.3869
965461	AG1-414 C O1	3.0326	Adder	6.73
965462	AG1-414 E O1	2.0217	Adder	4.49
965651	AG1-433 C	3.2072	50/50	3.2072
965652	AG1-433 E	15.0158	50/50	15.0158
WEC	WEC	1.8131	Confirmed LTF	1.8131
CBM-W2	CBM-W2	40.8397	Confirmed LTF	40.8397
NY	NY	0.5895	Confirmed LTF	0.5895
TVA	TVA	2.5368	Confirmed LTF	2.5368
O-066	O-066	7.2953	Confirmed LTF	7.2953
SIGE	SIGE	0.7680	Confirmed LTF	0.7680
CBM-S1	CBM-S1	0.5320	Confirmed LTF	0.5320
G-007	G-007	1.1382	Confirmed LTF	1.1382
HAMLET	HAMLET	0.2333	Confirmed LTF	0.2333
MEC	MEC	8.2056	Confirmed LTF	8.2056
TRIMBLE	TRIMBLE	0.1358	Confirmed LTF	0.1358
LAGN	LAGN	4.4572	Confirmed LTF	4.4572
CATAWBA	CATAWBA	0.1054	Confirmed LTF	0.1054
CBM-W1	CBM-W1	64.7163	Confirmed LTF	64.7163

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
164488613	243233	05TANNER	AEP	248001	06DEARB1	OVEC	Z1	AEP_P4_#14920_05TANNER 345_T	breaker	1204.0	143.38	154.49	DC	139.1

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243415	05WWVSTA	2.5309	50/50	2.5309
243795	05HDWTR1G C	1.0971	50/50	1.0971
247264	05LAWG1A	15.3783	50/50	15.3783
247265	05LAWG1B	15.3783	50/50	15.3783
247266	05LAWG1S	24.5616	50/50	24.5616
247267	05LAWG2A	15.3783	50/50	15.3783
247268	05LAWG2B	15.3783	50/50	15.3783
247269	05LAWG2S	24.5616	50/50	24.5616
247289	05RICHG2	0.8780	50/50	0.8780
247543	V3-007 C	1.0971	50/50	1.0971
247929	S-071 E	12.2686	Adder	14.43
247935	V3-007 E	46.5363	50/50	46.5363
247958	05WLD G2 E	23.1449	Adder	27.23
247963	05HDWTR1G E	46.5363	50/50	46.5363
247968	Z2-115 E	0.1239	Adder	0.15
920501	AA2-148 C O1	5.7544	50/50	5.7544
920502	AA2-148 E O1	38.5101	50/50	38.5101
923881	AB2-028 C	4.8142	50/50	4.8142
923882	AB2-028 E	32.2178	50/50	32.2178
926881	AC1-175 C	20.3262	50/50	20.3262
926882	AC1-175 E	33.1638	50/50	33.1638
932681	AC2-090 C	10.1631	50/50	10.1631
932682	AC2-090 E	16.5819	50/50	16.5819
932841	AC2-111 C O1	5.5489	50/50	5.5489
932842	AC2-111 E O1	9.0535	50/50	9.0535
933596	AC2-176 E	13.8780	Adder	16.33
934161	AD1-043 C O1	7.4209	50/50	7.4209
934162	AD1-043 E O1	12.1079	50/50	12.1079
934961	AD1-128 C	10.6487	50/50	10.6487
934962	AD1-128 E	17.3743	50/50	17.3743
936561	AD2-071 C	8.3990	Adder	9.88
936562	AD2-071 E	4.1368	Adder	4.87
939761	AE1-207 C	8.1939	Adder	9.64
939762	AE1-207 E	11.3153	Adder	13.31
939771	AE1-208 C	8.9105	50/50	8.9105
939772	AE1-208 E	12.1507	50/50	12.1507
939781	AE1-209 C O1	2.7387	50/50	2.7387
939782	AE1-209 E O1	18.3283	50/50	18.3283
939791	AE1-210 C O1	2.7387	50/50	2.7387
939792	AE1-210 E O1	18.3283	50/50	18.3283
940981	AE2-089 C O1	9.8560	Adder	11.6
940982	AE2-089 E O1	6.5706	Adder	7.73

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
941691	AE2-169	5.3463	50/50	5.3463
941711	AE2-171	4.8822	50/50	4.8822
941721	AE2-172	4.8773	Adder	5.74
942071	AE2-219 C	5.5578	Adder	6.54
942072	AE2-219 E	7.6750	Adder	9.03
942081	AE2-220 C	14.0411	50/50	14.0411
942082	AE2-220 E	19.3901	50/50	19.3901
942221	AE2-234 C O1	2.4758	Adder	2.91
942222	AE2-234 E O1	1.1198	Adder	1.32
942791	AE2-297 C O1	22.6554	50/50	22.6554
942792	AE2-297 E O1	15.1036	50/50	15.1036
944031	AF1-071 C	1.3872	50/50	1.3872
944032	AF1-071 E	2.2634	50/50	2.2634
944531	AF1-118 C O1	31.0803	Adder	36.57
944532	AF1-118 E O1	9.3738	Adder	11.03
944541	AF1-119 C O1	23.8476	50/50	23.8476
944542	AF1-119 E O1	10.2204	50/50	10.2204
944831	AF1-148 C O1	11.4832	Adder	13.51
944832	AF1-148 E O1	7.6554	Adder	9.01
945371	AF1-202 C O1	6.0411	50/50	6.0411
945372	AF1-202 E O1	29.4949	50/50	29.4949
945561	AF1-221 C O1	34.4242	50/50	34.4242
945562	AF1-221 E O1	10.3472	50/50	10.3472
945581	AF1-223 C O1	15.9912	50/50	15.9912
945582	AF1-223 E O1	10.6608	50/50	10.6608
946031	AF1-268 C O1	10.3711	50/50	10.3711
946032	AF1-268 E O1	4.7042	50/50	4.7042
953351	J805	18.8732	PJM External (MISO)	18.8732
954351	J903	9.6360	PJM External (MISO)	9.6360
955151	J993	19.1640	PJM External (MISO)	19.1640
956561	J1152	21.9860	PJM External (MISO)	21.9860
957741	AF2-068 C O1	11.0435	Adder	12.99
957742	AF2-068 E O1	7.3624	Adder	8.66
958711	AF2-162 C	5.1102	50/50	5.1102
958712	AF2-162 E	2.5551	50/50	2.5551
958821	AF2-173 C	17.6963	50/50	17.6963
958822	AF2-173 E	24.4377	50/50	24.4377
958861	AF2-177 C O1	4.3784	50/50	4.3784
958862	AF2-177 E O1	29.3016	50/50	29.3016
959131	AF2-204 C	7.6433	Adder	8.99
959132	AF2-204 E	4.0339	Adder	4.75
959201	AF2-211 C	10.9518	50/50	10.9518
959202	AF2-211 E	7.3012	50/50	7.3012
960441	AF2-335 C	10.8672	50/50	10.8672
960442	AF2-335 E	3.6224	50/50	3.6224
960791	AF2-370	3.6224	50/50	3.6224
960971	AF2-388 C	5.7355	50/50	5.7355
960972	AF2-388 E	26.8525	50/50	26.8525
961161	AF2-407	52.5750	50/50	52.5750
961171	AF2-408	14.3080	50/50	14.3080
961761	AG1-017 C	0.1906	Adder	0.42
961762	AG1-017 E	0.8916	Adder	1.98

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
962031	AG1-047 C	3.9021	Adder	8.66
962032	AG1-047 E	2.6014	Adder	5.77
962051	AG1-049	3.2125	50/50	3.2125
963721	AG1-224 C O1	39.1759	50/50	39.1759
963722	AG1-224 E O1	26.1173	50/50	26.1173
963731	AG1-225 C	10.4416	Adder	23.18
963732	AG1-225 E	7.0115	Adder	15.56
963791	AG1-232 C	3.4086	Adder	7.57
963792	AG1-232 E	2.2724	Adder	5.04
964351	AG1-297 C	55.6400	50/50	55.6400
964352	AG1-297 E	83.4600	50/50	83.4600
964611	AG1-324 C O1	2.1577	Adder	4.79
964612	AG1-324 E O1	0.9247	Adder	2.05
965031	AG1-367 C	12.6402	50/50	12.6402
965032	AG1-367 E	8.4268	50/50	8.4268
965101	AG1-375 C	10.1040	50/50	10.1040
965102	AG1-375 E	6.7360	50/50	6.7360
965111	AG1-376 C	2.0208	50/50	2.0208
965112	AG1-376 E	3.0312	50/50	3.0312
965461	AG1-414 C O1	2.6277	Adder	5.83
965462	AG1-414 E O1	1.7518	Adder	3.89
965651	AG1-433 C	2.8677	50/50	2.8677
965652	AG1-433 E	13.4263	50/50	13.4263
WEC	WEC	1.2880	Confirmed LTF	1.2880
CALDERWOOD	CALDERWOOD	0.1779	Confirmed LTF	0.1779
CBM-W2	CBM-W2	26.8710	Confirmed LTF	26.8710
NY	NY	0.5790	Confirmed LTF	0.5790
TVA	TVA	0.9828	Confirmed LTF	0.9828
O-066	O-066	7.3222	Confirmed LTF	7.3222
SIGE	SIGE	0.5410	Confirmed LTF	0.5410
CHEOAH	CHEOAH	0.1862	Confirmed LTF	0.1862
CBM-S1	CBM-S1	0.0262	Confirmed LTF	0.0262
G-007	G-007	1.1445	Confirmed LTF	1.1445
HAMLET	HAMLET	0.5290	Confirmed LTF	0.5290
MEC	MEC	5.5869	Confirmed LTF	5.5869
BLUEG	BLUEG	6.4232	Confirmed LTF	6.4232
TRIMBLE	TRIMBLE	2.4364	Confirmed LTF	2.4364
LAGN	LAGN	2.3030	Confirmed LTF	2.3030
CATAWBA	CATAWBA	0.3031	Confirmed LTF	0.3031
CBM-W1	CBM-W1	45.6211	Confirmed LTF	45.6211

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
164489588	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	DEOK_P7_4504MFTANNERS4512EBTANNERS	tower	971.0	142.2	150.76	DC	82.71

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.6377	50/50	0.6377
247264	05LAWG1A	8.6056	50/50	8.6056
247265	05LAWG1B	8.6056	50/50	8.6056
247266	05LAWG1S	13.7446	50/50	13.7446
247267	05LAWG2A	8.6056	50/50	8.6056
247268	05LAWG2B	8.6056	50/50	8.6056
247269	05LAWG2S	13.7446	50/50	13.7446
247543	V3-007 C	0.6377	50/50	0.6377
247929	S-071 E	6.9980	Adder	8.23
247935	V3-007 E	27.0500	50/50	27.0500
247958	05WLD G2 E	14.4291	Adder	16.98
247963	05HDWTR1G E	27.0500	50/50	27.0500
247968	Z2-115 E	0.0822	Adder	0.1
250163	Y3-099 BAT	0.1705	Merchant Transmission	0.1705
250167	08DEO_STUART	0.1664	Merchant Transmission	0.1664
251823	Z1-065 BAT	0.3601	Merchant Transmission	0.3601
913222	Y1-054 E	-1.2048	Adder	-1.42
920501	AA2-148 C O1	3.3681	50/50	3.3681
920502	AA2-148 E O1	22.5406	50/50	22.5406
923881	AB2-028 C	2.9424	50/50	2.9424
923882	AB2-028 E	19.6916	50/50	19.6916
926881	AC1-175 C	11.8150	50/50	11.8150
926882	AC1-175 E	19.2770	50/50	19.2770
932661	AC2-088 C O1	-2.4366	Adder	-2.87
932681	AC2-090 C	5.9075	50/50	5.9075
932682	AC2-090 E	9.6385	50/50	9.6385
932841	AC2-111 C O1	2.4465	Adder	2.88
932842	AC2-111 E O1	3.9917	Adder	4.7
933596	AC2-176 E	8.0465	Adder	9.47
934161	AD1-043 C O1	4.6001	50/50	4.6001
934162	AD1-043 E O1	7.5055	50/50	7.5055
934961	AD1-128 C	6.1098	50/50	6.1098
934962	AD1-128 E	9.9687	50/50	9.9687
935031	AD1-136 C	-0.3426	Adder	-0.4
936561	AD2-071 C	5.2964	Adder	6.23
936562	AD2-071 E	2.6087	Adder	3.07
939761	AE1-207 C	5.1591	Adder	6.07
939762	AE1-207 E	7.1244	Adder	8.38
939771	AE1-208 C	4.5824	Adder	5.39
939772	AE1-208 E	6.2488	Adder	7.35
939781	AE1-209 C O1	1.6223	50/50	1.6223

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939782	AE1-209 E O1	10.8567	50/50	10.8567
939791	AE1-210 C O1	1.6223	50/50	1.6223
939792	AE1-210 E O1	10.8567	50/50	10.8567
940981	AE2-089 C O1	5.8205	Adder	6.85
940982	AE2-089 E O1	3.8803	Adder	4.57
941691	AE2-169	2.7495	Adder	3.23
941711	AE2-171	3.0264	50/50	3.0264
941721	AE2-172	3.0709	Adder	3.61
942071	AE2-219 C	3.1320	Adder	3.68
942072	AE2-219 E	4.3251	Adder	5.09
942081	AE2-220 C	8.1616	50/50	8.1616
942082	AE2-220 E	11.2709	50/50	11.2709
942221	AE2-234 C O1	1.5136	Adder	1.78
942222	AE2-234 E O1	0.6846	Adder	0.81
942791	AE2-297 C O1	13.2913	50/50	13.2913
942792	AE2-297 E O1	8.8609	50/50	8.8609
943773	AF1-045 BAT	3.5877	Merchant Transmission	3.5877
944031	AF1-071 C	0.6116	Adder	0.72
944032	AF1-071 E	0.9979	Adder	1.17
944531	AF1-118 C O1	19.0669	Adder	22.43
944532	AF1-118 E O1	5.7506	Adder	6.77
944541	AF1-119 C O1	14.3430	50/50	14.3430
944542	AF1-119 E O1	6.1470	50/50	6.1470
944831	AF1-148 C O1	7.0175	Adder	8.26
944832	AF1-148 E O1	4.6784	Adder	5.5
945371	AF1-202 C O1	3.6217	50/50	3.6217
945372	AF1-202 E O1	17.6823	50/50	17.6823
945561	AF1-221 C O1	18.4653	50/50	18.4653
945562	AF1-221 E O1	5.5503	50/50	5.5503
945581	AF1-223 C O1	9.5868	50/50	9.5868
945582	AF1-223 E O1	6.3912	50/50	6.3912
946031	AF1-268 C O1	6.1205	50/50	6.1205
946032	AF1-268 E O1	2.7762	50/50	2.7762
956561	J1152	12.4260	PJM External (MISO)	12.4260
957741	AF2-068 C O1	6.4031	Adder	7.53
957742	AF2-068 E O1	4.2687	Adder	5.02
958711	AF2-162 C	3.0735	50/50	3.0735
958712	AF2-162 E	1.5368	50/50	1.5368
958821	AF2-173 C	10.4824	50/50	10.4824
958822	AF2-173 E	14.4756	50/50	14.4756
958861	AF2-177 C O1	2.6359	50/50	2.6359
958862	AF2-177 E O1	17.6401	50/50	17.6401
959131	AF2-204 C	4.7350	Adder	5.57
959132	AF2-204 E	2.4991	Adder	2.94
959201	AF2-211 C	4.8287	Adder	5.68
959202	AF2-211 E	3.2191	Adder	3.79
960441	AF2-335 C	6.4992	50/50	6.4992
960442	AF2-335 E	2.1664	50/50	2.1664
960791	AF2-370	2.1664	50/50	2.1664
960971	AF2-388 C	2.9426	Adder	3.46
960972	AF2-388 E	13.7769	Adder	16.21
961161	AF2-407	32.5980	50/50	32.5980

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
961171	AF2-408	8.7872	50/50	8.7872
961761	AG1-017 C	0.1105	Adder	0.25
961762	AG1-017 E	0.5170	Adder	1.15
962031	AG1-047 C	2.2624	Adder	5.02
962032	AG1-047 E	1.5083	Adder	3.35
962051	AG1-049	0.7507	Adder	1.67
963721	AG1-224 C O1	22.4885	50/50	22.4885
963722	AG1-224 E O1	14.9923	50/50	14.9923
963731	AG1-225 C	6.2592	Adder	13.89
963732	AG1-225 E	4.2030	Adder	9.33
963791	AG1-232 C	2.0953	Adder	4.65
963792	AG1-232 E	1.3969	Adder	3.1
964351	AG1-297 C	33.0840	50/50	33.0840
964352	AG1-297 E	49.6260	50/50	49.6260
964611	AG1-324 C O1	1.2566	Adder	2.79
964612	AG1-324 E O1	0.5385	Adder	1.2
965031	AG1-367 C	7.4874	50/50	7.4874
965032	AG1-367 E	4.9916	50/50	4.9916
965101	AG1-375 C	6.0828	50/50	6.0828
965102	AG1-375 E	4.0552	50/50	4.0552
965111	AG1-376 C	1.2166	50/50	1.2166
965112	AG1-376 E	1.8248	50/50	1.8248
965461	AG1-414 C O1	1.6958	Adder	3.76
965462	AG1-414 E O1	1.1305	Adder	2.51
965651	AG1-433 C	0.7798	Adder	1.73
965652	AG1-433 E	3.6509	Adder	8.1
WEC	WEC	1.1564	Confirmed LTF	1.1564
LGEE	LGEE	1.0662	Confirmed LTF	1.0662
CBM-W2	CBM-W2	27.2205	Confirmed LTF	27.2205
NY	NY	0.4866	Confirmed LTF	0.4866
TVA	TVA	1.9796	Confirmed LTF	1.9796
O-066	O-066	6.0099	Confirmed LTF	6.0099
SIGE	SIGE	0.5611	Confirmed LTF	0.5611
CBM-S1	CBM-S1	0.5571	Confirmed LTF	0.5571
G-007	G-007	0.9376	Confirmed LTF	0.9376
HAMLET	HAMLET	0.1756	Confirmed LTF	0.1756
MEC	MEC	5.3454	Confirmed LTF	5.3454
LAGN	LAGN	3.1867	Confirmed LTF	3.1867
CATAWBA	CATAWBA	0.0735	Confirmed LTF	0.0735
CBM-W1	CBM-W1	41.7936	Confirmed LTF	41.7936

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
161674946	923880	AB2-028 TAP	AEP	243222	05FALL C	AEP	1	AEP_P7-1_#11019-D	tower	1318.0	106.46	108.1	DC	40.82

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	1.3143	50/50	1.3143
247292	05KEY G1	3.3844	50/50	3.3844
247293	05KEY G2	3.4019	50/50	3.4019
247294	05KEY G3	3.4956	50/50	3.4956
247295	05KEY G4	3.5073	50/50	3.5073
247536	05BLUFF P WF	0.5695	50/50	0.5695
247543	V3-007 C	1.3143	50/50	1.3143
247621	Y3-024	0.0507	50/50	0.0507
247929	S-071 E	14.4384	50/50	14.4384
247935	V3-007 E	55.7513	50/50	55.7513
247963	05HDWTR1G E	55.7513	50/50	55.7513
923881	AB2-028 C	15.6702	50/50	15.6702
923882	AB2-028 E	104.8698	50/50	104.8698
926881	AC1-175 C	24.3512	50/50	24.3512
926882	AC1-175 E	39.7308	50/50	39.7308
932681	AC2-090 C	12.1756	50/50	12.1756
932682	AC2-090 E	19.8654	50/50	19.8654
932841	AC2-111 C O1	2.4845	Adder	2.92
932842	AC2-111 E O1	4.0537	Adder	4.77
933594	AC2-176 C	0.4291	50/50	0.4291
933596	AC2-176 E	18.2023	50/50	18.2023
934961	AD1-128 C	12.0869	50/50	12.0869
934962	AD1-128 E	19.7207	50/50	19.7207
939761	AE1-207 C	8.5841	50/50	8.5841
939762	AE1-207 E	11.8543	50/50	11.8543
939771	AE1-208 C	6.8024	50/50	6.8024
939772	AE1-208 E	9.2760	50/50	9.2760
939781	AE1-209 C O1	4.8248	50/50	4.8248
939782	AE1-209 E O1	32.2892	50/50	32.2892
939791	AE1-210 C O1	4.8248	50/50	4.8248
939792	AE1-210 E O1	32.2892	50/50	32.2892
940981	AE2-089 C O1	11.2521	50/50	11.2521
940982	AE2-089 E O1	7.5014	50/50	7.5014
941691	AE2-169	4.0814	50/50	4.0814
941721	AE2-172	5.1096	50/50	5.1096
942071	AE2-219 C	6.1156	50/50	6.1156
942072	AE2-219 E	8.4454	50/50	8.4454
942081	AE2-220 C	16.8215	50/50	16.8215
942082	AE2-220 E	23.2297	50/50	23.2297
942221	AE2-234 C O1	1.8295	Adder	2.15
942222	AE2-234 E O1	0.8275	Adder	0.97

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944031	AF1-071 C	0.6211	Adder	0.73
944032	AF1-071 E	1.0134	Adder	1.19
944531	AF1-118 C O1	99.7969	50/50	99.7969
944532	AF1-118 E O1	30.0986	50/50	30.0986
944541	AF1-119 C O1	51.9582	50/50	51.9582
944542	AF1-119 E O1	22.2678	50/50	22.2678
944831	AF1-148 C O1	35.4058	50/50	35.4058
944832	AF1-148 E O1	23.6039	50/50	23.6039
945371	AF1-202 C O1	12.6184	50/50	12.6184
945372	AF1-202 E O1	61.6076	50/50	61.6076
945561	AF1-221 C O1	9.9512	Adder	11.71
945562	AF1-221 E O1	2.9911	Adder	3.52
945581	AF1-223 C O1	33.4017	50/50	33.4017
945582	AF1-223 E O1	22.2678	50/50	22.2678
946031	AF1-268 C O1	13.7794	50/50	13.7794
946032	AF1-268 E O1	6.2502	50/50	6.2502
957741	AF2-068 C O1	14.4846	50/50	14.4846
957742	AF2-068 E O1	9.6564	50/50	9.6564
958711	AF2-162 C	11.1339	50/50	11.1339
958712	AF2-162 E	5.5670	50/50	5.5670
958821	AF2-173 C	31.1758	50/50	31.1758
958822	AF2-173 E	43.0522	50/50	43.0522
958861	AF2-177 C O1	9.6494	50/50	9.6494
958862	AF2-177 E O1	64.5766	50/50	64.5766
959201	AF2-211 C	4.9037	Adder	5.77
959202	AF2-211 E	3.2691	Adder	3.85
960441	AF2-335 C	10.8810	50/50	10.8810
960442	AF2-335 E	3.6270	50/50	3.6270
960791	AF2-370	3.6270	50/50	3.6270
960971	AF2-388 C	13.0638	50/50	13.0638
960972	AF2-388 E	61.1622	50/50	61.1622
961162	AF2-407 BAT	92.1750	50/50	92.1750
961172	AF2-408 BAT	13.2912	50/50	13.2912
961761	AG1-017 C	0.4716	50/50	0.4716
961762	AG1-017 E	2.2065	50/50	2.2065
962031	AG1-047 C	9.6564	50/50	9.6564
962032	AG1-047 E	6.4376	50/50	6.4376
962051	AG1-049	0.7624	Adder	1.69
963731	AG1-225 C	8.8749	Adder	19.7
963732	AG1-225 E	5.9595	Adder	13.23
964353	AG1-297 BAT	21.6346	Merchant Transmission	21.6346
964611	AG1-324 C O1	5.5925	50/50	5.5925
964612	AG1-324 E O1	2.3968	50/50	2.3968
965031	AG1-367 C	22.2684	50/50	22.2684
965032	AG1-367 E	14.8456	50/50	14.8456
965101	AG1-375 C	22.2678	50/50	22.2678
965102	AG1-375 E	14.8452	50/50	14.8452
965111	AG1-376 C	4.4536	50/50	4.4536
965112	AG1-376 E	6.6803	50/50	6.6803
965461	AG1-414 C O1	1.8038	Adder	4.0
965462	AG1-414 E O1	1.2026	Adder	2.67
965651	AG1-433 C	6.5319	50/50	6.5319

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965652	AG1-433 E	30.5811	50/50	30.5811
G-007A	G-007A	0.4771	Confirmed LTF	0.4771
VFT	VFT	1.2900	Confirmed LTF	1.2900
CALDERWOOD	CALDERWOOD	0.6222	Confirmed LTF	0.6222
PRAIRIE	PRAIRIE	8.6195	Confirmed LTF	8.6195
CHEOAH	CHEOAH	0.6166	Confirmed LTF	0.6166
CBM-N	CBM-N	0.2412	Confirmed LTF	0.2412
COTTONWOOD	COTTONWOOD	4.5381	Confirmed LTF	4.5381
HAMLET	HAMLET	0.3101	Confirmed LTF	0.3101
GIBSON	GIBSON	3.8804	Confirmed LTF	3.8804
BLUEG	BLUEG	3.2394	Confirmed LTF	3.2394
TRIMBLE	TRIMBLE	0.8826	Confirmed LTF	0.8826
CATAWBA	CATAWBA	0.2222	Confirmed LTF	0.2222

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
AA1-099	Clinton Co. 34.5kV	In Service
AA2-148	Madison-Tanners Creek 138kV	Active
AB2-028	Fall Creek-Desoto 345kV	Active
AC1-175	Losantville 345kV	Active
AC2-088	S. Bethel-Brown 69kV	Engineering and Procurement
AC2-090	Losantville 345kV	Active
AC2-111	College Corner 138kV	Active
AC2-176	Jay 138 kV	In Service
AD1-043	Makahoy 138 kV	Active
AD1-128	Modoc-Delaware 138 kV	Active
AD1-136	South Bethel-Brown 69 kV	Engineering and Procurement
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
AE2-169	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
AE2-297	Madison-Tanners Creek 138 kV	Active
AF1-045	Cedarville-Ford 138 kV	Active
AF1-071	College Corner 138 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
AF1-221	College Corner-Drewersburg 138 kV	Active
AF1-223	Jay-Desoto 138 kV	Active
AF1-268	Desoto-Jay 138 kV	Active
AF2-033	Miami Fort GT 138 kV	Active
AF2-068	Jay 138 kV	Active
AF2-162	Keystone-Desoto 345 kV	Active
AF2-173	Desoto 345 kV	Active
AF2-177	Sorenson-DeSoto #2 345 kV	Active
AF2-204	Van Buren 138 kV	Active

Queue Number	Project Name	Status
AF2-211	College Corner 138 kV	Active
AF2-335	West Del-Royerton 138 kV	Active
AF2-370	West Del-Royerton 138 kV	Active
AF2-388	Desoto-Sorenson 345 kV	Active
AF2-407	Fall Creek 345 kV	Active
AF2-408	Fall Creek 138 kV	Active
AG1-017	Jay 138 kV	Active
AG1-047	Jay 138 kV	Active
AG1-049	College Corner 138 kV	Active
AG1-224	Pendleton-Tanners Creek 138 kV	Active
AG1-225	Adams 138 kV	Active
AG1-232	Magley 138 kV	Active
AG1-297	Hanna-Tanners Creek 345 kV	Active
AG1-324	Jay-Desoto 138 kV	Active
AG1-367	DeSoto 345 kV	Active
AG1-375	Sorenson-Desoto 345 kV	Active
AG1-376	Sorenson-DeSoto 345 kV	Active
AG1-414	Mississinewa 138 kV	Active
AG1-433	DeSoto-Keystone 345 kV	Active
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
Y1-054	Rochelle 138kV	In Service
Y3-024	Bluff Point 12kV	In Service
Y3-099	Beckjord 2 MW-1	In Service
Z1-065	Wiley 34.5kV	In Service
Z1-080	Clinton County 34.5kV	In Service
Z2-115	Deer Creek 12.47kV	In Service
J1152	MISO	MISO
J805	MISO	MISO
J903	MISO	MISO
J993	MISO	MISO

10.8 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
DEOK_P1_TERMINAL-EAST BEND 4516	CONTINGENCY 'DEOK_P1_TERMINAL-EAST BEND 4516' OPEN BRANCH FROM BUS 249575 TO BUS 249565 CKT 1 END
AEP_P7-1_#485	CONTINGENCY 'AEP_P7-1_#485' OPEN BRANCH FROM BUS 248001 TO BUS 248013 CKT 1 / 248001 06DEARB1 345 248013 06PIERCE 345 1 OPEN BRANCH FROM BUS 248002 TO BUS 249564 CKT 1 / 248002 06DEARB2 345 249564 08BUFTN1 345 1 END
DEOK_P7_4519BUFFCLIFTYPIERCEDEAR1OVEC	CONTINGENCY 'DEOK_P7_4519BUFFCLIFTYPIERCEDEAR1OVEC' OPEN BRANCH FROM BUS 248002 TO BUS 248000 CKT 2 OPEN BRANCH FROM BUS 248002 TO BUS 249564 CKT 1 OPEN BRANCH FROM BUS 248001 TO BUS 248013 CKT 1 END
AEP_P7-1_#11087-H	CONTINGENCY 'AEP_P7-1_#11087-H' OPEN BRANCH FROM BUS 960970 TO BUS 243225 CKT 1 / 960970 AF2-388 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_#363_1682	CONTINGENCY 'AEP_P1-2_#363_1682' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
AEP_P4_#14920_05TANNER 345_T	CONTINGENCY 'AEP_P4_#14920_05TANNER 345_T' OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 / 243233 05TANNER 345 249565 08EBEND
AEP_P1-2_#4817_6341	CONTINGENCY 'AEP_P1-2_#4817_6341' OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END

Contingency Name	Contingency Definition
DEOK_P7_4504MFTANNERS4512EBTANNERS	CONTINGENCY 'DEOK_P7_4504MFTANNERS4512EBTANNERS' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 END
DEOK_P2-3_1401_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_1401_MIAMIFORT' OPEN BRANCH FROM BUS 249567 TO BUS 250057 CKT 9 OPEN BRANCH FROM BUS 249567 TO BUS 243233 CKT 1 END
DEOK_P2-3_1403_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_1403_MIAMIFORT' OPEN BRANCH FROM BUS 249567 TO BUS 243233 CKT 1 OPEN BRANCH FROM BUS 249567 TO BUS 251950 CKT 7 END
AEP_P1-2_#8702_2543-C	CONTINGENCY 'AEP_P1-2_#8702_2543-C' OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 END
AEP_P4_#9456_06DEARB1 345_DC	CONTINGENCY 'AEP_P4_#9456_06DEARB1 345_DC' OPEN BRANCH FROM BUS 243233 TO BUS 248001 CKT Z1 / 243233 05TANNER 345 248001 06DEARB1 345 Z1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 / 243233 05TANNER 345 249565 08EBEND
AEP_P1-2_#144_1696	CONTINGENCY 'AEP_P1-2_#144_1696' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 END
AEP_P7-1_#11019-D	CONTINGENCY 'AEP_P7-1_#11019-D' OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END
AEP_P2-2_#9456_06DEARB1 345_1	CONTINGENCY 'AEP_P2-2_#9456_06DEARB1 345_1' OPEN BRANCH FROM BUS 243233 TO BUS 248001 CKT Z1 / 243233 05TANNER 345 248001 06DEARB1 345 Z1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 / 243233 05TANNER 345 249565 08EBEND

11 Short Circuit Analysis

The following Breakers are overdutied:

None.

12 Affected Systems

12.1 TVA

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

12.2 Duke Energy Progress

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

12.3 MISO

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

12.4 LG&E

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