



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-068
JAY 138 KV
90 MW Capacity / 150 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.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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

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

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Blackford County, Indiana. The installed facilities will have a total capability of 150 MW with 90 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 03, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-068
Project Name	JAY 138 KV
State	Indiana
County	Blackford
Transmission Owner	AEP
MFO	150
MWE	150
MWC	90
Fuel	Solar
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

AF2-068 will interconnect with the AEP transmission system along one of the following Points of Interconnection:

Primary POI: AF2-068 will interconnect with the AEP transmission system via a direction connection to the Jay 138 kV substation.

To accommodate the interconnection to the Jay 138 kV substation, two (2) new 138 kV circuit breakers will be installed (Figure 1). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 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.

Secondary POI: Tap - Jay to Pennville 138 kV line

AF2-068 will interconnect with the AEP transmission system via a new station cut into the Jay – Pennville section of the Jay - Adams 138 kV circuit.

To accommodate the interconnection on the Jay - Pennville section of the Jay - Adams 138 kV circuit, a new three (3) circuit breaker 138 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed (see Figure 3). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

5 Cost Summary

The AF2-068 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$2,593,000
Total System Network Upgrade Costs	\$35,794,345
Total Costs	\$38,387,345

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 onsite 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
345 kV 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
Two (2) new 138 kV circuit breakers will be installed (Figure 1). Installation of associated protection and control equipment, 138 kV line risers, and SCADA will also be required.	\$1,760,000
Total Direct Connection Facility Costs	\$1,760,000

6.3 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Review line protection and control settings at the Jay station	\$45,000
Total Non-Direct Connection Facility Costs	\$45,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

8 Schedule

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

9 Interconnection Customer Requirements

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

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

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

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

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

10.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter²)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)
- Wind direction (decimal degrees from true north) – (Accepted, not required)

10.3 Interconnected Transmission Owner Requirements

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

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

11 Summer Peak - Load Flow Analysis - Primary POI

The Queue Project AF2-068 was evaluated as a 150.0 MW (Capacity 90.0 MW) injection at the Jay 138 kV substation in the AEP area. Project AF2-068 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-068 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
98655648	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P2-3_C2 1401_MIAMIFORT	breaker	972.0	99.93	100.43	DC	10.54

11.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
95222127	243262	05COLLCO	138.0	AEP	250001	08COLINV	138.0	DEO&K	1	AEP_P2-2_#2812_05TANNER 345_2	bus	167.0	135.23	137.32	DC	7.75
98655647	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P2-3_C2 1403_MIAMIFORT	breaker	972.0	100.49	100.99	DC	10.53
98656230	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	130.15	130.78	DC	13.45

11.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
95222596	243218	05DESOTO	345.0	AEP	945370	AF1-202 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	102.83	105.01	DC	19.71
95222604	243218	05DESOTO	345.0	AEP	958860	AF2-177 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	109.88	111.91	DC	19.79

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
95222608	243225	05KEYSTN	345.0	AEP	243232	05SORENS	345.0	AEP	1	AEP_P1-2_#8702-C	operation	1301.0	103.46	104.96	DC	19.52
95222609	243225	05KEYSTN	345.0	AEP	243232	05SORENS	345.0	AEP	1	Base Case	operation	897.0	105.49	106.21	DC	14.28
98655916	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	AEP_P1-2_#144	operation	972.0	99.89	100.4	DC	10.54
95645836	940980	AE2-089 TAP	138.0	AEP	243237	05ADAM	138.0	AEP	1	AEP_P1-2_#5598-A	operation	205.0	100.98	125.42	DC	50.1
95645841	940980	AE2-089 TAP	138.0	AEP	243237	05ADAM	138.0	AEP	1	Base Case	operation	187.0	92.9	104.57	DC	21.82
95222482	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	141.03	143.06	DC	19.79
95222487	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	Base Case	operation	971.0	102.37	103.05	DC	14.61
95222518	944540	AF1-119 TAP	345.0	AEP	243225	05KEYSTN	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	128.28	130.46	DC	19.71
95222524	944830	AF1-148 TAP	345.0	AEP	944530	AF1-118 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	119.3	121.34	DC	19.79
95222542	945370	AF1-202 TAP	345.0	AEP	944540	AF1-119 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	118.53	120.71	DC	19.71
95222572	958860	AF2-177 TAP	345.0	AEP	960970	AF2-388 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	109.87	111.9	DC	19.79
95222536	960970	AF2-388 TAP	345.0	AEP	944830	AF1-148 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	109.87	111.91	DC	19.79

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
95222127	2	05COLLCO 138.0 kV - 08COLINV 138.0 kV Ckt 1	<u>AEP</u> AEPI0005a (271) : A Sag Study will be required on the 0.15 mile section of line to mitigate the overload . New Rating after the Sag Study : S/N: 167 MVA S/E: 245 MVA. Depending on the sag study results, cost for this upgrade is expected to be between \$600 (no remediations required just sag study) and \$0.3 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 : \$600 Time Estimate : 6-12 Months <u>DEOK</u> r3281 (1009) : Rebuild the line Project Type : FAC Cost : \$26,493,745 Time Estimate : 35.0 Months	\$26,494,345
98656230,98655647,98655648	1	06DEARB1 345.0 kV - 06PIERCE 345.0 kV Ckt 1	<u>OVEC</u> OVEC0001a (1669) : 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 (1670) : Replace 2156 KCM ACSR risers at Dearborn 345 kV Project Type : FAC Cost : \$175,000 Time Estimate : 12 -18 months Months OVEC0001c (1671) : 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 Months	\$9,300,000
			TOTAL COST	\$35,794,345

11.6 Flow Gate Details - Primary POI

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

11.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	ACDC	MW IMPACT
98656230	248001	06DEARB1	OVEC	248013	06PIERC E	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	130.15	130.78	DC	13.45

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.6960	50/50	0.6960
247264	05LAWG1A	8.5772	50/50	8.5772
247265	05LAWG1B	8.5772	50/50	8.5772
247266	05LAWG1S	13.6964	50/50	13.6964
247267	05LAWG2A	8.5772	50/50	8.5772
247268	05LAWG2B	8.5772	50/50	8.5772
247269	05LAWG2S	13.6964	50/50	13.6964
247543	V3-007 C	0.6960	50/50	0.6960
247929	S-071 E	7.3481	Adder	8.64
247935	V3-007 E	27.0013	50/50	27.0013
247958	05WLD G2 E	13.9869	Adder	16.46
247963	05HDWTR1G E	27.0013	50/50	27.0013
247968	Z2-115 E	0.0795	Adder	0.09
250163	Y3-099 BAT	0.1995	Merchant Transmission	0.1995
250167	Y3-100 BAT	0.1995	Merchant Transmission	0.1995
251823	Z1-065 BAT	0.3781	Merchant Transmission	0.3781
913222	Y1-054 E	-1.2723	Adder	-1.5
920501	AA2-148 C OP	3.5390	50/50	3.5390
920502	AA2-148 E OP	23.6840	50/50	23.6840
923881	AB2-028 C	2.9047	50/50	2.9047
923882	AB2-028 E	19.4393	50/50	19.4393
926691	AC1-152	2.7057	50/50	2.7057
926851	AC1-172	2.7057	50/50	2.7057
926881	AC1-175 C	11.7937	50/50	11.7937
926882	AC1-175 E	19.2423	50/50	19.2423
932681	AC2-090 C	5.8968	50/50	5.8968
932682	AC2-090 E	9.6212	50/50	9.6212
932841	AC2-111 C O1	2.4220	Adder	2.85
932842	AC2-111 E O1	3.9517	Adder	4.65
933592	AC2-176 E O1	8.6195	Adder	10.14
933601	AC2-177 C O1	4.0347	50/50	4.0347
933602	AC2-177 E O1	27.0013	50/50	27.0013
934161	AD1-043 C O1	3.8066	Adder	4.48
934162	AD1-043 E O1	6.2108	Adder	7.31
934961	AD1-128 C	6.0887	50/50	6.0887
934962	AD1-128 E	9.9343	50/50	9.9343
936561	AD2-071 C	5.0577	Adder	5.95
936562	AD2-071 E	2.4911	Adder	2.93
939761	AE1-207 C	5.0243	Adder	5.91
939762	AE1-207 E	6.9383	Adder	8.16
939771	AE1-208 C	4.5086	Adder	5.3

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939772	AE1-208 E	6.1481	Adder	7.23
939781	AE1-209 C O1	1.6073	50/50	1.6073
939782	AE1-209 E O1	10.7567	50/50	10.7567
939791	AE1-210 C O1	1.6073	50/50	1.6073
939792	AE1-210 E O1	10.7567	50/50	10.7567
940981	AE2-089 C O1	6.1580	Adder	7.24
940982	AE2-089 E O1	4.1053	Adder	4.83
940991	AE2-090 C	6.7653	Adder	7.96
940992	AE2-090 E	4.5102	Adder	5.31
941691	AE2-169	2.7051	Adder	3.18
941711	AE2-171	2.5044	Adder	2.95
941721	AE2-172	2.9906	Adder	3.52
942071	AE2-219 C	3.2541	Adder	3.83
942072	AE2-219 E	4.4937	Adder	5.29
942081	AE2-220 C	8.1469	50/50	8.1469
942082	AE2-220 E	11.2506	50/50	11.2506
942221	AE2-234 C O1	1.5306	Adder	1.8
942222	AE2-234 E O1	0.6923	Adder	0.81
942791	AE2-297 C O1	13.9062	50/50	13.9062
942792	AE2-297 E O1	9.2708	50/50	9.2708
943772	AF1-045 BAT	3.3194	Merchant Transmission	3.3194
944031	AF1-071 C	0.6055	Adder	0.71
944032	AF1-071 E	0.9879	Adder	1.16
944121	AF1-080	1.6077	Adder	1.89
944531	AF1-118 C O1	18.8840	Adder	22.22
944532	AF1-118 E O1	5.6954	Adder	6.7
944541	AF1-119 C O1	14.2086	50/50	14.2086
944542	AF1-119 E O1	6.0894	50/50	6.0894
944831	AF1-148 C O1	6.9502	Adder	8.18
944832	AF1-148 E O1	4.6335	Adder	5.45
945371	AF1-202 C O1	3.5877	50/50	3.5877
945372	AF1-202 E O1	17.5163	50/50	17.5163
945561	AF1-221 C O1	18.2951	50/50	18.2951
945562	AF1-221 E O1	5.4991	50/50	5.4991
945581	AF1-223 C O1	9.4968	50/50	9.4968
945582	AF1-223 E O1	6.3312	50/50	6.3312
946031	AF1-268 C O1	5.9578	50/50	5.9578
946032	AF1-268 E O1	2.7024	50/50	2.7024
946491	AF1-313 C O1	2.5716	50/50	2.5716
946492	AF1-313 E O1	1.7144	50/50	1.7144
956561	J1152	12.1360	PJM External (MISO)	12.1360
957741	AF2-068 C O1	3.6353	Adder	8.07
957742	AF2-068 E O1	2.4235	Adder	5.38
958711	AF2-162 C	3.0447	50/50	3.0447
958712	AF2-162 E	1.5224	50/50	1.5224
958821	AF2-173 C	10.3858	50/50	10.3858
958822	AF2-173 E	14.3422	50/50	14.3422
958861	AF2-177 C	2.6112	50/50	2.6112
958862	AF2-177 E	17.4748	50/50	17.4748
959131	AF2-204 C O1	2.4486	Adder	5.44
959132	AF2-204 E O1	1.2923	Adder	2.87
959201	AF2-211 C	2.5335	Adder	5.62

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959202	AF2-211 E	1.6890	Adder	3.75
960441	AF2-335 C	6.4290	50/50	6.4290
960442	AF2-335 E	4.2860	50/50	4.2860
960791	AF2-370	2.1430	50/50	2.1430
960971	AF2-388 C O1	1.4283	Adder	3.17
960972	AF2-388 E O1	6.6870	Adder	14.84
961161	AF2-407	32.1240	50/50	32.1240
961171	AF2-408	8.6224	50/50	8.6224
WEC	WEC	1.1434	Confirmed LTF	1.1434
LGEE	LGEE	0.8985	Confirmed LTF	0.8985
CBM-W2	CBM-W2	24.8075	Confirmed LTF	24.8075
NY	NY	0.5027	Confirmed LTF	0.5027
CBM-W1	CBM-W1	36.4917	Confirmed LTF	36.4917
TVA	TVA	1.8102	Confirmed LTF	1.8102
O-066	O-066	6.1488	Confirmed LTF	6.1488
CBM-S1	CBM-S1	11.4594	Confirmed LTF	11.4594
G-007	G-007	0.9516	Confirmed LTF	0.9516
MADISON	MADISON	20.2326	Confirmed LTF	20.2326
MEC	MEC	5.2691	Confirmed LTF	5.2691
CATAWBA	CATAWBA	0.0868	Confirmed LTF	0.0868

11.6.2 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
95222127	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	AEP_P2-2_#2812_05TANNER 345_2	bus	167.0	135.23	137.32	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243415	05WWWSTA	2.9782	50/50	2.9782
247288	05RICHG1	0.9848	50/50	0.9848
247289	05RICHG2	0.9848	50/50	0.9848
247929	S-071 E	6.8177	Adder	8.02
920501	AA2-148 C OP	1.7179	Adder	2.02
920502	AA2-148 E OP	11.4970	Adder	13.53
932841	AC2-111 C O1	8.0776	50/50	8.0776
932842	AC2-111 E O1	13.1792	50/50	13.1792
933592	AC2-176 E O1	4.9692	Adder	5.85
934961	AD1-128 C	4.5432	Adder	5.34
934962	AD1-128 E	7.4125	Adder	8.72
940991	AE2-090 C	12.4701	50/50	12.4701
940992	AE2-090 E	8.3134	50/50	8.3134
942071	AE2-219 C	4.4449	50/50	4.4449
942072	AE2-219 E	6.1381	50/50	6.1381
942791	AE2-297 C O1	6.5992	Adder	7.76
942792	AE2-297 E O1	4.3995	Adder	5.18
944031	AF1-071 C	2.0194	50/50	2.0194
944032	AF1-071 E	3.2948	50/50	3.2948
945561	AF1-221 C O1	34.2554	50/50	34.2554
945562	AF1-221 E O1	10.2964	50/50	10.2964
957741	AF2-068 C O1	2.0958	Adder	4.65
957742	AF2-068 E O1	1.3972	Adder	3.1
959201	AF2-211 C	15.9426	50/50	15.9426
959202	AF2-211 E	10.6284	50/50	10.6284
WEC	WEC	0.2110	Confirmed LTF	0.2110
CALDERWOOD	CALDERWOOD	0.0020	Confirmed LTF	0.0020
CBM-W2	CBM-W2	3.4070	Confirmed LTF	3.4070
NY	NY	0.0481	Confirmed LTF	0.0481
CBM-W1	CBM-W1	6.9055	Confirmed LTF	6.9055
TVA	TVA	0.1764	Confirmed LTF	0.1764
O-066	O-066	0.5914	Confirmed LTF	0.5914
CHEOAH	CHEOAH	0.0025	Confirmed LTF	0.0025
CBM-S1	CBM-S1	0.6901	Confirmed LTF	0.6901
G-007	G-007	0.0915	Confirmed LTF	0.0915
MADISON	MADISON	8.7232	Confirmed LTF	8.7232
MEC	MEC	0.8883	Confirmed LTF	0.8883
BLUEG	BLUEG	0.1059	Confirmed LTF	0.1059
TRIMBLE	TRIMBLE	0.0529	Confirmed LTF	0.0529
CATAWBA	CATAWBA	0.0186	Confirmed LTF	0.0186

11.7 Queue Dependencies

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

Queue Number	Project Name	Status
AA2-148	Madison-Tanners Creek 138kV	Active
AB2-028	Fall Creek-Desoto 345kV	Active
AC1-152	Lawrenceburg 345kV PB I	In Service
AC1-172	Lawrenceburg 345kV PB II	Partially in Service - Under Construction
AC1-175	Losantville 345kV	Active
AC2-090	Losantville 345kV	Active
AC2-111	College Corner 138kV	Active
AC2-176	Jay 138 kV	Under Construction
AC2-177	Desoto-Tanners Creek 345kV	Active
AD1-043	Makahoy 138 kV	Active
AD1-128	Modoc-Delaware 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
AE2-169	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
AF1-080	Deer Creek-Fisher Body-Mullin 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
AF1-313	Wes Del-Royerton 138 kV	Active
AF2-068	Jay 138 kV	Active
AF2-162	Keystone-Desoto 345 kV	Active
AF2-173	Desoto 345 kV	Active

Queue Number	Project Name	Status
AF2-177	Sorenson-DeSoto #2 345 kV	Active
AF2-204	Van Buren 138 kV	Active
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
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
Y1-054	Rochelle 138kV	In Service
Y3-099	Beckjord 2 MW-1	In Service
Y3-100	Beckjord 2 MW-2	In Service
Z1-065	Wiley 34.5kV	In Service
Z2-115	Deer Creek 12.47kV	In Service
J1152	MISO	MISO

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
DEOK_P2-3_C2 1401_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_C2 1401_MIAMIFORT' OPEN BRANCH FROM BUS 249567 TO BUS 250057 CKT 9 / 249567 08M.FORT 345 250057 08M.FORT 138 9 OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 END
AEP_P1-2_#5598-A	CONTINGENCY 'AEP_P1-2_#5598-A' OPEN BRANCH FROM BUS 243278 TO BUS 946030 CKT 1 / 243278 05DESOTO 138 946030 AF1-268 TAP 138 1 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_#144	CONTINGENCY 'AEP_P1-2_#144' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 END
DEOK_P2-3_C2 1403_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_C2 1403_MIAMIFORT' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 OPEN BRANCH FROM BUS 249567 TO BUS 251950 CKT 7 / 249567 08M.FORT 345 251950 08M.FRT7 22.0 7 END
Base Case	
DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	CONTINGENCY 'DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 / 243233 05TANNER 345 249565 08EBEND

Contingency Name	Contingency Definition
AEP_P2-2_#2812_05TANNER 345_2	CONTINGENCY 'AEP_P2-2_#2812_05TANNER 345_2' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 OPEN BRANCH FROM BUS 243233 TO BUS 243382 CKT 5 / 243233 05TANNER 345 243382 05TANNER 138 5 END

12 Light Load Analysis

Light Load Studies (As applicable)

Not applicable.

13 Short Circuit Analysis – Primary POI

The following Breakers are overdutied:

To be determined during later study phases.

14 Stability and Reactive Power Assessment

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

To be determined during later study phases.

15 Affected Systems

15.1 TVA

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

15.2 Duke Energy Progress

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

15.3 MISO

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

15.4 LG&E

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

16 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AF2-068 was evaluated as a 150.0 MW (Capacity 90.0 MW) injection tapping the Jay to Pennville 138 kV line in the AEP area. Project AF2-068 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-068 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

16.1 Generation Deliverability

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

None

16.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE T LOADI NG %	POST PROJE T LOADI NG %	AC D C	MW IMPA CT
144651882	243237	05ADAM	138.0	AEP	243334	05MAGLEY	138.0	AEP	1	AEP_SUBT_P4_#1212_05JAY 69.0_H	breaker	180.0	50.16	108.29	DC	104.63
144651883	243237	05ADAM	138.0	AEP	243334	05MAGLEY	138.0	AEP	1	AEP_SUBT_P4_#1213_05JAY 69.0_J	breaker	180.0	49.5	107.62	DC	104.63
98655648	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P2-3_C2 1401_MIAMIFORT	breaker	972.0	99.93	100.41	DC	10.17

16.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE T LOADI NG %	POST PROJE T LOADI NG %	AC D C	MW IMPA CT
98655647	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P2-3_C2 1403_MIAMIFORT	breaker	972.0	100.49	100.97	DC	10.17
98656230	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	130.15	130.75	DC	12.99

16.4 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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE T LOADI NG %	POST PROJE T LOADI NG %	AC D C	MW IMPA CT
95222596	243218	05DESOTO	345.0	AEP	945370	AF1-202 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	102.83	104.78	DC	17.7
143988010	243218	05DESOTO	345.0	AEP	944830	AF1-148 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	109.96	111.79	DC	17.76

ID	FROM BUS#	FROM BUS	KV	FROM BUS AREA	TO BUS#	TO BUS	KV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
95222608	243225	05KEYST N	345.0	AEP	243232	05SOREN S	345.0	AEP	1	AEP_P1-2_#8702-C	operation	1301.0	103.46	104.8	DC	17.51
95222609	243225	05KEYST N	345.0	AEP	243232	05SOREN S	345.0	AEP	1	Base Case	operation	897.0	105.45	106.1	DC	12.81
144652310	243237	05ADAM	138.0	AEP	243334	05MAGL EY	138.0	AEP	1	AEP_SUBT_P1-3_#786_05JAY 138_1-C	operation	180.0	48.83	106.96	DC	104.63
98655916	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	AEP_P1-2_#144	operation	972.0	99.89	100.38	DC	10.17
95645841	940980	AE2-089 TAP	138.0	AEP	243237	05ADAM	138.0	AEP	1	Base Case	operation	187.0	92.85	109.86	DC	31.81
144652115	940980	AE2-089 TAP	138.0	AEP	243237	05ADAM	138.0	AEP	1	AEP_SUBT_P1-3_#786_05JAY 138_1-C	operation	205.0	73.12	146.29	DC	150.0
144652116	940980	AE2-089 TAP	138.0	AEP	243237	05ADAM	138.0	AEP	1	AEP_P1-2_#5505-C	operation	205.0	73.12	146.29	DC	150.0
95222482	944530	AF1-118 TAP	345.0	AEP	243232	05SOREN S	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	141.12	142.94	DC	17.76
95222487	944530	AF1-118 TAP	345.0	AEP	243232	05SOREN S	345.0	AEP	2	Base Case	operation	971.0	102.46	103.07	DC	13.12
143987958	944540	AF1-119 TAP	345.0	AEP	960970	AF2-388 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	128.29	130.25	DC	17.7
95222524	944830	AF1-148 TAP	345.0	AEP	944530	AF1-118 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	119.39	121.21	DC	17.76
143988026	945370	AF1-202 TAP	345.0	AEP	958860	AF2-177 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	118.53	120.48	DC	17.7
144652109	957740	AF2-068 TAP	138.0	AEP	243319	05JAY	138.0	AEP	1	AEP_P1-2_#5505-A	operation	205.0	73.22	146.39	DC	150.0
143987971	958860	AF2-177 TAP	345.0	AEP	944540	AF1-119 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	118.53	120.49	DC	17.7
143987951	960970	AF2-388 TAP	345.0	AEP	243225	05KEYST N	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	128.29	130.25	DC	17.7

16.5 Flow Gate Details - Secondary POI

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

16.5.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	ACID C	MW IMPACT
144651882	243237	05ADAM	AEP	243334	05MAGLEY	AEP	1	AEP_SUBT_P4_#1212_05JAY 69.0_H	breaker	180.0	50.16	108.29	DC	104.63

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247621	Y3-024	0.0917	50/50	0.0917
247929	S-071 E	8.0874	Adder	9.51
940981	AE2-089 C O1	64.8712	50/50	64.8712
940982	AE2-089 E O1	43.2475	50/50	43.2475
940991	AE2-090 C	4.5819	Adder	5.39
940992	AE2-090 E	3.0546	Adder	3.59
942071	AE2-219 C	2.9959	Adder	3.52
942072	AE2-219 E	4.1373	Adder	4.87
942221	AE2-234 C O1	2.4951	50/50	2.4951
942222	AE2-234 E O1	1.1285	50/50	1.1285
957741	AF2-068 C O2	62.7786	50/50	62.7786
957742	AF2-068 E O2	41.8524	50/50	41.8524
LGEE	LGEE	0.0673	Confirmed LTF	0.0673
CPL	CPL	0.0152	Confirmed LTF	0.0152
CBM-W2	CBM-W2	0.4177	Confirmed LTF	0.4177
NY	NY	0.0039	Confirmed LTF	0.0039
TVA	TVA	0.0658	Confirmed LTF	0.0658
O-066	O-066	0.0403	Confirmed LTF	0.0403
EDWARDS	EDWARDS	0.0077	Confirmed LTF	0.0077
CBM-S2	CBM-S2	0.1618	Confirmed LTF	0.1618
CBM-S1	CBM-S1	0.5112	Confirmed LTF	0.5112
G-007	G-007	0.0062	Confirmed LTF	0.0062

16.5.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	ACDC	MW IMPACT
98656230	248001	06DEARB1	OVEC	248013	06PIERC E	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	130.15	130.75	DC	12.99

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.6960	50/50	0.6960
247264	05LAWG1A	8.5772	50/50	8.5772
247265	05LAWG1B	8.5772	50/50	8.5772
247266	05LAWG1S	13.6964	50/50	13.6964
247267	05LAWG2A	8.5772	50/50	8.5772
247268	05LAWG2B	8.5772	50/50	8.5772
247269	05LAWG2S	13.6964	50/50	13.6964
247543	V3-007 C	0.6960	50/50	0.6960
247929	S-071 E	7.3481	Adder	8.64
247935	V3-007 E	27.0013	50/50	27.0013
247958	05WLD G2 E	13.9869	Adder	16.46
247963	05HDWTR1G E	27.0013	50/50	27.0013
247968	Z2-115 E	0.0795	Adder	0.09
250163	Y3-099 BAT	0.1995	Merchant Transmission	0.1995
250167	Y3-100 BAT	0.1995	Merchant Transmission	0.1995
251823	Z1-065 BAT	0.3781	Merchant Transmission	0.3781
913222	Y1-054 E	-1.2723	Adder	-1.5
920501	AA2-148 C OP	3.5390	50/50	3.5390
920502	AA2-148 E OP	23.6840	50/50	23.6840
923881	AB2-028 C	2.9047	50/50	2.9047
923882	AB2-028 E	19.4393	50/50	19.4393
926691	AC1-152	2.7057	50/50	2.7057
926851	AC1-172	2.7057	50/50	2.7057
926881	AC1-175 C	11.7937	50/50	11.7937
926882	AC1-175 E	19.2423	50/50	19.2423
932681	AC2-090 C	5.8968	50/50	5.8968
932682	AC2-090 E	9.6212	50/50	9.6212
932841	AC2-111 C O1	2.4220	Adder	2.85
932842	AC2-111 E O1	3.9517	Adder	4.65
933592	AC2-176 E O1	8.6195	Adder	10.14
933601	AC2-177 C O1	4.0347	50/50	4.0347
933602	AC2-177 E O1	27.0013	50/50	27.0013
934161	AD1-043 C O1	3.8066	Adder	4.48
934162	AD1-043 E O1	6.2108	Adder	7.31
934961	AD1-128 C	6.0887	50/50	6.0887
934962	AD1-128 E	9.9343	50/50	9.9343
936561	AD2-071 C	5.0577	Adder	5.95
936562	AD2-071 E	2.4911	Adder	2.93
939761	AE1-207 C	5.0243	Adder	5.91
939762	AE1-207 E	6.9383	Adder	8.16
939771	AE1-208 C	4.5086	Adder	5.3

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939772	AE1-208 E	6.1481	Adder	7.23
939781	AE1-209 C O1	1.6073	50/50	1.6073
939782	AE1-209 E O1	10.7567	50/50	10.7567
939791	AE1-210 C O1	1.6073	50/50	1.6073
939792	AE1-210 E O1	10.7567	50/50	10.7567
940981	AE2-089 C O1	6.1580	Adder	7.24
940982	AE2-089 E O1	4.1053	Adder	4.83
940991	AE2-090 C	6.7653	Adder	7.96
940992	AE2-090 E	4.5102	Adder	5.31
941691	AE2-169	2.7051	Adder	3.18
941711	AE2-171	2.5044	Adder	2.95
941721	AE2-172	2.9906	Adder	3.52
942071	AE2-219 C	3.2541	Adder	3.83
942072	AE2-219 E	4.4937	Adder	5.29
942081	AE2-220 C	8.1469	50/50	8.1469
942082	AE2-220 E	11.2506	50/50	11.2506
942221	AE2-234 C O1	1.5306	Adder	1.8
942222	AE2-234 E O1	0.6923	Adder	0.81
942791	AE2-297 C O1	13.9062	50/50	13.9062
942792	AE2-297 E O1	9.2708	50/50	9.2708
943772	AF1-045 BAT	3.3194	Merchant Transmission	3.3194
944031	AF1-071 C	0.6055	Adder	0.71
944032	AF1-071 E	0.9879	Adder	1.16
944121	AF1-080	1.6077	Adder	1.89
944531	AF1-118 C O1	18.8840	Adder	22.22
944532	AF1-118 E O1	5.6954	Adder	6.7
944541	AF1-119 C O1	14.2086	50/50	14.2086
944542	AF1-119 E O1	6.0894	50/50	6.0894
944831	AF1-148 C O1	6.9502	Adder	8.18
944832	AF1-148 E O1	4.6335	Adder	5.45
945371	AF1-202 C O1	3.5877	50/50	3.5877
945372	AF1-202 E O1	17.5163	50/50	17.5163
945561	AF1-221 C O1	18.2951	50/50	18.2951
945562	AF1-221 E O1	5.4991	50/50	5.4991
945581	AF1-223 C O1	9.4968	50/50	9.4968
945582	AF1-223 E O1	6.3312	50/50	6.3312
946031	AF1-268 C O1	5.9578	50/50	5.9578
946032	AF1-268 E O1	2.7024	50/50	2.7024
946491	AF1-313 C O1	2.5716	50/50	2.5716
946492	AF1-313 E O1	1.7144	50/50	1.7144
956561	J1152	12.1360	PJM External (MISO)	12.1360
957741	AF2-068 C O2	3.5108	Adder	7.79
957742	AF2-068 E O2	2.3405	Adder	5.2
958711	AF2-162 C	3.0447	50/50	3.0447
958712	AF2-162 E	1.5224	50/50	1.5224
958821	AF2-173 C	10.3858	50/50	10.3858
958822	AF2-173 E	14.3422	50/50	14.3422
958861	AF2-177 C O2	2.6887	50/50	2.6887
958862	AF2-177 E O2	17.9933	50/50	17.9933
959131	AF2-204 C O2	2.4745	Adder	5.49
959132	AF2-204 E O2	1.3060	Adder	2.9
959201	AF2-211 C	2.5335	Adder	5.62

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959202	AF2-211 E	1.6890	Adder	3.75
960441	AF2-335 C	6.4290	50/50	6.4290
960442	AF2-335 E	4.2860	50/50	4.2860
960791	AF2-370	2.1430	50/50	2.1430
960971	AF2-388 C O2	1.5448	Adder	3.43
960972	AF2-388 E O2	7.2327	Adder	16.05
961161	AF2-407	32.1240	50/50	32.1240
961171	AF2-408	8.6224	50/50	8.6224
WEC	WEC	1.1434	Confirmed LTF	1.1434
LGEE	LGEE	0.8985	Confirmed LTF	0.8985
CBM-W2	CBM-W2	24.8075	Confirmed LTF	24.8075
NY	NY	0.5027	Confirmed LTF	0.5027
CBM-W1	CBM-W1	36.4917	Confirmed LTF	36.4917
TVA	TVA	1.8102	Confirmed LTF	1.8102
O-066	O-066	6.1488	Confirmed LTF	6.1488
CBM-S1	CBM-S1	11.4594	Confirmed LTF	11.4594
G-007	G-007	0.9516	Confirmed LTF	0.9516
MADISON	MADISON	20.2326	Confirmed LTF	20.2326
MEC	MEC	5.2707	Confirmed LTF	5.2707
CATAWBA	CATAWBA	0.0868	Confirmed LTF	0.0868

16.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
AEP_SUBT_P4_#1213_05JAY 69.0_J	CONTINGENCY 'AEP_SUBT_P4_#1213_05JAY 69.0_J' OPEN BRANCH FROM BUS 246018 TO BUS 243319 CKT 1 / 246018 05JAY EQ 999 243319 05JAY 138 1 OPEN BRANCH FROM BUS 246018 TO BUS 246016 CKT 1 / 246018 05JAY EQ 999 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246018 TO BUS 246015 CKT 1 / 246018 05JAY EQ 999 246015 05JAY 34.5 1 OPEN BRANCH FROM BUS 243253 TO BUS 243319 CKT 1 / 243253 05BLUFFP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 946030 TO BUS 243319 CKT 1 / 946030 AF1-268 TAP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 243319 TO BUS 957740 CKT 1 / 243319 05JAY 138 957740 AF2-068 TAP 138 1 REMOVE SWSHUNT FROM BUS 243319 / 243319 05JAY 138 OPEN BRANCH FROM BUS 246005 TO BUS 247883 CKT 1 / 246005 053-M 69.0 247883 05FULKERSNSS69.0 1 OPEN BRANCH FROM BUS 246013 TO BUS 247883 CKT 1 / 246013 05ARMSTRON 69.0 247883 05FULKERSNSS69.0 1 OPEN BRANCH FROM BUS 246013 TO BUS 246016 CKT 1 / 246013 05ARMSTRON 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246024 TO BUS 246016 CKT 1 / 246024 05GREEN SW 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246026 TO BUS 246015 CKT 1 / 246026 05BARLEY 34.5 246015 05JAY 34.5 1 END
DEOK_P2-3_C2 1401_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_C2 1401_MIAMIFORT' OPEN BRANCH FROM BUS 249567 TO BUS 250057 CKT 9 / 249567 08M.FORT 345 250057 08M.FORT 138 9 OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 END
AEP_P1-2_#5505-C	CONTINGENCY 'AEP_P1-2_#5505-C' OPEN BRANCH FROM BUS 243319 TO BUS 957740 CKT 1 / 243319 05JAY 138 957740 AF2-068 TAP 138 1 END

Contingency Name	Contingency Definition
AEP_P1-2_#5505-A	CONTINGENCY 'AEP_P1-2_#5505-A' OPEN BRANCH FROM BUS 246232 TO BUS 243237 CKT 1 / 246232 05ADAMS1EQ 999 243237 05ADAM 138 1 OPEN BRANCH FROM BUS 246232 TO BUS 246231 CKT 1 / 246232 05ADAMS1EQ 999 246231 05ADAMS- 69.0 1 OPEN BRANCH FROM BUS 246232 TO BUS 246230 CKT 1 / 246232 05ADAMS1EQ 999 246230 05ADAMS 34.5 1 OPEN BRANCH FROM BUS 243237 TO BUS 243334 CKT 1 / 243237 05ADAM 138 243334 05MAGLEY 138 1 OPEN BRANCH FROM BUS 243237 TO BUS 940980 CKT 1 / 243237 05ADAM 138 940980 AE2-089 TAP 138 1 END
AEP_SUBT_P4_#1212_05JAY 69.0_H	CONTINGENCY 'AEP_SUBT_P4_#1212_05JAY 69.0_H' OPEN BRANCH FROM BUS 246018 TO BUS 243319 CKT 1 / 246018 05JAY EQ 999 243319 05JAY 138 1 OPEN BRANCH FROM BUS 246018 TO BUS 246016 CKT 1 / 246018 05JAY EQ 999 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246018 TO BUS 246015 CKT 1 / 246018 05JAY EQ 999 246015 05JAY 34.5 1 OPEN BRANCH FROM BUS 243253 TO BUS 243319 CKT 1 / 243253 05BLUFFP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 946030 TO BUS 243319 CKT 1 / 946030 AF1-268 TAP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 243319 TO BUS 957740 CKT 1 / 243319 05JAY 138 957740 AF2-068 TAP 138 1 REMOVE SWSHUNT FROM BUS 243319 / 243319 05JAY 138 OPEN BRANCH FROM BUS 247258 TO BUS 246012 CKT 1 / 247258 05ANTIVILL 69.0 246012 05ANTIVTAPSS69.0 1 OPEN BRANCH FROM BUS 246012 TO BUS 246024 CKT 1 / 246012 05ANTIVTAPSS69.0 246024 05GREEN SW 69.0 1 OPEN BRANCH FROM BUS 246012 TO BUS 246022 CKT 1 / 246012 05ANTIVTAPSS69.0 246022 05PORTLAND 69.0 1 OPEN BRANCH FROM BUS 246013 TO BUS 246016 CKT 1 / 246013 05ARMSTRON 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246024 TO BUS 246016 CKT 1 / 246024 05GREEN SW 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246026 TO BUS 246015 CKT 1 / 246026 05BARLEY 34.5 246015 05JAY 34.5 1 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

Contingency Name	Contingency Definition
AEP_P1-2_#144	CONTINGENCY 'AEP_P1-2_#144' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 END
DEOK_P2-3_C2 1403_MIAMIFORT	CONTINGENCY 'DEOK_P2-3_C2 1403_MIAMIFORT' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 OPEN BRANCH FROM BUS 249567 TO BUS 251950 CKT 7 / 249567 08M.FORT 345 251950 08M.FRT7 22.0 7 END
AEP_SUBT_P1-3_#786_05JAY 138_1-C	CONTINGENCY 'AEP_SUBT_P1-3_#786_05JAY 138_1-C' OPEN BRANCH FROM BUS 246018 TO BUS 243319 CKT 1 / 246018 05JAY EQ 999 243319 05JAY 138 1 OPEN BRANCH FROM BUS 246018 TO BUS 246016 CKT 1 / 246018 05JAY EQ 999 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246018 TO BUS 246015 CKT 1 / 246018 05JAY EQ 999 246015 05JAY 34.5 1 OPEN BRANCH FROM BUS 243253 TO BUS 243319 CKT 1 / 243253 05BLUFFP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 253250 TO BUS 243319 CKT 1 / 253250 09FTRECV 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 946030 TO BUS 243319 CKT 1 / 946030 AF1-268 TAP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 243319 TO BUS 957740 CKT 1 / 243319 05JAY 138 957740 AF2-068 TAP 138 1 REMOVE SWSHUNT FROM BUS 243319 / 243319 05JAY 138 OPEN BRANCH FROM BUS 246013 TO BUS 246016 CKT 1 / 246013 05ARMSTRON 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246024 TO BUS 246016 CKT 1 / 246024 05GREEN SW 69.0 246016 05JAY 69.0 1 OPEN BRANCH FROM BUS 246026 TO BUS 246015 CKT 1 / 246026 05BARLEY 34.5 246015 05JAY 34.5 1 END
Base Case	
DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	CONTINGENCY 'DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 / 243233 05TANNER 345 249567 08M.FORT 345 1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 / 243233 05TANNER 345 249565 08EBEND

17 Affected Systems

17.1 TVA

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

17.2 Duke Energy Progress

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

17.3 MISO

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

17.4 LG&E

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