Generation Interconnection

System Impact Study Report

for

Queue Project AF1-118

SORENSON-DESOTO 345 KV

268.9 MW Capacity / 350 MW Energy

August, 2020

Table of Contents

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1 Introduction

This System Impact Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the System Impact 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 System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. 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 System Impact Study is performed.

The System Impact 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.

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.

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3 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Wells County, Indiana. The installed facilities will have a total capability of 350 MW with 268.9 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is June 01, 2022. This study does not imply a TO commitment to this in-service date.

The objective of this System Impact Study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the ITO transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required for maintaining the reliability of the ITO transmission system.

Queue Number	**AF1-118**
Project Name	SORENSON-DESOTO 345 KV
State	Indiana
County	Wells
Transmission Owner	AEP
MFO	350
MWE	350
MWC	268.9
Fuel	Solar; Storage
Basecase Study Year	2023

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

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4 Point of Interconnection

AF1-118 will interconnect with the AEP transmission system via a new switching station cut in on the Sorenson – Desoto 345 kV circuit.

To accommodate the interconnection on the Sorenson – Desoto 345 kV circuit, a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but 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

This project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,082,000
Direct Connection Network Upgrade	$17,440,000
Non Direct Connection Network Upgrades	$1,300,000
Allocation for New System Upgrades*	$0
Contribution to Previously Identified Upgrades*	$0
Total Costs	**$19,822,000**

*As your project progresses through the study process and other projects modify their request or withdraw, then your cost allocation could change.

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

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start

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with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

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6 Transmission Owner Scope of Work

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 in a breaker and half bus arrangement but 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
Sorenson – Desoto 345 kV T-Line Cut In	$1,210,000
Review Protection and Control Settings at the Sorenson 345 kV substation	$45,000
Review Protection and Control Settings at the Desoto 345 kV substation	$45,000
Total Non-Direct Connection Facility Costs	**$1,300,000**

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7 Incremental Capacity Transfer Rights (ICTRs)

None.

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

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

Requirement from the PJM Open Access Transmission Tariff:

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.

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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

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

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

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/

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11 Summer Peak Analysis

The Queue Project AF1-118 was evaluated as a 350.0 MW (Capacity 268.9 MW) injection tapping the Sorenson to Desoto 345 kV line in the AEP area. Project AF1-118 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-118 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4271290 5	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	116.16	118.76	AC	28.93

11.4 Steady-State Voltage Requirements

None

11.5 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.

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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
4344571 4	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	92.47	113.9	AC	211.31

11.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF1-118	Upgrade Number
42712905,42151669	1	**06DEARB1 345.0 kV - 06PIERCE 345.0 kV Ckt 1**	Perform a sag study on the line. OVEC's cost estimate for performing the sag study is $125K. New SE rating to be 1204 MVA. PJM Network Upgrade N6759.1. This constraint is presently driven by a prior queue cycle. Per PJM cost allocation rules, Queue Project AF1-118 presently does not receive cost allocation for this upgrade.	$125 K	$0	N6759.1
			Total Cost	**$125,000**	**$0**	

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

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11.7 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".

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11.7.1 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
4271290 5	248001	06DEARB 1	OVEC	248013	06PIERCE	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	116.16	118.76	AC	28.93

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.7148	50/50	0.7148
247264	05LAWG1A	8.8080	50/50	8.8080
247265	05LAWG1B	8.8080	50/50	8.8080
247266	05LAWG1S	14.0650	50/50	14.0650
247267	05LAWG2A	8.8080	50/50	8.8080
247268	05LAWG2B	8.8080	50/50	8.8080
247269	05LAWG2S	14.0650	50/50	14.0650
247543	V3-007 C	0.7148	50/50	0.7148
247929	S-071 E	7.3505	Adder	8.65
247935	V3-007 E	27.0083	50/50	27.0083
247958	05WLD G2 E	13.9928	Adder	16.46
247963	05HDWTR1G E	27.0083	50/50	27.0083
247968	Z2-115 E	0.0795	Adder	0.09
250163	Y3-099 BAT	0.1994	Merchant Transmission	0.1994
250167	Y3-100 BAT	0.1994	Merchant Transmission	0.1994
251823	Z1-065 BAT	0.3779	Merchant Transmission	0.3779
913222	Y1-054 E	-1.2718	Adder	-1.5
920501	AA2-148 C OP	3.5399	50/50	3.5399
920502	AA2-148 E OP	23.6901	50/50	23.6901
923881	AB2-028 C	2.9055	50/50	2.9055
923882	AB2-028 E	19.4445	50/50	19.4445
926691	AC1-152	2.7785	50/50	2.7785
926851	AC1-172	2.7785	50/50	2.7785
926881	AC1-175 C	11.7967	50/50	11.7967
926882	AC1-175 E	19.2473	50/50	19.2473
932681	AC2-090 C	5.8984	50/50	5.8984
932682	AC2-090 E	9.6236	50/50	9.6236
932841	AC2-111 C O1	2.4228	Adder	2.85
932842	AC2-111 E O1	3.9529	Adder	4.65
933592	AC2-176 E O1	8.6223	Adder	10.14
933601	AC2-177 C O1	4.0357	50/50	4.0357
933602	AC2-177 E O1	27.0083	50/50	27.0083
934161	AD1-043 C O1	3.8082	Adder	4.48
934162	AD1-043 E O1	6.2133	Adder	7.31
934961	AD1-128 C	6.0910	50/50	6.0910
934962	AD1-128 E	9.9380	50/50	9.9380
936561	AD2-071 C	5.0594	Adder	5.95
936562	AD2-071 E	2.4920	Adder	2.93
939761	AE1-207 C	5.0266	Adder	5.91
939762	AE1-207 E	6.9414	Adder	8.17
939771	AE1-208 C	4.5100	Adder	5.31

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939772	AE1-208 E	6.1500	Adder	7.24
939781	AE1-209 C O1	1.6077	50/50	1.6077
939782	AE1-209 E O1	10.7593	50/50	10.7593
939791	AE1-210 C O1	1.6077	50/50	1.6077
939792	AE1-210 E O1	10.7593	50/50	10.7593
940981	AE2-089 C O1	6.1604	Adder	7.25
940982	AE2-089 E O1	4.1069	Adder	4.83
940991	AE2-090 C	6.7682	Adder	7.96
940992	AE2-090 E	4.5122	Adder	5.31
941691	AE2-169	2.7060	Adder	3.18
941711	AE2-171	2.5054	Adder	2.95
941721	AE2-172	2.9920	Adder	3.52
942071	AE2-219 C	3.2551	Adder	3.83
942072	AE2-219 E	4.4952	Adder	5.29
942081	AE2-220 C	8.1490	50/50	8.1490
942082	AE2-220 E	11.2535	50/50	11.2535
942221	AE2-234 C O1	1.5313	Adder	1.8
942222	AE2-234 E O1	0.6926	Adder	0.81
942791	AE2-297 C O1	13.9098	50/50	13.9098
942792	AE2-297 E O1	9.2732	50/50	9.2732
943772	AF1-045 BAT	3.3173	Merchant Transmission	3.3173
944031	AF1-071 C	0.6057	Adder	0.71
944032	AF1-071 E	0.9882	Adder	1.16
944121	AF1-080	1.6084	Adder	1.89
944531	AF1-118 C O1	18.8909	Adder	22.22
944532	AF1-118 E O1	5.6975	Adder	6.7
944541	AF1-119 C O1	14.2128	50/50	14.2128
944542	AF1-119 E O1	6.0912	50/50	6.0912
944831	AF1-148 C O1	6.9535	Adder	8.18
944832	AF1-148 E O1	4.6356	Adder	5.45
945371	AF1-202 C O1	3.5887	50/50	3.5887
945372	AF1-202 E O1	17.5213	50/50	17.5213
945561	AF1-221 C O1	18.2992	50/50	18.2992
945562	AF1-221 E O1	5.5004	50/50	5.5004
945581	AF1-223 C O1	9.4995	50/50	9.4995
945582	AF1-223 E O1	6.3330	50/50	6.3330
946031	AF1-268 C O1	5.9601	50/50	5.9601
946032	AF1-268 E O1	2.7034	50/50	2.7034
946491	AF1-313 C O1	2.5723	50/50	2.5723
946492	AF1-313 E O1	1.7149	50/50	1.7149
956561	J1152	12.1360	PJM External (MISO)	12.1360
WEC	WEC	1.1444	Confirmed LTF	1.1444
LGEE	LGEE	0.9002	Confirmed LTF	0.9002
CBM-W2	CBM-W2	24.8321	Confirmed LTF	24.8321
NY	NY	0.5005	Confirmed LTF	0.5005
TVA	TVA	1.8144	Confirmed LTF	1.8144
O-066	O-066	6.1085	Confirmed LTF	6.1085
CBM-S1	CBM-S1	11.4850	Confirmed LTF	11.4850
G-007	G-007	0.9454	Confirmed LTF	0.9454
MADISON	MADISON	20.2346	Confirmed LTF	20.2346
MEC	MEC	5.2739	Confirmed LTF	5.2739
CATAWBA	CATAWBA	0.0858	Confirmed LTF	0.0858

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CBM-W1	CBM-W1	36.5292	Confirmed LTF	36.5292

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11.8 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
AC1-212	Minster 69kV	Engineering and Procurement
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 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
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
Y1-054	Rochelle 138kV	In Service

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Queue Number	Project Name	Status
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

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11.9 Contingency Descriptions

Contingency Name	Contingency Definition
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
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_P7-1_#11087-C	CONTINGENCY 'AEP_P7-1_#11087-C' OPEN BRANCH FROM BUS 944540 TO BUS 243225 CKT 1 / 944540 AF1-119 TAP 345 243225 05KEYSTN 345 1 OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 END
Base Case	
AEP_P7-1_#11019	CONTINGENCY 'AEP_P7-1_#11019' OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 243218 05DESOTO 345 243232 05SORENS 345 2 OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END
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

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12 Light Load Analysis

The Queue Project AF1-118 was evaluated as a 350.0 MW injection tapping the Sorenson to Desoto 345 kV line in the AEP area. Project AF1-118 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-118 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

12.1 Generation Deliverability

(Single or N-1 contingencies)

None

12.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies)

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
150632598	243211	05ALLEN	345.0	AEP	242933	05RPMONE	345.0	AEP	1	AEP_P4_#7445_05MARYSV 765_B	breaker	897.0	98.56	101.89	AC	35.34

12.3 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
150632597	243211	05ALLEN	345.0	AEP	242933	05RPMONE	345.0	AEP	1	AEP_P1-2_#7441	single	897.0	124.0	128.32	DC	35.8

12.4 Steady-State Voltage Requirements

None

12.5 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.

None

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12.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF1-118	Upgrade Number
150632597,150632598,150632601	4	**05ALLEN 345.0 kV - 05RPMONE 345.0 kV Ckt 1**	A sag study will be required on ACSR/PE~ 1275 ~ 54/19, conductor section 3, 12.25 miles of line. Cost of sag study is $49 K. New SE rating of conductor section 3 after sag study: 1301 MVA SE. New expected SE rating of line to be 971 MVA. If the sag study concludes a complete Rebuild/Reconductor is required, the estimated cost is $ 24.5 million. A sag study will be required on ACSR/PE~ 1414 ~ 62/19, conductor section 2, 6.07 miles of line.The cost of the sag study is expected to be $24,280. New Ratings of conductor section 2 after sag study: S/N: 971 MVA S/E: 1419 MVA. New expected SE rating of line to be 1301 MVA. If the sag study concludes a complete Rebuild/Reconductor is required, the estimated cost to Rebuild/Reconductor is $ 12.14 million. This overload, along with N6740 and N6740.1, is presently driven by a prior queue cycle and AF1-118 presently has no cost responsibility.	$49 K + $24.28 K	$0 + $0	N6740 N6740.1
			Total Cost	**$2,477,000**	**$0**	

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

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12.7 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".

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12.7.1 Index 1

None

12.7.2 Index 2

None

12.7.3 Index 3

None

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12.7.4 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
150632597	243211	05ALLEN	AEP	242933	05RPMONE	AEP	1	AEP_P1-2_#7441	single	897.0	124.0	128.32	DC	35.8

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.6617	80/20	0.6617
243859	05FR-11G C	0.5315	80/20	0.5315
243862	05FR-12G C	0.5234	80/20	0.5234
243864	05FR-21G C	0.5586	80/20	0.5586
243866	05FR-22G C	0.5342	80/20	0.5342
243870	05FR-3G C	1.0820	80/20	1.0820
243873	05FR-4G C	0.8379	80/20	0.8379
246909	05MDL-1G C	1.1299	80/20	1.1299
246910	05MDL-2G C	0.5593	80/20	0.5593
246953	05TIMB G C	1.1144	80/20	1.1144
246976	05MDL-3G C	0.5706	80/20	0.5706
246979	05MDL-4G C	0.5565	80/20	0.5565
246991	05WLD G1 C	0.3442	80/20	0.3442
247255	05WLD G2 C	0.3614	80/20	0.3614
247521	T-131 C	1.2976	80/20	1.2976
247536	05BLUFF P WF	0.6334	80/20	0.6334
247543	V3-007 C	0.6617	80/20	0.6617
247556	T-127 C	0.5650	80/20	0.5650
247901	05FR-12G E	2.0880	80/20	2.0880
247902	05FR-21G E	2.2317	80/20	2.2317
247904	05FR-3G E	4.3279	80/20	4.3279
247905	05FR-4G E	3.3897	80/20	3.3897
247906	05MDL-1G E	4.5112	80/20	4.5112
247907	05MDL-2G E	2.2598	80/20	2.2598
247911	05TIMB G E	4.4872	80/20	4.4872
247912	05MDL-3G E	2.2598	80/20	2.2598
247913	05MDL-4G E	2.2598	80/20	2.2598
247925	T-131 E	5.1902	80/20	5.1902
247929	S-071 E	2.5336	80/20	2.5336
247943	T-127 E	2.2598	80/20	2.2598
247958	05WLD G2 E	4.7233	80/20	4.7233
247963	05HDWTR1G E	4.4282	80/20	4.4282
274847	GR RIDGE ;BU	0.8867	80/20	0.8867
274848	CAMPGROVE;RU	0.8106	80/20	0.8106
274849	CRESCENT ;1U	0.2646	80/20	0.2646
274850	MENDOTA H;RU	0.1479	80/20	0.1479
274851	PROVIDENC;RU	0.4036	80/20	0.4036
274853	TWINGROVE;U1	1.0327	80/20	1.0327
274854	TWINGROVE;U2	1.0327	80/20	1.0327
274855	GSG-6 ;RU	0.6229	80/20	0.6229
274856	ECOGROVE ;U1	0.5602	80/20	0.5602
274857	BIG SKY ;U1	0.6642	80/20	0.6642

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274858	BIG SKY ;U2	0.6642	80/20	0.6642
274859	EASYR;U1 E	2.6568	80/20	2.6568
274860	EASYR;U2 E	2.6568	80/20	2.6568
274861	TOP CROP ;1U	0.5944	80/20	0.5944
274862	TOP CROP ;2U	1.1539	80/20	1.1539
274863	CAYUGA RI;1U	0.8462	80/20	0.8462
274864	CAYUGA RI;2U	0.8462	80/20	0.8462
274871	GR RIDGE ;2U	1.1260	80/20	1.1260
274872	LEE DEKAL;1U	1.3755	80/20	1.3755
274877	BISHOP HL;1U	0.5424	80/20	0.5424
274878	BISHOP HL;2U	0.5424	80/20	0.5424
274879	MINONK ;1U	1.1437	80/20	1.1437
274880	GENERATOR;	1.1448	80/20	1.1448
274881	PILOT HIL;1E	4.2124	80/20	4.2124
274882	W4-005 E	7.6661	80/20	7.6661
274887	PILOT HIL;1U	1.0531	80/20	1.0531
274888	KELLYCK ;1U	1.0531	80/20	1.0531
274890	CAYUG;1U E	3.3849	80/20	3.3849
274891	CAYUG;2U E	3.3849	80/20	3.3849
275149	KELLYCK ;1E	4.2124	80/20	4.2124
276156	O-029 C	0.3034	80/20	0.3034
276157	O-029 C	0.3280	80/20	0.3280
276158	O-029 C	0.5986	80/20	0.5986
290021	O50 E	4.5748	80/20	4.5748
290051	GSG-6; E	2.4917	80/20	2.4917
290108	LEEDK;1U E	5.7314	80/20	5.7314
290261	S-027 E	4.1309	80/20	4.1309
290265	S-028 E	4.1309	80/20	4.1309
293061	N-015 E	3.5466	80/20	3.5466
293513	O-009 C1	0.5603	80/20	0.5603
293514	O-009 C2	0.2843	80/20	0.2843
293515	O-009 C3	0.3143	80/20	0.3143
293516	O-009 E1	2.2425	80/20	2.2425
293517	O-009 E2	1.1390	80/20	1.1390
293518	O-009 E3	1.2543	80/20	1.2543
293644	O22 E1	2.3777	80/20	2.3777
293645	O22 E2	4.6155	80/20	4.6155
293715	O-029 E	2.3974	80/20	2.3974
293716	O-029 E	1.3145	80/20	1.3145
293717	O-029 E	1.2082	80/20	1.2082
293771	O-035 E	1.6146	80/20	1.6146
294392	P-010 E	4.5042	80/20	4.5042
294401	BSHIL;1U E	2.1697	80/20	2.1697
294410	BSHIL;2U E	2.1697	80/20	2.1697
294763	P-046 E	2.2409	80/20	2.2409
917501	Z2-087 C	0.7128	80/20	0.7128
917502	Z2-087 E	4.7700	80/20	4.7700
918051	AA1-018 C OP	0.5671	80/20	0.5671
923881	AB2-028 C	1.3189	80/20	1.3189
923882	AB2-028 E	8.8267	80/20	8.8267
924041	AB2-047 C O1	1.7776	80/20	1.7776
924042	AB2-047 E O1	11.8964	80/20	11.8964

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
924261	AB2-070 C O1	1.3040	80/20	1.3040
924262	AB2-070 E O1	8.7264	80/20	8.7264
925301	AB2-191	0.2389	80/20	0.2389
925581	AC1-033 C	0.7089	80/20	0.7089
925582	AC1-033 E	4.7456	80/20	4.7456
925771	AC1-053 C	1.2998	80/20	1.2998
925772	AC1-053 E	8.6986	80/20	8.6986
926821	AC1-168 C O1	0.5655	80/20	0.5655
926822	AC1-168 E O1	3.7949	80/20	3.7949
926841	AC1-171 C O1	0.5472	80/20	0.5472
926842	AC1-171 E O1	3.6552	80/20	3.6552
926861	AC1-173 C	0.4365	80/20	0.4365
926862	AC1-173 E	2.9101	80/20	2.9101
926901	**AC1-176 C (Withdrawn : 07/09/2020)**	**0.5633**	**80/20**	**0.5633**
926902	**AC1-176 E (Withdrawn : 07/09/2020)**	**3.7871**	**80/20**	**3.7871**
927201	AC1-214 C O1	1.0339	80/20	1.0339
927202	AC1-214 E O1	3.2867	80/20	3.2867
930041	AB1-006 C	0.7344	80/20	0.7344
930042	AB1-006 E	4.9151	80/20	4.9151
932601	AC2-080 C O1	1.5255	80/20	1.5255
932602	AC2-080 E O1	10.2089	80/20	10.2089
933281	AC2-140 C	3.1415	80/20	3.1415
933282	AC2-140 E	0.1653	80/20	0.1653
933591	AC2-176 C O1	0.2529	80/20	0.2529
933592	AC2-176 E O1	3.2458	80/20	3.2458
933601	AC2-177 C O1	1.3202	80/20	1.3202
933602	AC2-177 E O1	8.8350	80/20	8.8350
934431	AD1-067 C	0.0624	80/20	0.0624
934432	AD1-067 E	0.2625	80/20	0.2625
934721	AD1-100 C	8.9064	80/20	8.9064
934722	AD1-100 E	41.5632	80/20	41.5632
935141	AD1-148	2.4324	80/20	2.4324
936291	AD2-038 C O1	1.1084	80/20	1.1084
936292	AD2-038 E O1	7.4176	80/20	7.4176
936371	AD2-047 C O1	2.0411	80/20	2.0411
936372	AD2-047 E O1	9.9653	80/20	9.9653
936722	AD2-091 BAT	6.7775	80/20	6.7775
936752	AD2-096 BAT	3.0915	80/20	3.0915
936971	AD2-131 C	0.4852	80/20	0.4852
936972	AD2-131 E	2.4378	80/20	2.4378
937001	AD2-134 C	1.2996	80/20	1.2996
937002	AD2-134 E	5.3687	80/20	5.3687
937041	AD2-138 C	2.0653	80/20	2.0653
937042	AD2-138 E	9.6691	80/20	9.6691
937211	AD2-159 C	1.6529	80/20	1.6529
937212	AD2-159 E	7.7386	80/20	7.7386
938851	AE1-113 C	3.7652	80/20	3.7652
938852	AE1-113 E	13.3492	80/20	13.3492
938861	AE1-114 C O1	1.8877	80/20	1.8877
938862	AE1-114 E O1	6.4403	80/20	6.4403
939321	AE1-163 C O1	2.7852	80/20	2.7852

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939322	AE1-163 E O1	17.1088	80/20	17.1088
939401	AE1-172 C O1	2.5611	80/20	2.5611
939402	AE1-172 E O1	12.0167	80/20	12.0167
939631	AE1-193 C	4.0357	80/20	4.0357
939632	AE1-193 E	27.0083	80/20	27.0083
939641	AE1-194 C	4.0357	80/20	4.0357
939642	AE1-194 E	27.0083	80/20	27.0083
939651	AE1-195 C	4.0357	80/20	4.0357
939652	AE1-195 E	27.0083	80/20	27.0083
939681	AE1-198 C	0.0001	80/20	0.0001
939682	AE1-198 E	6.9073	80/20	6.9073
939781	AE1-209 C O1	0.7508	80/20	0.7508
939782	AE1-209 E O1	5.0244	80/20	5.0244
939791	AE1-210 C O1	0.7508	80/20	0.7508
939792	AE1-210 E O1	5.0244	80/20	5.0244
940101	AE1-252 C O1	0.0001	80/20	0.0001
940102	AE1-252 E O1	10.7190	80/20	10.7190
940752	AE2-062 E	0.0743	80/20	0.0743
941561	AE2-153 C O1	2.1092	80/20	2.1092
941562	AE2-153 E O1	9.8748	80/20	9.8748
941571	AE2-154 C	1.8317	80/20	1.8317
941572	AE2-154 E	12.2583	80/20	12.2583
941691	AE2-169	2.6291	80/20	2.6291
941711	AE2-171	1.9833	80/20	1.9833
941721	AE2-172	2.9032	80/20	2.9032
941731	AE2-173 O1	3.4185	80/20	3.4185
942042	AE2-216 BAT	7.4553	80/20	7.4553
942111	AE2-223 C	1.0666	80/20	1.0666
942112	AE2-223 E	7.1378	80/20	7.1378
942421	AE2-255 C O1	1.4262	80/20	1.4262
942422	AE2-255 E O1	4.2786	80/20	4.2786
942651	AE2-281 C O1	0.3979	80/20	0.3979
942652	AE2-281 E O1	2.4441	80/20	2.4441
943021	AE2-325 C	2.6503	80/20	2.6503
943022	AE2-325 E	1.7627	80/20	1.7627
943381	AF1-009 C	0.3541	80/20	0.3541
943382	AF1-009 E	1.4164	80/20	1.4164
943401	AF1-011 C	0.7635	80/20	0.7635
943402	AF1-011 E	1.2816	80/20	1.2816
943781	AF1-046 C	3.4671	80/20	3.4671
943782	AF1-046 E	2.3114	80/20	2.3114
943791	AF1-047 C	1.2392	80/20	1.2392
943792	AF1-047 E	0.8262	80/20	0.8262
943801	AF1-048 C	2.2375	80/20	2.2375
943802	AF1-048 E	1.4917	80/20	1.4917
943921	AF1-060	0.7224	80/20	0.7224
944121	AF1-080	1.3540	80/20	1.3540
944221	AF1-090 C O1	1.6029	80/20	1.6029
944222	AF1-090 E O1	7.5043	80/20	7.5043
944232	AF1-091 E O1	16.9319	80/20	16.9319
944241	AF1-092 C O1	0.0001	80/20	0.0001
944242	AF1-092 E O1	12.5936	80/20	12.5936

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944532	AF1-118 E O1	35.7980	80/20	35.7980
944542	AF1-119 E O1	17.6880	80/20	17.6880
944831	AF1-148 C O1	0.0001	80/20	0.0001
944832	AF1-148 E O1	15.9016	80/20	15.9016
944931	AF1-158 C O1	0.0001	80/20	0.0001
944932	AF1-158 E O1	12.5145	80/20	12.5145
944961	AF1-161 C	2.1135	80/20	2.1135
944962	AF1-161 E	2.1135	80/20	2.1135
945111	AF1-176 C O1	4.3602	80/20	4.3602
945112	AF1-176 E O1	6.5407	80/20	6.5407
945351	AF1-200 FTIR	121.4325	80/20	121.4325
945371	AF1-202 C O1	2.3251	80/20	2.3251
945372	AF1-202 E O1	11.3517	80/20	11.3517
945391	AF1-204 C O1	2.8994	80/20	2.8994
945392	AF1-204 E O1	8.6981	80/20	8.6981
945421	AF1-207 C	1.9519	80/20	1.9519
945422	AF1-207 E	8.3816	80/20	8.3816
945623	AF1-227 BAT	8.5370	80/20	8.5370
945871	AF1-252 O1	3.5518	80/20	3.5518
945881	AF1-253 O1	2.4589	80/20	2.4589
946161	AF1-281 C	0.2063	80/20	0.2063
946162	AF1-281 E	1.1693	80/20	1.1693
946203	AF1-285 BAT	2.4868	80/20	2.4868
946321	AF1-296 C O1	1.9731	80/20	1.9731
946322	AF1-296 E O1	9.2376	80/20	9.2376
946501	AF1-314 C	2.0853	80/20	2.0853
946502	AF1-314 E	9.7630	80/20	9.7630
946531	AF1-317 C O1	1.3794	80/20	1.3794
946532	AF1-317 E O1	2.0691	80/20	2.0691
946541	AF1-318 C O1	2.8950	80/20	2.8950
946542	AF1-318 E O1	13.5554	80/20	13.5554
990901	L-005 E	3.2425	80/20	3.2425

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12.8 Queue Dependencies

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

Queue Number	Project Name	Status
AA1-018	Powerton-Goodings Grove	In Service
AA2-148	Madison-Tanners Creek 138kV	Active
AB1-006	Meadow Lake 345kV	In Service
AB1-055	Balls Gap 34.5kV	In Service
AB2-028	Fall Creek-Desoto 345kV	Active
AB2-047	Brokaw-Pontiac Midpoint	Engineering and Procurement
AB2-070	Brokaw-Lanesville	Active
AB2-191	Mendota Hills	In Service
AC1-033	Kewanee	Active
AC1-053	Lanesville-Brokaw	Active
AC1-131	PJM-CPLE	Confirmed
AC1-168	Kewanee-Streator	Active
AC1-171	Powerton	Active
AC1-173	Logtown 138kV	In Service
AC1-176	Timber Switch 138kV	Withdrawn
AC1-214	Crescent Ridge	Engineering and Procurement
AC2-080	Olive-Reynolds 345kV	Active
AC2-140	DC Cook Unit 2	Engineering and Procurement
AC2-176	Jay 138 kV	Under Construction
AC2-177	Desoto-Tanners Creek 345kV	Active
AD1-067	Mendota Hills	Active
AD1-100	Loretto-Wilton & Braidwood-Davis Creek	Active
AD1-148	Brokaw-Lanesville	Active
AD2-038	Powerton	Active
AD2-047	Davis Creek 138 kV	Active
AD2-091	Hardin Tap 345kV	Active
AD2-096	Marysville 345kV	Active
AD2-131	Latham Kincaid	Active
AD2-134	Shady Oaks	Active
AD2-138	Olive-Reynolds 345kV	Active
AD2-159	Chestnut 345kV	Active
AE1-113	Mole Creek 345 kV	Active
AE1-114	Maryland-Lancaster 138 kV	Active
AE1-163	Powerton-Nevada 345 kV	Active
AE1-172	Loretto-Wilton Center	Active
AE1-193	Crete 345 kV	Active
AE1-194	Crete 345 kV	Active
AE1-195	Crete 345 kV	Active
AE1-198	Crete 345 kV	Active

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Queue Number	Project Name	Status
AE1-209	Desoto 345 kV	Active
AE1-210	Desoto 345 kV	Active
AE1-245	Haviland 138 kV	Active
AE1-252	Loretto-Wilton Center	Active
AE2-062	Normantown	Active
AE2-130	Rockport 765 kV	Active
AE2-153	Braidwood-Davis Creek	Active
AE2-154	Meadow Lake 345 kV (MLV VIII)	Active
AE2-169	Delaware-Van Buren 138 kV	Active
AE2-171	Makahoy 138 kV	Active
AE2-172	Mississinewa-Gaston 138 kV	Active
AE2-173	McLean 345 kV	Active
AE2-216	Hardin Switch 345 kV	Active
AE2-223	McLean 345 kV	Active
AE2-255	Molecreek 345 kV	Active
AE2-276	Sullivan 345kV	Active
AE2-281	Powerton-Nevada 345 kV	Active
AE2-325	Valley 138 kV	Active
AF1-009	Dixon-McGirr	Active
AF1-011	Schauff Road	Active
AF1-046	Twin Branch-Guardian 138 kV	Active
AF1-047	Mark Center 69 kV	Active
AF1-048	Belvidere-Marengo	Active
AF1-060	Lena 138 kV	Active
AF1-080	Deer Creek-Fisher Body-Mullin 138 kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-090	Kincaid-Pana	Active
AF1-091	Butler-S Hicksville 138 kV	Active
AF1-092	Huntington Jct. 138 kV	Active
AF1-118	Sorenson-Desoto 345 kV	Active
AF1-119	Keystone-Desoto 345 kV	Active
AF1-148	Sorenson-Desoto 345 kV	Active
AF1-158	Edison-Gravel Pit 138 kV	Active
AF1-161	Valley 138 kV	Active
AF1-176	Corey 138 kV	Active
AF1-200	Plano 345 kV	Active
AF1-202	Keystone-Desoto 345 kV	Active
AF1-204	Eugene 345 kV	Active
AF1-207	Reynolds–Olive #1 345 kV	Active
AF1-227	Marysville-East Lima 345 kV	Active
AF1-252	Kincaid-Pana	Active
AF1-253	Kincaid-Pana	Active
AF1-281	Nelson-Lee County	Active
AF1-285	Gunn Road 345 kV	Active
AF1-296	Garden Plain 138 kV	Active
AF1-314	Lena 138 kV	Active
AF1-317	Electric Jct-Nelson	Active
AF1-318	Crescent Ridge-Corbin	Active
V1-011	Haviland 138kV	In Service
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
W4-005	Blue Mound-Latham	Partially in Service - Under Construction
Z2-087	Pontiac MidPoint-Brokaw 345kV	In Service

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12.9 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#7446_05MARYSV 765_B2	CONTINGENCY 'AEP_P4_#7446_05MARYSV 765_B2' OPEN BRANCH FROM BUS 242928 TO BUS 246999 CKT 1 / 242928 05MARYSV 765 246999 05SORENS 765 1 OPEN BRANCH FROM BUS 242928 TO BUS 242939 CKT 2 / 242928 05MARYSV 765 242939 05MARYSV 345 2 END
AEP_P1-2_#7441	CONTINGENCY 'AEP_P1-2_#7441' OPEN BRANCH FROM BUS 242928 TO BUS 246999 CKT 1 / 242928 05MARYSV 765 246999 05SORENS 765 1 END
AEP_P4_#7445_05MARYSV 765_B	CONTINGENCY 'AEP_P4_#7445_05MARYSV 765_B' OPEN BRANCH FROM BUS 242922 TO BUS 242928 CKT 1 / 242922 05FLTLCK 765 242928 05MARYSV 765 1 OPEN BRANCH FROM BUS 242928 TO BUS 246999 CKT 1 / 242928 05MARYSV 765 246999 05SORENS 765 1 END

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13 Short Circuit Analysis

The following Breakers are overdutied

Bus Name	Breaker	Voltage	Interrupting Capability	Duty Percentage Pre Queue	Duty Percentage Post Queue

13.1 System Reinforcements - Short Circuit

14 Stability and Reactive Power

To be determined in the Facilities Study Phase.

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).

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16 Attachment 1: One- Line Diagram and Site Location