Generation Interconnection

System Impact Study Report

for

Queue Project AF2-177

SORENSON-DESOTO #2 345 KV

26 MW Capacity / 200 MW Energy

February 2021

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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.

3 General

The Interconnection Customer (IC), has proposed a Wind generating facility located in Blackford County, Indiana. The installed facilities will have a total capability of 200 MW with 26 MW of this output being recognized by PJM as Capacity.

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

Queue Number	AF2-177
Project Name	SORENSON-DESOTO #2 345 KV
State	Indiana
County	Blackford
Transmission Owner	AEP
MFO	200
MWE	200
MWC	26
Fuel	Wind
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

AF2-177 will interconnect with the AEP transmission system via a new station cut into 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 and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, line risers, SCADA, jumpers, switches, 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.

AEP will extend one span of 345 kV transmission line for the generation-leads going to the AF2-177 site. Unless this span extends directly from within the AEP station at the POI to the IC collector station structure, AEP will build and own the first transmission line structure outside of the Sorenson - Desoto 345 kV station fence to which the AEP and AF2-177 transmission line conductors will attach.

5 Cost Summary

The AF2-177 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$19,822,000
Allocation towards System Network Upgrade Costs*	$4,040,000
Total Costs	**$23,862,000**

*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 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

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 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.

Note 2: 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.

6 Transmission Owner Scope of Work

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

6.1 Attachment Facilities

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

Description	Total Cost
345 kV Revenue Metering	$431,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$651,000
Total Attachment Facility Costs	**$1,082,000**

6.2 Direct Connection Cost Estimate

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

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

6.3 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Sorenson - Desoto 345 kV T-Line Cut In	$1,210,000
Review Protection and Control Settings at the Desoto 345 kV station	$45,000
Review Protection and Control Settings at the Sorenson 345 kV station	$45,000
Total Non-Direct Connection Facility Costs	**$1,300,000**

7 Schedule

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

8 Interconnection Customer Requirements

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

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

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

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

9.2 Meteorological Data Reporting Requirements

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

- Wind speed (meters/second) – (Required)
- Wind direction (decimal degrees from true north) – (Required)
- Ambient air temperature (Fahrenheit) – (Required)
- Air Pressure (Hectopascals) – (Required)
- Humidity (Percent) (Accepted, not required)

9.3 Interconnected Transmission Owner Requirements

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

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

10 Summer Peak Analysis

The Queue Project AF2-177 was evaluated as a 200.0 MW (Capacity 26.0 MW) injection tapping the Sorenson to Desoto 345 kV line, ckt. 2 (specifically the AF1-148 Tap – Desoto line section) in the AEP area. Project AF2-177 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-177 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

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

None

10.2 Multiple Facility Contingency

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

None

10.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC| DC	MW IMPACT
95754296	243278	05DESOTO	138.0	AEP	946030	AF1-268 TAP	138.0	AEP	1	AEP_P7-1_#11019	tower	393.0	117.05	120.4	AC	15.51
156907332	243278	05DESOTO	138.0	AEP	946030	AF1-268 TAP	138.0	AEP	1	AEP_P7-1_#11087-C-A	tower	393.0	112.62	115.98	AC	15.53
98750100	248001	06DEARB1	345.0	OVEC	248013	06PIERCE	345.0	OVEC	1	DEOK_P7-1_C5 4504MFTANNERS4512EBTANNERS	tower	972.0	126.18	128.31	AC	20.16
95754255	946030	AF1-268 TAP	138.0	AEP	243319	05JAY	138.0	AEP	1	AEP_P7-1_#11019	tower	393.0	121.56	124.92	AC	15.51
156907221	946030	AF1-268 TAP	138.0	AEP	243319	05JAY	138.0	AEP	1	AEP_P7-1_#11087-C-A	tower	393.0	117.12	120.48	AC	15.53

10.4 Steady-State Voltage Requirements

To be determined.

10.5 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.

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
95327176	243218	05DESOTO	345.0	AEP	945370	AF1-202 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	110.67	115.97	AC	48.5
95327188	243225	05KEYSTN	345.0	AEP	243232	05SORENS	345.0	AEP	1	AEP_P1-2_#8702-C	operation	1301.0	110.16	113.84	AC	48.25
95327189	243225	05KEYSTN	345.0	AEP	243232	05SORENS	345.0	AEP	1	Base Case	operation	897.0	113.28	115.04	AC	18.56
95327062	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	148.75	157.87	AC	89.51
95327067	944530	AF1-118 TAP	345.0	AEP	243232	05SORENS	345.0	AEP	2	Base Case	operation	971.0	107.73	116.21	AC	82.79
144149763	944540	AF1-119 TAP	345.0	AEP	960970	AF2-388 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	137.67	143.0	AC	48.5
95327104	944830	AF1-148 TAP	345.0	AEP	944530	AF1-118 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	127.13	136.25	AC	89.51
95327122	945370	AF1-202 TAP	345.0	AEP	944540	AF1-119 TAP	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	125.87	131.21	AC	48.5
156565765	958860	AF2-177 TAP	345.0	AEP	944830	AF1-148 TAP	345.0	AEP	2	AEP_P1-2_#4817	operation	971.0	118.02	127.11	AC	89.51
144149756	960970	AF2-388 TAP	345.0	AEP	243225	05KEYSTN	345.0	AEP	1	AEP_P1-2_#8702-C	operation	897.0	137.68	143.01	AC	48.5

10.6 System Reinforcements

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF2-177</th><th>Upgrade Number</th></tr>
<tr><td>95754296,156907332</td><td>5,6</td><td>05DESOTO 138.0 kV - AF1-268 TAP 138.0 kV Ckt 1 & AF1-268 TAP 138.0 kV - 05JAY 138.0 kV Ckt 1</td><td>Replace 2 risers at Jay 138 kV substation.
This work is covered under PJM 2022 baseline upgrade B3103.5.
There is also work on this line covered under PJM supplemental project S2015.3.
Work presently expected to be complete by summer 2022.
New expected ratings 383/409 MVA SN/SE.

A Sag Study will be required on the (Desoto-Jay) 12.53 miles of ACSR ~ 556.5 ~ 26/7 ~ DOVE - Conductor section 1 to mitigate the overload. The new ratings after sag study will be: S/N: 409 MVA, S/E: 620 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between $50,120(no remediation required, just sag study) and $18.8 million (complete line Reconductor/rebuild). 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. PJM Network Upgrade N6279.2.

This upgrade is required in a prior queue cycle.</td><td>$50.12 K</td><td>$0</td><td>B3103.5
S2015.3
N6279.2</td></tr>
<tr><td>98749517,98750100,98749518</td><td>3</td><td>06DEARB1 345.0 kV - 06PIERCE 345.0 kV Ckt 1</td><td>Perform a sag study.
Cost estmate: $125 K
Time estmate is 6-12 months.
New expected SE rating to be 1204 MVA.
PJM Network Upgrade N6759.1

This upgrade is required in a prior queue cycle.

Replace 2, 1600 A switches at Dearborn and 4 switches at Pierce.
Cost $9.0M.
Time estmate is 12-18 months.
New SE rating to be 1319 MVA.
PJM Network Upgrade N6759.2

The cost allocation is:

<table><tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($9.0 M)</th></tr><tr><td>AF2-173</td><td>24.8</td><td>55.11%</td><td>4.960</td></tr><tr><td>AF2-177</td><td>20.2</td><td>44.89%</td><td>4.040</td></tr></table></td><td>$125 K
$9 M</td><td>$0
$4.04 M</td><td>N6759.1
N6759.2</td></tr>
</table>

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF2-177	Upgrade Number
			Total Cost	**$9,175,120**	**$4,040,000**	

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.

10.7 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".

10.7.1 Index 1

None

10.7.2 Index 2

None

10.7.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
98750100	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	DEOK_P7-1_C54504MFTANNERS4512EBTANNERS	tower	972.0	126.18	128.31	AC	20.16

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243795	05HDWTR1G C	0.6797	50/50	0.6797
247264	05LAWG1A	8.3663	50/50	8.3663
247265	05LAWG1B	8.3663	50/50	8.3663
247266	05LAWG1S	13.3597	50/50	13.3597
247267	05LAWG2A	8.3663	50/50	8.3663
247268	05LAWG2B	8.3663	50/50	8.3663
247269	05LAWG2S	13.3597	50/50	13.3597
247543	V3-007 C	0.6797	50/50	0.6797
247929	S-071 E	7.3799	Adder	8.68
247935	V3-007 E	27.0709	50/50	27.0709
247958	05WLD G2 E	14.0446	Adder	16.52
247963	05HDWTR1G E	27.0709	50/50	27.0709
247968	Z2-115 E	0.0799	Adder	0.09
250163	Y3-099 BAT	0.1987	Merchant Transmission	0.1987
250167	Y3-100 BAT	0.1987	Merchant Transmission	0.1987
251823	Z1-065 BAT	0.3758	Merchant Transmission	0.3758
913222	Y1-054 E	-1.2657	Adder	-1.49
920501	AA2-148 C OP	3.5479	50/50	3.5479
920502	AA2-148 E OP	23.7434	50/50	23.7434
923881	AB2-028 C	2.9149	50/50	2.9149
923882	AB2-028 E	19.5071	50/50	19.5071
926691	AC1-152	2.6392	50/50	2.6392
926851	AC1-172	2.6392	50/50	2.6392
926881	AC1-175 C	11.8241	50/50	11.8241
926882	AC1-175 E	19.2919	50/50	19.2919
932681	AC2-090 C	5.9120	50/50	5.9120
932682	AC2-090 E	9.6460	50/50	9.6460
932841	AC2-111 C O1	2.4321	Adder	2.86
932842	AC2-111 E O1	3.9681	Adder	4.67
933592	AC2-176 E O1	8.6570	Adder	10.18
933601	AC2-177 C O1	4.0451	50/50	4.0451
933602	AC2-177 E O1	27.0709	50/50	27.0709
934161	AD1-043 C O1	3.8217	Adder	4.5
934162	AD1-043 E O1	6.2355	Adder	7.34
934961	AD1-128 C	6.1110	50/50	6.1110
934962	AD1-128 E	9.9705	50/50	9.9705
936561	AD2-071 C	5.0799	Adder	5.98
936562	AD2-071 E	2.5021	Adder	2.94
939761	AE1-207 C	5.0466	Adder	5.94
939762	AE1-207 E	6.9690	Adder	8.2
939771	AE1-208 C	4.5268	Adder	5.33

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939772	AE1-208 E	6.1729	Adder	7.26
939781	AE1-209 C O1	1.6124	50/50	1.6124
939782	AE1-209 E O1	10.7906	50/50	10.7906
939791	AE1-210 C O1	1.6124	50/50	1.6124
939792	AE1-210 E O1	10.7906	50/50	10.7906
940981	AE2-089 C O1	6.1888	Adder	7.28
940982	AE2-089 E O1	4.1259	Adder	4.85
941691	AE2-169	2.7161	Adder	3.2
941711	AE2-171	2.5143	Adder	2.96
941721	AE2-172	3.0039	Adder	3.53
942071	AE2-219 C	3.2680	Adder	3.84
942072	AE2-219 E	4.5129	Adder	5.31
942081	AE2-220 C	8.1679	50/50	8.1679
942082	AE2-220 E	11.2795	50/50	11.2795
942221	AE2-234 C O1	1.5386	Adder	1.81
942222	AE2-234 E O1	0.6959	Adder	0.82
942791	AE2-297 C O1	13.9419	50/50	13.9419
942792	AE2-297 E O1	9.2946	50/50	9.2946
943772	AF1-045 BAT	3.2990	Merchant Transmission	3.2990
944031	AF1-071 C	0.6080	Adder	0.72
944032	AF1-071 E	0.9920	Adder	1.17
944531	AF1-118 C O1	18.9732	Adder	22.32
944532	AF1-118 E O1	5.7223	Adder	6.73
944541	AF1-119 C O1	14.2632	50/50	14.2632
944542	AF1-119 E O1	6.1128	50/50	6.1128
944831	AF1-148 C O1	6.9818	Adder	8.21
944832	AF1-148 E O1	4.6546	Adder	5.48
945371	AF1-202 C O1	3.6009	50/50	3.6009
945372	AF1-202 E O1	17.5811	50/50	17.5811
945561	AF1-221 C O1	18.3491	50/50	18.3491
945562	AF1-221 E O1	5.5153	50/50	5.5153
945581	AF1-223 C O1	9.5319	50/50	9.5319
945582	AF1-223 E O1	6.3546	50/50	6.3546
946031	AF1-268 C O1	5.9801	50/50	5.9801
946032	AF1-268 E O1	2.7125	50/50	2.7125
956561	J1152	12.1380	PJM External (MISO)	12.1380
957741	AF2-068 C O1	6.8888	Adder	8.1
957742	AF2-068 E O1	4.5926	Adder	5.4
958711	AF2-162 C	3.0564	50/50	3.0564
958712	AF2-162 E	1.5282	50/50	1.5282
958821	AF2-173 C	10.4185	50/50	10.4185
958822	AF2-173 E	14.3875	50/50	14.3875
958861	AF2-177 C O1	2.6213	50/50	2.6213
958862	AF2-177 E O1	17.5427	50/50	17.5427
959131	AF2-204 C	4.6928	Adder	5.52
959132	AF2-204 E	2.4768	Adder	2.91
959201	AF2-211 C	4.8001	Adder	5.65
959202	AF2-211 E	3.2001	Adder	3.76
960441	AF2-335 C	6.4524	50/50	6.4524
960442	AF2-335 E	4.3016	50/50	4.3016
960791	AF2-370	2.1508	50/50	2.1508
960971	AF2-388 C	2.9265	Adder	3.44

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960972	AF2-388 E	13.7012	Adder	16.12
961161	AF2-407	32.2410	50/50	32.2410
961171	AF2-408	8.6536	50/50	8.6536
LGEE	LGEE	0.9208	Confirmed LTF	0.9208
CBM-W2	CBM-W2	25.1269	Confirmed LTF	25.1269
NY	NY	0.4806	Confirmed LTF	0.4806
TVA	TVA	1.8648	Confirmed LTF	1.8648
WEC	WEC	1.1557	Confirmed LTF	1.1557
O-066	O-066	5.8666	Confirmed LTF	5.8666
CBM-S1	CBM-S1	11.7917	Confirmed LTF	11.7917
G-007	G-007	0.9079	Confirmed LTF	0.9079
MADISON	MADISON	20.2346	Confirmed LTF	20.2346
MEC	MEC	5.3311	Confirmed LTF	5.3311
CATAWBA	CATAWBA	0.0732	Confirmed LTF	0.0732
CBM-W1	CBM-W1	36.9670	Confirmed LTF	36.9670

10.7.4 Index 4

None

10.7.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95754296	243278	05DESOTO	AEP	946030	AF1-268 TAP	AEP	1	AEP_P7-1_#11019	tower	393.0	117.05	120.4	AC	15.51

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247935	V3-007 E	10.0143	Adder	11.78
247963	05HDWTR1G E	10.0143	Adder	11.78
923881	AB2-028 C	1.2803	Adder	1.51
923882	AB2-028 E	8.5678	Adder	10.08
926881	AC1-175 C	4.3741	Adder	5.15
926882	AC1-175 E	7.1366	Adder	8.4
927181	AC1-212 C	-0.1224	Adder	-0.14
927183	AC1-212 BAT	1.5086	Merchant Transmission	1.5086
932681	AC2-090 C	2.1870	Adder	2.57
932682	AC2-090 E	3.5683	Adder	4.2
933601	AC2-177 C O1	1.4964	Adder	1.76
933602	AC2-177 E O1	10.0143	Adder	11.78
934961	AD1-128 C	3.3896	Adder	3.99
934962	AD1-128 E	5.5303	Adder	6.51
939761	AE1-207 C	3.0194	Adder	3.55
939762	AE1-207 E	4.1696	Adder	4.91
939771	AE1-208 C	2.4703	Adder	2.91
939772	AE1-208 E	3.3685	Adder	3.96
939781	AE1-209 C O1	0.8571	Adder	1.01
939782	AE1-209 E O1	5.7363	Adder	6.75
939791	AE1-210 C O1	0.8571	Adder	1.01
939792	AE1-210 E O1	5.7363	Adder	6.75
941691	AE2-169	1.4822	Adder	1.74
941721	AE2-172	1.7972	Adder	2.11
942081	AE2-220 C	3.0216	Adder	3.55
942082	AE2-220 E	4.1726	Adder	4.91
944531	AF1-118 C O1	17.7252	Adder	20.85
944532	AF1-118 E O1	5.3459	Adder	6.29
944541	AF1-119 C O1	9.2296	Adder	10.86
944542	AF1-119 E O1	3.9556	Adder	4.65
944831	AF1-148 C O1	6.2885	Adder	7.4
944832	AF1-148 E O1	4.1924	Adder	4.93
945371	AF1-202 C O1	2.2415	Adder	2.64
945372	AF1-202 E O1	10.9437	Adder	12.87
945581	AF1-223 C O1	5.9333	Adder	6.98
945582	AF1-223 E O1	3.9556	Adder	4.65
958711	AF2-162 C	1.9778	Adder	2.33
958712	AF2-162 E	0.9889	Adder	1.16
958821	AF2-173 C	5.5385	Adder	6.52
958822	AF2-173 E	7.6484	Adder	9.0
958861	AF2-177 C O1	1.7141	Adder	2.02

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958862	AF2-177 E O1	11.4711	Adder	13.5
960441	AF2-335 C	4.3615	Adder	5.13
960442	AF2-335 E	2.9077	Adder	3.42
960791	AF2-370	1.4538	Adder	1.71
960971	AF2-388 C	2.3206	Adder	2.73
960972	AF2-388 E	10.8646	Adder	12.78
LGEE	LGEE	0.6572	Confirmed LTF	0.6572
CPLE	CPLE	0.1442	Confirmed LTF	0.1442
CBM-W2	CBM-W2	6.5602	Confirmed LTF	6.5602
NY	NY	0.0459	Confirmed LTF	0.0459
TVA	TVA	0.8148	Confirmed LTF	0.8148
WEC	WEC	0.0154	Confirmed LTF	0.0154
O-066	O-066	0.4838	Confirmed LTF	0.4838
CBM-S2	CBM-S2	1.6300	Confirmed LTF	1.6300
CBM-S1	CBM-S1	5.8618	Confirmed LTF	5.8618
G-007	G-007	0.0738	Confirmed LTF	0.0738
MEC	MEC	0.4942	Confirmed LTF	0.4942

10.7.6 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
95754255	946030	AF1-268 TAP	AEP	243319	05JAY	AEP	1	AEP_P7-1_#11019	tower	393.0	121.56	124.92	AC	15.51

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247935	V3-007 E	10.0143	Adder	11.78
247963	05HDWTR1G E	10.0143	Adder	11.78
923881	AB2-028 C	1.2803	Adder	1.51
923882	AB2-028 E	8.5678	Adder	10.08
926881	AC1-175 C	4.3741	Adder	5.15
926882	AC1-175 E	7.1366	Adder	8.4
927181	AC1-212 C	-0.1224	Adder	-0.14
927183	AC1-212 BAT	1.5086	Merchant Transmission	1.5086
932681	AC2-090 C	2.1870	Adder	2.57
932682	AC2-090 E	3.5683	Adder	4.2
933601	AC2-177 C O1	1.4964	Adder	1.76
933602	AC2-177 E O1	10.0143	Adder	11.78
934961	AD1-128 C	3.3896	Adder	3.99
934962	AD1-128 E	5.5303	Adder	6.51
939761	AE1-207 C	3.0194	Adder	3.55
939762	AE1-207 E	4.1696	Adder	4.91
939771	AE1-208 C	2.4703	Adder	2.91
939772	AE1-208 E	3.3685	Adder	3.96
939781	AE1-209 C O1	0.8571	Adder	1.01
939782	AE1-209 E O1	5.7363	Adder	6.75
939791	AE1-210 C O1	0.8571	Adder	1.01
939792	AE1-210 E O1	5.7363	Adder	6.75
941691	AE2-169	1.4822	Adder	1.74
941721	AE2-172	1.7972	Adder	2.11
942081	AE2-220 C	3.0216	Adder	3.55
942082	AE2-220 E	4.1726	Adder	4.91
944531	AF1-118 C O1	17.7252	Adder	20.85
944532	AF1-118 E O1	5.3459	Adder	6.29
944541	AF1-119 C O1	9.2296	Adder	10.86
944542	AF1-119 E O1	3.9556	Adder	4.65
944831	AF1-148 C O1	6.2885	Adder	7.4
944832	AF1-148 E O1	4.1924	Adder	4.93
945371	AF1-202 C O1	2.2415	Adder	2.64
945372	AF1-202 E O1	10.9437	Adder	12.87
945581	AF1-223 C O1	5.9333	Adder	6.98
945582	AF1-223 E O1	3.9556	Adder	4.65
946031	AF1-268 C O1	12.9406	50/50	12.9406
946032	AF1-268 E O1	5.8697	50/50	5.8697
958711	AF2-162 C	1.9778	Adder	2.33
958712	AF2-162 E	0.9889	Adder	1.16
958821	AF2-173 C	5.5385	Adder	6.52
958822	AF2-173 E	7.6484	Adder	9.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958861	AF2-177 C O1	1.7141	Adder	2.02
958862	AF2-177 E O1	11.4711	Adder	13.5
960441	AF2-335 C	4.3615	Adder	5.13
960442	AF2-335 E	2.9077	Adder	3.42
960791	AF2-370	1.4538	Adder	1.71
960971	AF2-388 C	2.3206	Adder	2.73
960972	AF2-388 E	10.8646	Adder	12.78
961161	AF2-407	12.8265	Adder	15.09
961171	AF2-408	3.4537	Adder	4.06
LGEE	LGEE	0.6572	Confirmed LTF	0.6572
CPLE	CPLE	0.1442	Confirmed LTF	0.1442
CBM-W2	CBM-W2	6.5602	Confirmed LTF	6.5602
NY	NY	0.0459	Confirmed LTF	0.0459
TVA	TVA	0.8148	Confirmed LTF	0.8148
WEC	WEC	0.0154	Confirmed LTF	0.0154
O-066	O-066	0.4838	Confirmed LTF	0.4838
CBM-S2	CBM-S2	1.6300	Confirmed LTF	1.6300
CBM-S1	CBM-S1	5.8618	Confirmed LTF	5.8618
G-007	G-007	0.0738	Confirmed LTF	0.0738
MEC	MEC	0.4942	Confirmed LTF	0.4942

10.8 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	In Service
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
AE2-169	Delaware-Van Buren 138 kV	Active
AE2-171	Makahoy 138 kV	Active
AE2-172	Mississinewa-Gaston 138 kV	Active
AE2-219	Bluff Point-Randolph 138 kV	Active
AE2-220	Losantville 345 kV	Active
AE2-234	Liberty Center-Buckeye Tap 69 kV	Active
AE2-297	Madison-Tanners Creek 138 kV	Active
AF1-045	Cedarville-Ford 138 kV	Active
AF1-071	College Corner 138 kV	Active
AF1-118	Sorenson-Desoto 345 kV	Active
AF1-119	Keystone-Desoto 345 kV	Active
AF1-148	Sorenson-Desoto 345 kV	Active
AF1-202	Keystone-Desoto 345 kV	Active
AF1-221	College Corner-Drewersburg 138 kV	Active
AF1-223	Jay-Desoto 138 kV	Active
AF1-268	Desoto-Jay 138 kV	Active
AF2-068	Jay 138 kV	Active
AF2-162	Keystone-Desoto 345 kV	Active
AF2-173	Desoto 345 kV	Active
AF2-177	Sorenson-DeSoto #2 345 kV	Active
AF2-204	Van Buren 138 kV	Active

Queue Number	Project Name	Status
AF2-211	College Corner 138 kV	Active
AF2-335	West Del-Royerton 138 kV	Active
AF2-370	West Del-Royerton 138 kV	Active
AF2-388	Desoto-Sorenson 345 kV	Active
AF2-407	Fall Creek 345 kV	Active
AF2-408	Fall Creek 138 kV	Active
V3-007	Desoto-Tanners Creek #1 345kV	Under Construction
Y1-054	Rochelle 138kV	In Service
Y3-024	Bluff Point 12kV	In Service
Y3-099	Beckjord 2 MW-1	In Service
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
J805	MISO	MISO
J903	MISO	MISO
J993	MISO	MISO

10.9 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_P7-1_#11087-C-A	CONTINGENCY 'AEP_P7-1_#11087-C-A' OPEN BRANCH FROM BUS 960970 TO BUS 243225 CKT 1 / 960970 AF2-388 TAP 345 243225 05KEYSTN 345 1 OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 / 944530 AF1-118 TAP 345 243232 05SORENS 345 2 END
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_#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	
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

Contingency Name	Contingency Definition
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

11 Light Load Analysis

The Queue Project AF2-177 was evaluated as a 200.0 MW injection tapping the Sorenson to Desoto 345 kV line, ckt. 2 (specifically the AF1-148 Tap – Desoto line section) in the AEP area. Project AF2-177 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-177 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
170243620	243211	05ALLEN	345.0	AEP	242933	05RPMONE	345.0	AEP	1	AEP_P1-2_#7441-B	single	897.0	136.27	136.29	DC	14.71
170243621	243211	05ALLEN	345.0	AEP	242933	05RPMONE	345.0	AEP	1	AEP_P1-2_#7441-A	single	897.0	136.26	136.28	DC	14.71

11.4 Steady-State Voltage Requirements

To be determined.

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.

None

11.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF2-177	Upgrade Number
170243620,170243621	1	**05ALLEN 345.0 kV - 05RPMONE 345.0 kV Ckt 1**	A sag study is required on ACSR/PE~ 1275 ~ 54/19, conductor section 3, 12.25 miles of line. Cost of sag study is $49 K. New expected SE rating of the 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, 6.07 miles of line. The cost is expected to be 24,280. New expected SE rating of the line after sag study: S/N: 971 MVA S/E: 1304 MVA. Rebuild/Reconductor, cost: $ 12.14 million. These upgrades are presently driven by a prior queue cycle.	$49 K + $24.280 K	$0	N6740 N6740.1
			Total Cost	**$73,280**	**$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.

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".

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
170243621	243211	05ALLEN	AEP	242933	05RPMONE	AEP	1	AEP_P1-2_#7441-A	single	897.0	136.26	136.28	DC	14.71

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246909	05MDL-1G C	1.1709	80/20	1.1709
246910	05MDL-2G C	0.5796	80/20	0.5796
246953	05TIMB G C	1.1444	80/20	1.1444
246976	05MDL-3G C	0.5913	80/20	0.5913
246979	05MDL-4G C	0.5767	80/20	0.5767
247521	T-131 C	1.3273	80/20	1.3273
247556	T-127 C	0.5854	80/20	0.5854
247906	05MDL-1G E	4.6747	80/20	4.6747
247907	05MDL-2G E	2.3418	80/20	2.3418
247911	05TIMB G E	4.6083	80/20	4.6083
247912	05MDL-3G E	2.3418	80/20	2.3418
247913	05MDL-4G E	2.3418	80/20	2.3418
247925	T-131 E	5.3093	80/20	5.3093
247943	T-127 E	2.3418	80/20	2.3418
274847	GR RIDGE ;BU	0.9173	80/20	0.9173
274850	MENDOTA H;RU	0.1532	80/20	0.1532
274855	GSG-6 ;RU	0.6453	80/20	0.6453
274856	ECOGROVE ;U1	0.5808	80/20	0.5808
274857	BIG SKY ;U1	0.6888	80/20	0.6888
274858	BIG SKY ;U2	0.6888	80/20	0.6888
274859	EASYR;U1 E	2.7552	80/20	2.7552
274860	EASYR;U2 E	2.7552	80/20	2.7552
274861	TOP CROP ;1U	0.6153	80/20	0.6153
274862	TOP CROP ;2U	1.1945	80/20	1.1945
274863	CAYUGA RI;1U	0.8771	80/20	0.8771
274864	CAYUGA RI;2U	0.8771	80/20	0.8771
274871	GR RIDGE ;2U	1.1649	80/20	1.1649
274872	LEE DEKAL;1U	1.4248	80/20	1.4248
274879	MINONK ;1U	1.1848	80/20	1.1848
274881	PILOT HIL;1E	4.3557	80/20	4.3557
274887	PILOT HIL;1U	1.0889	80/20	1.0889
274888	KELLYCK ;1U	1.0889	80/20	1.0889
274890	CAYUG;1U E	3.5083	80/20	3.5083
274891	CAYUG;2U E	3.5083	80/20	3.5083
275149	KELLYCK ;1E	4.3557	80/20	4.3557
290021	O50 E	4.7392	80/20	4.7392
290051	GSG-6; E	2.5814	80/20	2.5814
290108	LEEDK;1U E	5.9368	80/20	5.9368
293061	N-015 E	3.6691	80/20	3.6691
293644	O22 E1	2.4614	80/20	2.4614
293645	O22 E2	4.7780	80/20	4.7780

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
294392	P-010 E	4.6598	80/20	4.6598
294763	P-046 E	2.3232	80/20	2.3232
295108	WESTBROOK C	0.2122	80/20	0.2122
295110	SUBLETTE C	0.0928	80/20	0.0928
918051	AA1-018 C OP	0.5871	80/20	0.5871
925301	AB2-191	0.2481	80/20	0.2481
926821	AC1-168 C O1	0.5878	80/20	0.5878
926822	AC1-168 E O1	3.9444	80/20	3.9444
926861	AC1-173 C	0.4476	80/20	0.4476
926862	AC1-173 E	2.9840	80/20	2.9840
930041	AB1-006 C	0.7611	80/20	0.7611
930042	AB1-006 E	5.0933	80/20	5.0933
932601	AC2-080 C O1	1.5825	80/20	1.5825
932602	AC2-080 E O1	10.5903	80/20	10.5903
933281	AC2-140 C	3.2452	80/20	3.2452
933282	AC2-140 E	0.1708	80/20	0.1708
933591	AC2-176 C O1	0.2628	80/20	0.2628
933592	AC2-176 E O1	3.3724	80/20	3.3724
934431	AD1-067 C	0.0648	80/20	0.0648
934432	AD1-067 E	0.2726	80/20	0.2726
934721	AD1-100 C	9.2352	80/20	9.2352
934722	AD1-100 E	43.0976	80/20	43.0976
936291	AD2-038 C O1	1.1510	80/20	1.1510
936292	AD2-038 E O1	7.7026	80/20	7.7026
936371	AD2-047 C O1	2.1156	80/20	2.1156
936372	AD2-047 E O1	10.3292	80/20	10.3292
936722	AD2-091 BAT	6.6405	80/20	6.6405
937001	AD2-134 C	1.3496	80/20	1.3496
937002	AD2-134 E	5.5753	80/20	5.5753
937041	AD2-138 C	2.1424	80/20	2.1424
937042	AD2-138 E	10.0304	80/20	10.0304
938851	AE1-113 C	3.9098	80/20	3.9098
938852	AE1-113 E	13.8622	80/20	13.8622
938861	AE1-114 C O1	1.9622	80/20	1.9622
938862	AE1-114 E O1	6.6946	80/20	6.6946
939321	AE1-163 C O1	2.8922	80/20	2.8922
939322	AE1-163 E O1	17.7662	80/20	17.7662
939401	AE1-172 C O1	2.6590	80/20	2.6590
939402	AE1-172 E O1	12.4758	80/20	12.4758
939631	AE1-193 C	4.1782	80/20	4.1782
939632	AE1-193 E	27.9618	80/20	27.9618
939641	AE1-194 C	4.1782	80/20	4.1782
939642	AE1-194 E	27.9618	80/20	27.9618
939651	AE1-195 C	4.1782	80/20	4.1782
939652	AE1-195 E	27.9618	80/20	27.9618
939681	AE1-198 C	0.0001	80/20	0.0001
939682	AE1-198 E	7.1511	80/20	7.1511
939781	AE1-209 C O1	0.7793	80/20	0.7793
939782	AE1-209 E O1	5.2151	80/20	5.2151
939791	AE1-210 C O1	0.7793	80/20	0.7793
939792	AE1-210 E O1	5.2151	80/20	5.2151
940101	AE1-252 C O1	0.0001	80/20	0.0001

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
940102	AE1-252 E O1	11.1285	80/20	11.1285
940752	AE2-062 E	0.0769	80/20	0.0769
941561	AE2-153 C O1	2.1861	80/20	2.1861
941562	AE2-153 E O1	10.2347	80/20	10.2347
941571	AE2-154 C	1.9027	80/20	1.9027
941572	AE2-154 E	12.7333	80/20	12.7333
941691	AE2-169	2.7195	80/20	2.7195
941721	AE2-172	3.0124	80/20	3.0124
942042	AE2-216 BAT	7.3045	80/20	7.3045
942421	AE2-255 C O1	1.4810	80/20	1.4810
942422	AE2-255 E O1	4.4430	80/20	4.4430
942651	AE2-281 C O1	0.4132	80/20	0.4132
942652	AE2-281 E O1	2.5380	80/20	2.5380
943021	AE2-325 C	2.7362	80/20	2.7362
943022	AE2-325 E	1.8198	80/20	1.8198
943781	AF1-046 C	3.5529	80/20	3.5529
943782	AF1-046 E	2.3686	80/20	2.3686
943801	AF1-048 C	2.3233	80/20	2.3233
943802	AF1-048 E	1.5489	80/20	1.5489
943921	AF1-060	0.7507	80/20	0.7507
944241	AF1-092 C O1	0.0001	80/20	0.0001
944242	AF1-092 E O1	12.9076	80/20	12.9076
944831	AF1-148 C O1	0.0001	80/20	0.0001
944832	AF1-148 E O1	16.3373	80/20	16.3373
944931	AF1-158 C O1	0.0001	80/20	0.0001
944932	AF1-158 E O1	12.9255	80/20	12.9255
944961	AF1-161 C	2.1820	80/20	2.1820
944962	AF1-161 E	2.1820	80/20	2.1820
945111	AF1-176 C O1	4.4934	80/20	4.4934
945112	AF1-176 E O1	6.7406	80/20	6.7406
945351	AF1-200 FTIR	125.8932	80/20	125.8932
945371	AF1-202 C O1	2.3996	80/20	2.3996
945372	AF1-202 E O1	11.7156	80/20	11.7156
945421	AF1-207 C	2.0264	80/20	2.0264
945422	AF1-207 E	8.7016	80/20	8.7016
946203	AF1-285 BAT	2.4320	80/20	2.4320
946501	AF1-314 C	2.1671	80/20	2.1671
946502	AF1-314 E	10.1459	80/20	10.1459
957331	AF2-027 C	1.4996	80/20	1.4996
957332	AF2-027 E	2.2494	80/20	2.2494
957371	AF2-031 C O1	0.6371	80/20	0.6371
957372	AF2-031 E O1	0.9557	80/20	0.9557
957401	AF2-034 C	0.8260	80/20	0.8260
957402	AF2-034 E	0.7036	80/20	0.7036
958861	AF2-177 C O1	1.9126	80/20	1.9126
958862	AF2-177 E O1	12.7994	80/20	12.7994
959102	AF2-201 E O1	10.1640	80/20	10.1640
959351	AF2-226 C	1.5082	80/20	1.5082
959352	AF2-226 E	2.2623	80/20	2.2623
960281	AF2-319 C	1.5082	80/20	1.5082
960282	AF2-319 E	2.2623	80/20	2.2623
960381	AF2-329	3.9677	80/20	3.9677

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960601	AF2-351 C O1	0.6222	80/20	0.6222
960602	AF2-351 E O1	0.9334	80/20	0.9334
960851	AF2-376 C	1.9074	80/20	1.9074
960852	AF2-376 E	2.8611	80/20	2.8611
960861	AF2-377 C	2.2122	80/20	2.2122
960862	AF2-377 E	3.3183	80/20	3.3183
960971	AF2-388 C	2.6515	80/20	2.6515
960972	AF2-388 E	12.4141	80/20	12.4141

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
AA1-018	Powerton-Goodings Grove	In Service
AB1-006	Meadow Lake 345kV	In Service
AB2-191	Mendota Hills	In Service
AC1-168	Kewanee-Streator	Active
AC1-173	Logtown 138kV	In Service
AC2-080	Olive-Reynolds 345kV	Active
AC2-140	DC Cook Unit 2	In Service
AC2-176	Jay 138 kV	In Service
AD1-067	Mendota Hills	In Service
AD1-100	Loretto-Wilton & Braidwood-Davis Creek	Active
AD2-038	Powerton	Active
AD2-047	Davis Creek 138 kV	Active
AD2-091	Hardin Tap 345kV	Active
AD2-134	Shady Oaks	Active
AD2-138	Olive-Reynolds 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
AE1-209	Desoto 345 kV	Active
AE1-210	Desoto 345 kV	Active
AE1-252	Loretto-Wilton Center	Active
AE2-062	Romeoville 12 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
AE2-172	Mississinewa-Gaston 138 kV	Active
AE2-216	Hardin Switch 345 kV	Active
AE2-255	Molecreek 345 kV	Active
AE2-281	Powerton-Nevada 345 kV	Active
AE2-325	Valley 138 kV	Active
AF1-046	Twin Branch-Guardian 138 kV	Active
AF1-048	Belvidere-Marengo	Active
AF1-060	Lena 138 kV	Active
AF1-092	Huntington Jct. 138 kV	Active

Queue Number	Project Name	Status
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
AF1-207	Reynolds–Olive #1 345 kV	Active
AF1-285	Gunn Road 345 kV	Active
AF1-314	Lena 138 kV	Active
AF2-027	Zion Energy Center 345 kV	Active
AF2-031	River E.C.	Active
AF2-034	Kendall	Active
AF2-177	Sorenson-DeSoto #2 345 kV	Active
AF2-201	Lena-Ecogrove 138 kV	Active
AF2-226	Katydid Road 345 kV	Active
AF2-319	Katydid Road 345 kV	Active
AF2-329	Sandwich-Plano 138 kV	Active
AF2-351	Kensington 138 kV	Active
AF2-376	Timber Switch 138 kV	Active
AF2-377	Logtown 138 kV	Active
AF2-388	Desoto-Sorenson 345 kV	Active

11.9 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_P1-2_#7441-A	CONTINGENCY 'AEP_P1-2_#7441-A' OPEN BRANCH FROM BUS 242928 TO BUS 958430 CKT 1 / 242928 05MARYSV 765 958430 AF2-137 TAP 765 1 END
AEP_P1-2_#7441-B	CONTINGENCY 'AEP_P1-2_#7441-B' OPEN BRANCH FROM BUS 958430 TO BUS 246999 CKT 1 / 958430 AF2-137 TAP 765 246999 05SORENS 765 1 END

12 Short Circuit Analysis

The following Breakers are overdutied:

None.

13 Stability and Reactive Power

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

To be determined in the Facilities Study Phase.

14 Affected Systems

14.1 TVA

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

14.2 Duke Energy Progress

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

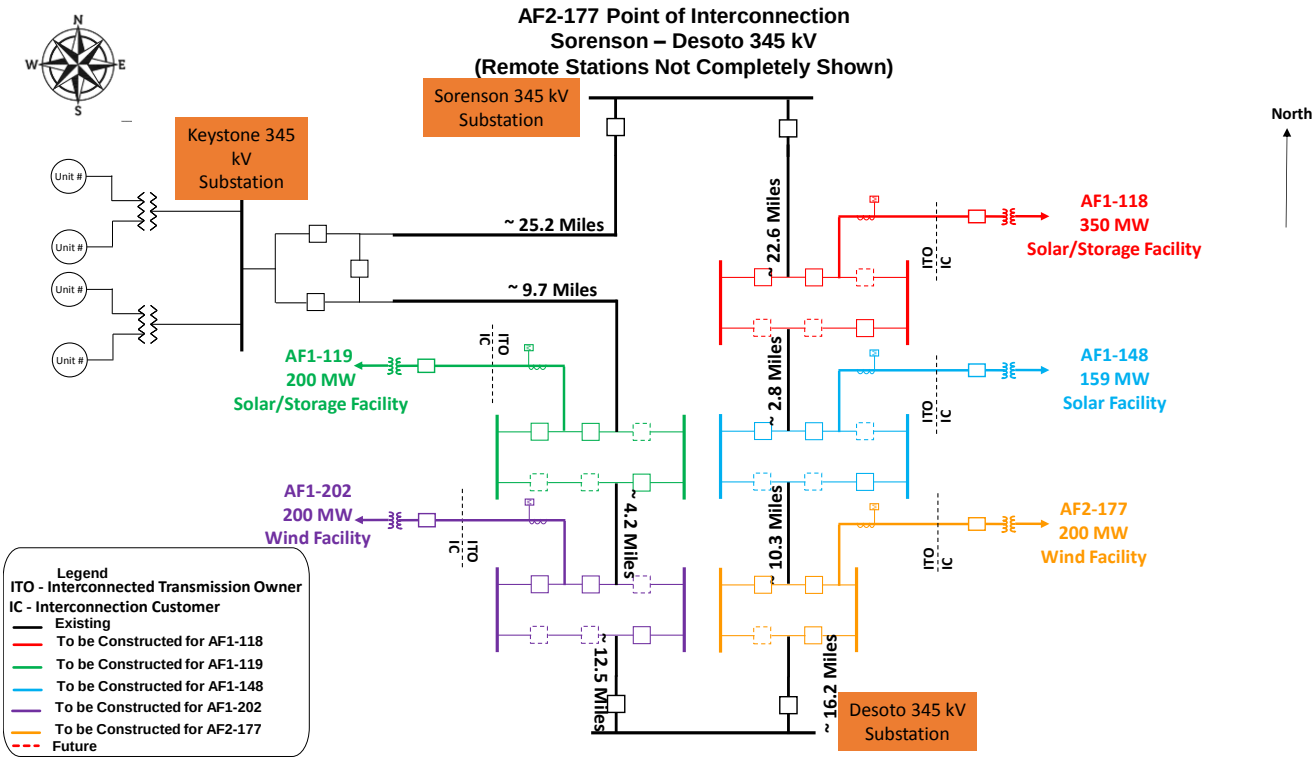
14.3 MISO

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

14.4 LG&E

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

15 Attachment 1: One Line Diagram and Project Site Location



NOTE: Based on review of switching configuration requirements, the diagram above represents several changes from previous versions.