



Revised

Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-349

OLIVE-REYNOLDS #2 345 KV

156 MW Capacity / 260 MW Energy

February 2021

Table of Contents

1	Introduction.....	4
2	Preface.....	4
3	General.....	5
4	Point of Interconnection.....	6
5	Cost Summary.....	7
6	Transmission Owner Scope of Work.....	8
6.1	Attachment Facilities.....	8
6.2	Direct Connection Cost Estimate.....	8
6.3	Non-Direct Connection Cost Estimate.....	8
7	Schedule.....	9
8	Interconnection Customer Requirements.....	9
9	Revenue Metering and SCADA Requirements.....	10
9.1	PJM Requirements.....	10
9.2	Meteorological Data Reporting Requirements.....	10
9.3	Interconnected Transmission Owner Requirements.....	10
10	Summer Peak - Load Flow Analysis - Primary POI.....	11
10.1	Generation Deliverability.....	12
10.2	Multiple Facility Contingency.....	12
10.3	Contribution to Previously Identified Overloads.....	12
10.4	Potential Congestion due to Local Energy Deliverability.....	12
10.5	System Reinforcements - Summer Peak Load Flow - Primary POI.....	13
10.6	Flow Gate Details - Primary POI.....	14
10.6.1	Index 1.....	15
10.6.2	Index 2.....	18
10.7	Queue Dependencies.....	22
10.8	Contingency Descriptions - Primary POI.....	25
11	Short Circuit Analysis - Primary POI.....	27
12	Summer Peak - Load Flow Analysis - Secondary POI.....	28
12.1	Generation Deliverability.....	29
12.2	Multiple Facility Contingency.....	29
12.3	Contribution to Previously Identified Overloads.....	29

12.4	Potential Congestion due to Local Energy Deliverability.....	29
12.5	Flow Gate Details - Secondary POI.....	31
12.5.1	Index 1	32
12.5.2	Index 2	33
12.5.3	Index 3	36
12.5.4	Index 4	40
12.6	Contingency Descriptions - Secondary POI.....	43
13	Affected Systems	47
13.1	TVA.....	47
13.2	Duke Energy Progress.....	47
13.3	MISO	47
13.4	LG&E.....	47

1 Introduction

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

2 Preface

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

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

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

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

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

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Pulaski County, Indiana. The installed facilities will have a total capability of 260 MW with 156 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is June 30, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-349
Project Name	OLIVE-REYNOLDS #2 345 KV
State	Indiana
County	Pulaski
Transmission Owner	AEP
MFO	260
MWE	260
MWC	156
Fuel	Solar
Basecase Study Year	2024

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

4 Point of Interconnection

AG1-349 will interconnect with the AEP transmission system along one of the following Points of Interconnection:

Primary POI: Reynolds to Olive 345 kV line circuit 2.

AG1-349 will interconnect with the AEP transmission system via a new switching station cut into the Olive (AEP) - Reynolds (NIPSCO) 345 kV circuit #2.

To accommodate the interconnection on the Olive (AEP) - Reynolds (NIPSCO) 345 kV circuit #2, a new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

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

Secondary POI: Reynolds to Olive 345 kV line circuit 1.

AG1-349 will interconnect with the AEP transmission system via a new switching station cut into the Olive (AEP) - Reynolds (NIPSCO) 345 kV circuit #1.

To accommodate the interconnection on the Olive (AEP) - Reynolds (NIPSCO) 345 kV circuit #1, a new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 2). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

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

5 Cost Summary

The AG1-349 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$19,777,000*
Total System Network Upgrade Costs	\$10,040,000
Total Costs	\$29,817,000*

*Additional Physical Interconnection costs to be provided by NIPSCO.

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

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

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

6 Transmission Owner Scope of Work

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

6.1 Attachment Facilities

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

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

6.2 Direct Connection Cost Estimate

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

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

6.3 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Olive (AEP) - Reynolds (NIPSCO) 345 kV circuit#2 T-Line Cut In	\$1,210,000
Review Protection and Control Settings at the Olive (AEP) 345 kV substation	\$45,000
Review Protection and Control Settings at the Reynolds (NIPSCO) 345 kV substation	To be provided by NIPSCO*
Total Non-Direct Connection Facility Costs	\$1,255,000*

7 Schedule

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

8 Interconnection Customer Requirements

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

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

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

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

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

9.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter²) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

9.3 Interconnected Transmission Owner Requirements

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

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

10 Summer Peak - Load Flow Analysis - Primary POI

The Queue Project AG1-349 was evaluated as a 260.0 MW (Capacity 156.0 MW) injection tapping the Reynolds to Olive 345 kV line circuit 2 in the AEP area. Project AG1-349 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-349 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

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

None

10.2 Multiple Facility Contingency

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

None

10.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
164554282	242865	05JEFRS O	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	1868.0	158.87	159.88	DC	33.72
164554599	242865	05JEFRS O	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P1-2_#709_546	single	1868.0	141.72	142.08	DC	20.28
167398590	242865	05JEFRS O	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P4_#6189_05HANG	breaker	1868.0	158.87	159.88	DC	33.72
167154532	958430	AF2-137 TAP	765.0	AEP	242928	05MARY SV	765.0	AEP	1	AEP_P4_#1760_05JEFRSO	breaker	4142.0	107.19	107.47	DC	65.71

10.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
164554598	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVEC	Z1	AEP_P1-2_#709_546	operation	1868.0	157.0	157.99	DC	33.8
168476199	255204	17REYNOLDS	765.0	NIPS	243207	05GRNTWN	765.0	AEP	1	AEP_P1-2_#363_1682	operation	2669.0	102.47	103.73	DC	65.1

10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
167154532	2	AF2-137 TAP 765.0 kV - 05MARYSV 765.0 kV Ckt 1	<u>AEP</u> AEPO0047a (473) : Replace one Marysville 765kV CB Project Type : FAC Cost : \$2,000,000 Time Estimate : 12-18 Months	\$2,000,000
164554599,164 554282,167398 590	1	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	<p><u>AEP</u> AEPI0045a (11) : Replace 4 Clifty Switches (3000A) Project Type : FAC Cost : \$2,000,000 Time Estimate : 12-18 Months</p> <p>AEPI0045b (12) : A Sag Study will be required on the 0.75 mile section of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD line to mitigate the overload . New Rating after the Sag Study : S/N: 2354 MVA S/E: 3212 MVA. Depending on the sag study results, cost for this upgrade is expected to be between \$20,000 (No remediations required just sag study) and 1.96 million (complete line reconductor/rebuild required). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : \$20,000 Time Estimate : 6-12 Months</p> <p>AEPI0045c (14) : Replace Clifty Bus 5"0 AL Tubular Sch 40 Project Type : FAC Cost : \$100,000 Time Estimate : 12-18 Months</p> <p>AEPI0045d (13) : Rebuild 0.75 miles of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD conductor to mitigate the overload. Project Type : FAC Cost : \$1,960,000 Time Estimate : 24-36 Months</p> <p>n4106 (23) : Perform a sag study on the 345 kV line between Jefferson and Clifty Creek. The 345 kV line between Jefferson and Clifty Creek can be sag studied to increase the emergency rating from 2354 to 3212. The cost of a sag study to identify any mitigation requirements should cost around \$3,680. If remediation can only be reached through a rebuild, wed expect that to cost around \$1,960,000. Note that the transformer will still be limited to 2919 MVA emergency. Project Type : FAC Cost : \$1,960,000 Time Estimate : N/A Months</p> <p>n4106.1 (25) : Replace 4 Clifty switches (5000A). Project Type : FAC Cost : \$2,000,000 Time Estimate : 12-18 Months</p>	\$8,040,000
			TOTAL COST	\$10,040,000

10.6 Flow Gate Details - Primary POI

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

10.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
167398590	242865	05JEFRS0	AEP	248000	06CLIFTY	OVENC	Z1	AEP_P4_#6189_05HANG	breaker	1868.0	158.87	159.88	DC	33.72

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243441	05CKG2	19.9630	50/50	19.9630
243442	05RKG1	67.7576	50/50	67.7576
243443	05RKG2	64.9593	50/50	64.9593
243859	05FR-11G C	0.5506	50/50	0.5506
243862	05FR-12G C	0.2678	50/50	0.2678
243864	05FR-21G C	0.2785	50/50	0.2785
243866	05FR-22G C	0.2785	50/50	0.2785
243870	05FR-3G C	0.2678	50/50	0.2678
243873	05FR-4G C	0.6234	50/50	0.6234
246909	05MDL-1G C	0.5683	50/50	0.5683
246910	05MDL-2G C	0.3335	50/50	0.3335
246976	05MDL-3G C	0.3357	50/50	0.3357
246979	05MDL-4G C	0.2589	50/50	0.2589
247556	05MDL-5G	0.4432	50/50	0.4432
247900	05FR-11G E	10.6324	50/50	10.6324
247901	05FR-12G E	10.4558	50/50	10.4558
247902	05FR-21G E	11.1755	50/50	11.1755
247903	05FR-22G E	10.7003	50/50	10.7003
247904	05FR-3G E	21.6721	50/50	21.6721
247905	05FR-4G E	16.9738	50/50	16.9738
247906	05MDL-1G E	22.2111	50/50	22.2111
247907	05MDL-2G E	11.1264	50/50	11.1264
247912	05MDL-3G E	11.1264	50/50	11.1264
247913	05MDL-4G E	11.1264	50/50	11.1264
247943	T-127 E	11.1264	50/50	11.1264
250163	Y3-099 BAT	0.2242	50/50	0.2242
250167	08DEO_STUART	0.2207	50/50	0.2207
251823	Z1-065 BAT	0.6484	50/50	0.6484
270100	X2-052 CT1	3.9619	50/50	3.9619
270101	X2-052 CT2	3.9619	50/50	3.9619
270102	X2-052 ST	4.2863	50/50	4.2863
274776	LINCOLN ;7U	1.2717	50/50	1.2717
274777	LINCOLN ;8U	1.2717	50/50	1.2717
930041	AB1-006 C	0.5705	50/50	0.5705
930042	AB1-006 E	24.1999	50/50	24.1999
930461	AB1-087 CT1	53.0501	50/50	53.0501
930462	AB1-087 ST1	42.1769	50/50	42.1769
930471	AB1-088 CT1	53.0501	50/50	53.0501
930472	AB1-088 ST1	42.1769	50/50	42.1769
932601	AC2-080 C O1	3.5064	50/50	3.5064
932602	AC2-080 E O1	23.4656	50/50	23.4656
933281	AC2-140 C	0.6609	50/50	0.6609

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
933282	AC2-140 E	0.2204	50/50	0.2204
933446	AC2-157 1C	6.5793	50/50	6.5793
933447	AC2-157 2C	6.5793	50/50	6.5793
933448	AC2-157 1E	10.7347	50/50	10.7347
933449	AC2-157 2E	10.7347	50/50	10.7347
937041	AD2-138 C	4.7471	50/50	4.7471
937042	AD2-138 E	22.2249	50/50	22.2249
940581	AE2-045 C O1	11.3660	50/50	11.3660
940582	AE2-045 E O1	15.6060	50/50	15.6060
941341	AE2-130 C	152.0256	50/50	152.0256
941342	AE2-130 E	101.3504	50/50	101.3504
941571	AE2-154 C	4.5201	50/50	4.5201
941572	AE2-154 E	30.2499	50/50	30.2499
942601	AE2-276	8.6570	50/50	8.6570
944201	AF1-088 FTIR	173.1400	50/50	173.1400
945391	AF1-204 C O1	6.8620	50/50	6.8620
945392	AF1-204 E O1	20.5861	50/50	20.5861
945421	AF1-207 C O1	4.7705	50/50	4.7705
945422	AF1-207 E O1	20.4853	50/50	20.4853
945501	AF1-215 C O1	22.4748	50/50	22.4748
945502	AF1-215 E O1	14.9832	50/50	14.9832
946581	AF1-322 C	11.6827	50/50	11.6827
946582	AF1-322 E	16.1333	50/50	16.1333
957141	AF2-008 FTIR	86.5700	50/50	86.5700
957142	AF2-008 NFTI	173.1400	50/50	173.1400
957393	AF2-033 BAT	2.2110	50/50	2.2110
957841	AF2-078 C O1	16.8372	50/50	16.8372
957842	AF2-078 E O1	11.2248	50/50	11.2248
958381	AF2-132 C O1	23.2380	50/50	23.2380
958382	AF2-132 E O1	15.4920	50/50	15.4920
958391	AF2-133 C O1	23.6322	50/50	23.6322
958392	AF2-133 E O1	15.7548	50/50	15.7548
958401	AF2-134 C O1	7.4916	50/50	7.4916
958402	AF2-134 E O1	4.9944	50/50	4.9944
958971	AF2-188 C O1	9.4409	50/50	9.4409
958972	AF2-188 E O1	6.2940	50/50	6.2940
958981	AF2-189 C O1	13.7043	50/50	13.7043
958982	AF2-189 E O1	9.1362	50/50	9.1362
959141	AF2-205 C	15.9444	50/50	15.9444
959142	AF2-205 E	10.6296	50/50	10.6296
960681	AF2-359 C	8.0895	50/50	8.0895
960682	AF2-359 E	5.3930	50/50	5.3930
963741	AG1-226 C O1	41.3281	50/50	41.3281
963742	AG1-226 E O1	14.7734	50/50	14.7734
963841	AG1-237 C O1	3.4427	50/50	3.4427
963842	AG1-237 E O1	23.0393	50/50	23.0393
963851	AG1-238 C	9.5301	50/50	9.5301
963852	AG1-238 E	6.3534	50/50	6.3534
964401	AG1-302 C O1	23.2380	50/50	23.2380
964402	AG1-302 E O1	15.4920	50/50	15.4920
964861	AG1-349 C O1	20.2348	50/50	20.2348
964862	AG1-349 E O1	13.4898	50/50	13.4898

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965681	AG1-436 C	8.0895	50/50	8.0895
965682	AG1-436 E	5.3930	50/50	5.3930
965791	AG1-447	5.9323	50/50	5.9323
965801	AG1-448	5.9323	50/50	5.9323
966531	AG1-522 C	42.4188	50/50	42.4188
966532	AG1-522 E	28.2792	50/50	28.2792
966541	AG1-523 C	42.4188	50/50	42.4188
966542	AG1-523 E	28.2792	50/50	28.2792
966551	AG1-524 C	42.4188	50/50	42.4188
966552	AG1-524 E	28.2792	50/50	28.2792
966561	AG1-525 C	42.4188	50/50	42.4188
966562	AG1-525 E	28.2792	50/50	28.2792
966841	AG1-555 C	12.0038	50/50	12.0038
966842	AG1-555 E	4.2910	50/50	4.2910
WEC	WEC	3.0438	Confirmed LTF	3.0438
CALDERWOOD	CALDERWOOD	0.8906	Confirmed LTF	0.8906
LGE-0012019	LGE-0012019	6.4405	LTF	6.4405
CBM-W2	CBM-W2	29.1110	Confirmed LTF	29.1110
NY	NY	0.9783	Confirmed LTF	0.9783
O-066	O-066	12.3697	Confirmed LTF	12.3697
SIGE	SIGE	0.0643	Confirmed LTF	0.0643
CHEOAH	CHEOAH	0.8959	Confirmed LTF	0.8959
G-007	G-007	1.9330	Confirmed LTF	1.9330
HAMLET	HAMLET	1.1192	Confirmed LTF	1.1192
MEC	MEC	12.4117	Confirmed LTF	12.4117
BLUEG	BLUEG	29.4738	Confirmed LTF	29.4738
TRIMBLE	TRIMBLE	10.2630	Confirmed LTF	10.2630
LAGN	LAGN	3.1553	Confirmed LTF	3.1553
CATAWBA	CATAWBA	0.6748	Confirmed LTF	0.6748
CBM-W1	CBM-W1	97.7474	Confirmed LTF	97.7474

10.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
16715453 2	95843 0	AF2- 137 TAP	AEP	24292 8	05MARYS V	AEP	1	AEP_P4_#1760_05JEFRS O	break r	4142. 0	107.19	107.47	DC	65.71

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243071	05BERRINSP G	0.2472	50/50	0.2472
243440	05CKG1	42.8729	50/50	42.8729
243441	05CKG2	53.5008	50/50	53.5008
244415	05OLIV SLR C	0.6656	50/50	0.6656
246397	05ELKHART HY	0.1078	50/50	0.1078
246416	05TWIN BRCH1	0.1633	50/50	0.1633
246422	05MAYFLWER	0.2417	50/50	0.2417
246431	05BUCHANAN	0.1165	50/50	0.1165
247620	Y3-023	0.1850	50/50	0.1850
247643	Z2-116 C	0.0545	50/50	0.0545
247966	05WTRV SLR E	0.5027	Adder	0.59
247967	05OLIV SLR E	0.6656	50/50	0.6656
247969	Z2-116 E	0.3457	50/50	0.3457
270100	X2-052 CT1	9.8655	50/50	9.8655
270101	X2-052 CT2	9.8655	50/50	9.8655
270102	X2-052 ST	10.6734	50/50	10.6734
270142	AA2-116_CT1	15.8406	50/50	15.8406
270143	AA2-116_CT2	15.8406	50/50	15.8406
270144	AA2-116_ST	14.0290	50/50	14.0290
274776	LINCOLN ;7U	3.1469	50/50	3.1469
274777	LINCOLN ;8U	3.1469	50/50	3.1469
274788	SE CHICAG;5U (Deactivation : 01/06/2020)	8.2483	Adder	9.7
274789	SE CHICAG;6U (Deactivation : 01/06/2020)	8.2701	Adder	9.73
274790	SE CHICAG;7U (Deactivation : 01/06/2020)	8.3789	Adder	9.86
274791	SE CHICAG;8U (Deactivation : 01/06/2020)	8.3789	Adder	9.86
274792	SE CHICAG;9U (Deactivation : 01/06/2020)	8.3838	Adder	9.86
274793	SE CHICAG;0U (Deactivation : 01/06/2020)	8.3838	Adder	9.86
274794	SE CHICAG;1U (Deactivation : 01/06/2020)	8.3838	Adder	9.86

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274795	SE CHICAG;2U (Deactivation : 01/06/2020)	8.3838	Adder	9.86
275149	KELLYCK ;1E	30.0058	Adder	35.3
293799	PILOT HIL;1E	30.0058	Adder	35.3
910542	X3-005 E	1.2128	Adder	1.43
930501	AB1-091 CT	65.7455	Adder	77.35
930502	AB1-091 ST	52.2702	Adder	61.49
933281	AC2-140 C	1.7711	50/50	1.7711
933282	AC2-140 E	0.5908	50/50	0.5908
933411	AC2-154 C	4.0722	Adder	4.79
933412	AC2-154 E	6.6442	Adder	7.82
934721	AD1-100 C	13.3091	Adder	15.66
934722	AD1-100 E	62.1092	Adder	73.07
936141	AD2-020 C O1	16.1454	50/50	16.1454
936142	AD2-020 E O1	9.9376	50/50	9.9376
936371	AD2-047 C O1	7.2871	Adder	8.57
936372	AD2-047 E O1	35.5784	Adder	41.86
936461	AD2-060	4.2865	Adder	5.04
936631	AD2-079 C O1	3.1823	50/50	3.1823
936632	AD2-079 E O1	2.1215	50/50	2.1215
939351	AE1-166 C O1	8.8290	Adder	19.6
939352	AE1-166 E O1	8.1499	Adder	18.09
939395	AE1-170 C	16.6314	50/50	16.6314
939396	AE1-170 E	22.9671	50/50	22.9671
939631	AE1-193 C	14.1252	Adder	16.62
939632	AE1-193 E	94.5303	Adder	111.21
939641	AE1-194 C	14.1252	Adder	16.62
939642	AE1-194 E	94.5303	Adder	111.21
939651	AE1-195 C	14.1252	Adder	16.62
939652	AE1-195 E	94.5303	Adder	111.21
939681	AE1-198 C	41.9410	Adder	49.34
939682	AE1-198 E	35.6390	Adder	41.93
941551	AE2-152 C O1	10.1873	Adder	22.61
941552	AE2-152 E O1	6.7916	Adder	15.08
941561	AE2-153 C O1	7.5434	Adder	8.87
941562	AE2-153 E O1	35.3170	Adder	41.55
942241	AE2-236 C O1	10.2502	50/50	10.2502
942242	AE2-236 E O1	4.3930	50/50	4.3930
943001	AE2-323 C	14.6340	Adder	17.22
943002	AE2-323 E	7.1753	Adder	8.44
943021	AE2-325 C	8.1692	50/50	8.1692
943022	AE2-325 E	5.4461	50/50	5.4461
943781	AF1-046 C	6.8307	Adder	8.04
943782	AF1-046 E	4.5538	Adder	5.36
944161	AF1-084 C	14.0357	50/50	14.0357
944162	AF1-084 E	8.0167	50/50	8.0167
944241	AF1-092 C O1	30.2806	50/50	30.2806
944242	AF1-092 E O1	9.2158	50/50	9.2158
944911	AF1-156 C	19.2872	Adder	22.69
944912	AF1-156 E	12.8581	Adder	15.13
944931	AF1-158 C O1	23.9760	50/50	23.9760
944932	AF1-158 E O1	15.9840	50/50	15.9840

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944961	AF1-161 C	6.5207	50/50	6.5207
944962	AF1-161 E	6.5207	50/50	6.5207
945111	AF1-176 C O1	40.6600	50/50	40.6600
945112	AF1-176 E O1	37.6910	50/50	37.6910
945351	AF1-200 FTIR	516.7069	Merchant Transmission	516.7069
945501	AF1-215 C O1	39.2292	Adder	46.15
945502	AF1-215 E O1	26.1528	Adder	30.77
957371	AF2-031 C O1	1.7402	Adder	2.05
957372	AF2-031 E O1	2.6103	Adder	3.07
957891	AF2-083 C O1	26.2870	50/50	26.2870
957892	AF2-083 E O1	13.1435	50/50	13.1435
958001	AF2-094 C	6.9514	50/50	6.9514
958002	AF2-094 E	3.5810	50/50	3.5810
958011	AF2-095 C O1	29.1485	Adder	34.29
958012	AF2-095 E O1	13.7170	Adder	16.14
958021	AF2-096 C	54.6275	Adder	64.27
958022	AF2-096 E	25.7071	Adder	30.24
958381	AF2-132 C O1	38.7365	Adder	45.57
958382	AF2-132 E O1	25.8244	Adder	30.38
958391	AF2-133 C O1	38.4826	Adder	45.27
958392	AF2-133 E O1	25.6550	Adder	30.18
958401	AF2-134 C O1	13.0764	Adder	15.38
958402	AF2-134 E O1	8.7176	Adder	10.26
958431	AF2-137 C	147.9450	50/50	147.9450
958432	AF2-137 E	204.3050	50/50	204.3050
958981	AF2-189 C O1	19.2726	Adder	22.67
958982	AF2-189 E O1	12.8484	Adder	15.12
959001	AF2-191 C O1	17.5415	50/50	17.5415
959002	AF2-191 E O1	11.6943	50/50	11.6943
960591	AF2-350 C O1	12.8597	Adder	15.13
960592	AF2-350 E O1	8.5731	Adder	10.09
960601	AF2-351 C O1	1.7146	Adder	2.02
960602	AF2-351 E O1	2.5719	Adder	3.03
960681	AF2-359 C	20.0610	50/50	20.0610
960682	AF2-359 E	13.3740	50/50	13.3740
960981	AF2-389 C	7.8894	50/50	7.8894
960982	AF2-389 E	5.2596	50/50	5.2596
961051	AF2-396 O1	52.1840	50/50	52.1840
961501	AF2-441 C O1	17.3427	Adder	20.4
961502	AF2-441 E O1	26.0141	Adder	30.6
961631	AG1-003 C	159.2170	50/50	159.2170
961632	AG1-003 E	122.5830	50/50	122.5830
961641	AG1-004	140.9000	50/50	140.9000
962601	AG1-109	6.5207	50/50	6.5207
963701	AG1-222 C	9.5824	Adder	21.27
963702	AG1-222 E	7.7560	Adder	17.22
963851	AG1-238 C	25.5600	50/50	25.5600
963852	AG1-238 E	17.0400	50/50	17.0400
964361	AG1-298 O1	57.3824	Adder	127.37
964401	AG1-302 C O1	20.5304	Adder	45.57
964402	AG1-302 E O1	13.6869	Adder	30.38
964861	AG1-349 C O1	17.7607	Adder	39.42

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
964862	AG1-349 E O1	11.8404	Adder	26.28
965501	AG1-418 C O1	7.9992	50/50	7.9992
965502	AG1-418 E O1	5.3328	50/50	5.3328
965681	AG1-436 C	20.0610	50/50	20.0610
965682	AG1-436 E	13.3740	50/50	13.3740
965791	AG1-447	14.7114	50/50	14.7114
965801	AG1-448	14.7114	50/50	14.7114
965841	AG1-453 C O1	9.6410	Adder	21.4
965842	AG1-453 E O1	6.4273	Adder	14.27
965851	AG1-454 O1	5.7387	Adder	12.74
966431	AG1-512 C	1.8313	Adder	4.07
966432	AG1-512 E	2.7469	Adder	6.1
966651	AG1-535 O1	9.8021	Adder	21.76
WEC	WEC	7.4236	Confirmed LTF	7.4236
LGEE	LGEE	4.8379	Confirmed LTF	4.8379
CBM-W2	CBM-W2	100.2624	Confirmed LTF	100.2624
NY	NY	3.4115	Confirmed LTF	3.4115
TVA	TVA	8.4154	Confirmed LTF	8.4154
O-066	O-066	42.0894	Confirmed LTF	42.0894
SIGE	SIGE	1.8779	Confirmed LTF	1.8779
CBM-S1	CBM-S1	2.4008	Confirmed LTF	2.4008
G-007	G-007	6.5667	Confirmed LTF	6.5667
HAMLET	HAMLET	1.3017	Confirmed LTF	1.3017
MEC	MEC	30.3245	Confirmed LTF	30.3245
LAGN	LAGN	14.5863	Confirmed LTF	14.5863
CATAWBA	CATAWBA	0.5824	Confirmed LTF	0.5824
CBM-W1	CBM-W1	263.5620	Confirmed LTF	263.5620

10.7 Queue Dependencies

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

Queue Number	Project Name	Status
AA2-116	Cook-East Elkhart 345kV	Under Construction
AB1-006	Meadow Lake 345kV	In Service
AB1-087	Sullivan 345kV #1	Active
AB1-088	Sullivan 345kV #2	Active
AB1-091	Davis Creek 345kV	Active
AC2-080	Olive-Reynolds 345kV	Active
AC2-140	DC Cook Unit 2	In Service
AC2-154	Davis Creek 138kV	Active
AC2-157	Sullivan 345 kV	Active
AD1-100	Loretto-Wilton & Braidwood-Davis Creek	Active
AD2-020	Valley 138 kV	Active
AD2-047	Davis Creek 138 kV	Active
AD2-060	Davis Creek 138kV	Active
AD2-079	Capitol Ave 34.5kV	Under Construction
AD2-138	Olive-Reynolds 345kV	Active
AE1-166	Loretto-Wilton & Braidwood-Davis Creek	Active
AE1-170	Kenzie Creek-Colby 138 kV	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
AE2-045	Olive-Reynolds 345 kV	Active
AE2-130	Rockport 765 kV	Active
AE2-152	Loretto-Wilton & Braidwood-Davis Creek	Active
AE2-153	Braidwood-Davis Creek	Active
AE2-154	Meadow Lake 345 kV (MLV VIII)	Active
AE2-236	Columbia-Northeast 138 kV	Active
AE2-276	Sullivan 345kV	Active
AE2-323	Twin Branch-Guardian 138 kV	Active
AE2-325	Valley 138 kV	Active
AF1-046	Twin Branch-Guardian 138 kV	Active
AF1-084	East Hartford-Murch 69 kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-092	Huntington Jct. 138 kV	Active
AF1-156	Braidwood-Davis Creek	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

Queue Number	Project Name	Status
AF1-204	Eugene 345 kV	Active
AF1-207	Reynolds-Olive #1 345 kV	Active
AF1-215	Reynolds-Olive 345 kV	Active
AF1-322	Meadow Lake 345 kV	Active
AF2-008	Sullivan 345 kV	Active
AF2-031	River E.C.	Active
AF2-033	Miami Fort GT 138 kV	Active
AF2-078	Reynolds-Olive #1 345 kV	Active
AF2-083	Ed Lowe-Kenzie Creek 138 kV	Active
AF2-094	Huntington Jct. 138 kV	Active
AF2-095	Wilmington-Davis Creek	Active
AF2-096	Braidwood-East Frankfort 345 kV	Active
AF2-132	Reynolds-Olive #1 345 kV	Active
AF2-133	Reynolds-Olive #2 345 kV	Active
AF2-134	Reynolds-Olive #2 345 kV	Active
AF2-137	Marysville-Sorenson 765 kV	Active
AF2-188	Reynolds-Meadow Lake #1 345 kV	Active
AF2-189	Greentown 138 kV	Active
AF2-191	New Carlisle 138 kV	Active
AF2-205	Olive-Reynolds #2 345 kV	Active
AF2-350	Kensington 138 kV	Active
AF2-351	Kensington 138 kV	Active
AF2-359	Olive-University Park 345 kV	Active
AF2-389	Pokagon-Corey 69 kV	Active
AF2-396	Stinger 138 kV	Active
AF2-441	Burnham 138kV	Active
AG1-003	Marysville-Sorenson 765 kV	Active
AG1-004	Marysville-Sorenson 765 kV	Active
AG1-109	Valley 138 kV	Active
AG1-222	Guardian-Twin Branch 138 kV	Active
AG1-226	Eugene-Dequine 345 kV	Active
AG1-237	Dequine-Eugene 345 kV	Active
AG1-238	Dumont 345 kV	Active
AG1-298	Calumet-Burnham 345 kV	Active
AG1-302	Reynolds-Olive 345 kV	Active
AG1-349	Olive-Reynolds #2 345 kV	Active
AG1-418	Columbia City 138 kV	Active
AG1-436	Olive-University Park 345 kV	Active
AG1-447	Olive-University Park 345 kV	Active
AG1-448	Olive-University Park 345 kV	Active
AG1-453	Guardian 138 kV	Active
AG1-454	Guardian 138 kV	Active
AG1-512	University Park North 345 kV	Active
AG1-522	Sullivan-Rockport 765 kV	Active
AG1-523	Sullivan-Rockport 765 kV	Active
AG1-524	Sullivan-Rockport 765 kV	Active
AG1-525	Sullivan-Rockport 765 kV	Active
AG1-535	State Line-S. Chicago Properties 138 kV	Active
AG1-555	Dequine 345 kV	Active
X2-052	Dumont-Olive 345kV	In Service
X3-005	Wildwood 12kV	In Service
Y3-023	Country Side 12kV	In Service

Queue Number	Project Name	Status
Y3-099	Beckjord 2 MW-1	In Service
Z1-065	Wiley 34.5kV	In Service
Z2-116	Twin Branch 12.47kV	In Service

10.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
AEP_P1-2_#709_546	CONTINGENCY 'AEP_P1-2_#709_546' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#1760_05JEFRSO	CONTINGENCY "'AEP_P4_#1760_05JEFRSO' 765_A" / 1455 OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#6189_05HANG	CONTINGENCY "'AEP_P4_#6189_05HANG' R 765_D1" / 1717 OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNNU 765 242934 05CORNNU 345 1 REMOVE MACHINE 1A FROM BUS 247245 /* 247245 05HRKG1A 18.0 DEFAULT DISPATCH REMOVE MACHINE 1B FROM BUS 247246 /* 247246 05HRKG1B 18.0 DEFAULT DISPATCH REMOVE MACHINE 1S FROM BUS 247247 /* 247247 05HRKG1S 18.0 DEFAULT DISPATCH REMOVE MACHINE 2A FROM BUS 247248 /* 247248 05HRKG2A 18.0 DEFAULT DISPATCH REMOVE MACHINE 2B FROM BUS 247249 /* 247249 05HRKG2B 18.0 DEFAULT DISPATCH REMOVE MACHINE 2S FROM BUS 247250 /* 247250 05HRKG2S 18.0 DEFAULT DISPATCH END
AEP_P1-2_#363_1682	CONTINGENCY 'AEP_P1-2_#363_1682' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END

Contingency Name	Contingency Definition
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765 242934 05CORNU 345 1 REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 1A REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 1B REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 1S REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 2A REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 2B REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 2S END

11 Short Circuit Analysis - Primary POI

The following Breakers are overdutied:

None.

12 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-349 was evaluated as a 260.0 MW (Capacity 156.0 MW) injection tapping the Reynolds to Olive 345 kV line circuit 1 in the AEP area. Project AG1-349 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-349 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

12.1 Generation Deliverability

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

None

12.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
161735974	945420	AF1-207 TAP	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	1	AEP_P7-1_#11043-A	tower	1414.0	90.52	108.91	DC	260.0
170714491	945420	AF1-207 TAP	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	1	AEP_P7-1_#11043-B	tower	1414.0	90.52	108.91	DC	260.0
174269538	945420	AF1-207 TAP	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	1	AEP_P5_#11277_05OLIV_05OLIV	breaker	1414.0	90.52	108.91	DC	260.0

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
164554282	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVOC	Z1	AEP_P4_#6189_05HANG R 765_D1	breaker	1868.0	159.08	160.11	DC	33.75
164554599	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVOC	Z1	AEP_P1-2_#709_546	single	1868.0	141.89	142.26	DC	20.29
174547371	246999	05SORENS	765.0	AEP	958430	AF2-137 TAP	765.0	AEP	1	AEP_P4_#7334_05JEFRSO 765_A2	breaker	4142.0	108.84	109.2	DC	66.75
174452229	255204	17REYNOLDS	765.0	NIPS	243207	05GRNTWN	765.0	AEP	1	AEP_P4_#8648_05JEFRSO 765_B	breaker	2669.0	102.82	104.07	DC	63.69

12.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
164554598	242865	05JEFRSO	345.0	AEP	248000	06CLIFTY	345.0	OVENC	Z1	AEP_P1-2_#709_546	operation	1868.0	157.21	158.21	DC	33.82
168476199	255204	17REYNOLDS	765.0	NIPS	243207	05GRNTWN	765.0	AEP	1	AEP_P1-2_#363_1682	operation	2669.0	102.58	103.83	DC	65.3
169702296	945420	AF1-207 TAP	345.0	AEP	255205	17REYNOLDS	345.0	NIPS	1	Base Case	operation	971.0	97.63	114.28	DC	161.74
169990534	958380	AF2-132 TAP	345.0	AEP	243229	05OLIVE	345.0	AEP	1	255205 17REYNOLDS 345 945420 AF1-207 TAP 345 1	operation	1414.0	90.52	108.91	DC	260.0

12.5 Flow Gate Details - Secondary POI

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

12.5.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJE CT LOADIN G %	POST PROJE CT LOADIN G %	AC D C	MW IMPAC T
174269538	945420	AF1-207 TAP	AEP	255205	17REYNOLDS	NIPS	1	AEP_P5_#11277_05OLIV_05O LIV	breaker	1414.0	90.52	108.91	DC	260.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
932601	AC2-080 C O1	26.0000	50/50	26.0000
932602	AC2-080 E O1	174.0000	50/50	174.0000
937041	AD2-138 C	35.2000	50/50	35.2000
937042	AD2-138 E	164.8000	50/50	164.8000
940581	AE2-045 C O1	84.2800	50/50	84.2800
940582	AE2-045 E O1	115.7200	50/50	115.7200
945421	AF1-207 C O1	34.0000	50/50	34.0000
945422	AF1-207 E O1	146.0000	50/50	146.0000
957841	AF2-078 C O1	120.0000	50/50	120.0000
957842	AF2-078 E O1	80.0000	50/50	80.0000
958381	AF2-132 C O1	180.0000	50/50	180.0000
958382	AF2-132 E O1	120.0000	50/50	120.0000
964861	AG1-349 C O2	156.0000	50/50	156.0000
964862	AG1-349 E O2	104.0000	50/50	104.0000

12.5.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
16455428 2	24286 5	05JEFRS O	AEP	24800 0	06CLIFT Y	OV E C	Z1	AEP_P4_#6189_05HAN G R 765_D1	breake r	1868. 0	159.08	160.11	DC	33.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243441	05CKG2	19.9630	50/50	19.9630
243442	05RKG1	67.7576	50/50	67.7576
243443	05RKG2	64.9593	50/50	64.9593
243859	05FR-11G C	0.5506	50/50	0.5506
243862	05FR-12G C	0.2678	50/50	0.2678
243864	05FR-21G C	0.2785	50/50	0.2785
243866	05FR-22G C	0.2785	50/50	0.2785
243870	05FR-3G C	0.2678	50/50	0.2678
243873	05FR-4G C	0.6234	50/50	0.6234
246909	05MDL-1G C	0.5683	50/50	0.5683
246910	05MDL-2G C	0.3335	50/50	0.3335
246976	05MDL-3G C	0.3357	50/50	0.3357
246979	05MDL-4G C	0.2589	50/50	0.2589
247556	05MDL-5G	0.4432	50/50	0.4432
247900	05FR-11G E	10.6324	50/50	10.6324
247901	05FR-12G E	10.4558	50/50	10.4558
247902	05FR-21G E	11.1755	50/50	11.1755
247903	05FR-22G E	10.7003	50/50	10.7003
247904	05FR-3G E	21.6721	50/50	21.6721
247905	05FR-4G E	16.9738	50/50	16.9738
247906	05MDL-1G E	22.2111	50/50	22.2111
247907	05MDL-2G E	11.1264	50/50	11.1264
247912	05MDL-3G E	11.1264	50/50	11.1264
247913	05MDL-4G E	11.1264	50/50	11.1264
247943	T-127 E	11.1264	50/50	11.1264
250163	Y3-099 BAT	0.2242	50/50	0.2242
250167	08DEO_STUART	0.2207	50/50	0.2207
251823	Z1-065 BAT	0.6484	50/50	0.6484
270100	X2-052 CT1	3.9619	50/50	3.9619
270101	X2-052 CT2	3.9619	50/50	3.9619
270102	X2-052 ST	4.2863	50/50	4.2863
274776	LINCOLN ;7U	1.2717	50/50	1.2717
274777	LINCOLN ;8U	1.2717	50/50	1.2717
930041	AB1-006 C	0.5705	50/50	0.5705
930042	AB1-006 E	24.1999	50/50	24.1999
930461	AB1-087 CT1	53.0501	50/50	53.0501
930462	AB1-087 ST1	42.1769	50/50	42.1769
930471	AB1-088 CT1	53.0501	50/50	53.0501
930472	AB1-088 ST1	42.1769	50/50	42.1769
932601	AC2-080 C O1	3.5064	50/50	3.5064
932602	AC2-080 E O1	23.4656	50/50	23.4656
933281	AC2-140 C	0.6609	50/50	0.6609

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
933282	AC2-140 E	0.2204	50/50	0.2204
933446	AC2-157 1C	6.5793	50/50	6.5793
933447	AC2-157 2C	6.5793	50/50	6.5793
933448	AC2-157 1E	10.7347	50/50	10.7347
933449	AC2-157 2E	10.7347	50/50	10.7347
937041	AD2-138 C	4.7471	50/50	4.7471
937042	AD2-138 E	22.2249	50/50	22.2249
940581	AE2-045 C O1	11.3660	50/50	11.3660
940582	AE2-045 E O1	15.6060	50/50	15.6060
941341	AE2-130 C	152.0256	50/50	152.0256
941342	AE2-130 E	101.3504	50/50	101.3504
941571	AE2-154 C	4.5201	50/50	4.5201
941572	AE2-154 E	30.2499	50/50	30.2499
942601	AE2-276	8.6570	50/50	8.6570
944201	AF1-088 FTIR	173.1400	50/50	173.1400
945391	AF1-204 C O1	6.8620	50/50	6.8620
945392	AF1-204 E O1	20.5861	50/50	20.5861
945421	AF1-207 C O1	4.7705	50/50	4.7705
945422	AF1-207 E O1	20.4853	50/50	20.4853
945501	AF1-215 C O1	22.4748	50/50	22.4748
945502	AF1-215 E O1	14.9832	50/50	14.9832
946581	AF1-322 C	11.6827	50/50	11.6827
946582	AF1-322 E	16.1333	50/50	16.1333
957141	AF2-008 FTIR	86.5700	50/50	86.5700
957142	AF2-008 NFTI	173.1400	50/50	173.1400
957393	AF2-033 BAT	2.2110	50/50	2.2110
957841	AF2-078 C O1	16.8372	50/50	16.8372
957842	AF2-078 E O1	11.2248	50/50	11.2248
958381	AF2-132 C O1	23.2380	50/50	23.2380
958382	AF2-132 E O1	15.4920	50/50	15.4920
958391	AF2-133 C O1	23.6322	50/50	23.6322
958392	AF2-133 E O1	15.7548	50/50	15.7548
958401	AF2-134 C O1	7.4916	50/50	7.4916
958402	AF2-134 E O1	4.9944	50/50	4.9944
958971	AF2-188 C O1	9.4409	50/50	9.4409
958972	AF2-188 E O1	6.2940	50/50	6.2940
958981	AF2-189 C O1	13.7043	50/50	13.7043
958982	AF2-189 E O1	9.1362	50/50	9.1362
959141	AF2-205 C	15.9444	50/50	15.9444
959142	AF2-205 E	10.6296	50/50	10.6296
960681	AF2-359 C	8.0902	50/50	8.0902
960682	AF2-359 E	5.3935	50/50	5.3935
963741	AG1-226 C O2	47.0365	50/50	47.0365
963742	AG1-226 E O2	16.8140	50/50	16.8140
963841	AG1-237 C O2	3.2313	50/50	3.2313
963842	AG1-237 E O2	21.6247	50/50	21.6247
963851	AG1-238 C	9.5301	50/50	9.5301
963852	AG1-238 E	6.3534	50/50	6.3534
964401	AG1-302 C O2	23.1966	50/50	23.1966
964402	AG1-302 E O2	15.4644	50/50	15.4644
964861	AG1-349 C O2	20.2488	50/50	20.2488
964862	AG1-349 E O2	13.4992	50/50	13.4992

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965681	AG1-436 C	8.0902	50/50	8.0902
965682	AG1-436 E	5.3935	50/50	5.3935
965791	AG1-447	5.9328	50/50	5.9328
965801	AG1-448	5.9328	50/50	5.9328
966531	AG1-522 C	42.4188	50/50	42.4188
966532	AG1-522 E	28.2792	50/50	28.2792
966541	AG1-523 C	42.4188	50/50	42.4188
966542	AG1-523 E	28.2792	50/50	28.2792
966551	AG1-524 C	42.4188	50/50	42.4188
966552	AG1-524 E	28.2792	50/50	28.2792
966561	AG1-525 C	42.4188	50/50	42.4188
966562	AG1-525 E	28.2792	50/50	28.2792
966841	AG1-555 C O2	11.0173	50/50	11.0173
966842	AG1-555 E O2	3.9383	50/50	3.9383
WEC	WEC	3.0438	Confirmed LTF	3.0438
CALDERWOOD	CALDERWOOD	0.8906	Confirmed LTF	0.8906
LGE-0012019	LGE-0012019	6.4405	LTF	6.4405
CBM-W2	CBM-W2	29.1110	Confirmed LTF	29.1110
NY	NY	0.9783	Confirmed LTF	0.9783
O-066	O-066	12.3697	Confirmed LTF	12.3697
SIGE	SIGE	0.0643	Confirmed LTF	0.0643
CHEOAH	CHEOAH	0.8959	Confirmed LTF	0.8959
G-007	G-007	1.9330	Confirmed LTF	1.9330
HAMLET	HAMLET	1.1192	Confirmed LTF	1.1192
MEC	MEC	12.4117	Confirmed LTF	12.4117
BLUEG	BLUEG	29.4738	Confirmed LTF	29.4738
TRIMBLE	TRIMBLE	10.2630	Confirmed LTF	10.2630
LAGN	LAGN	3.1553	Confirmed LTF	3.1553
CATAWBA	CATAWBA	0.6748	Confirmed LTF	0.6748
CBM-W1	CBM-W1	97.7474	Confirmed LTF	97.7474

12.5.3 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
174547371	246999	OSSORENS	AEP	958430	AF2-137 TAP	AEP	1	AEP_P4_#7334_05JEFRSO 765_A2	breaker	4142.0	108.84	109.2	DC	66.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243440	05CKG1	42.9497	50/50	42.9497
243441	05CKG2	53.4646	50/50	53.4646
244415	05OLIV SLR C	0.6694	50/50	0.6694
246397	05ELKHART HY	0.1081	50/50	0.1081
246416	05TWIN BRCH1	0.1637	50/50	0.1637
246422	05MAYFLWER	0.2425	50/50	0.2425
246431	05BUCHANAN	0.1170	50/50	0.1170
247643	Z2-116 C	0.0547	50/50	0.0547
247966	05WTRV SLR E	0.5039	Adder	0.59
247967	05OLIV SLR E	0.6694	50/50	0.6694
247969	Z2-116 E	0.3466	50/50	0.3466
270100	X2-052 CT1	9.9262	50/50	9.9262
270101	X2-052 CT2	9.9262	50/50	9.9262
270102	X2-052 ST	10.7391	50/50	10.7391
270142	AA2-116_CT1	15.8708	50/50	15.8708
270143	AA2-116_CT2	15.8708	50/50	15.8708
270144	AA2-116_ST	14.0558	50/50	14.0558
274658	DRESDEN ;2U	29.0404	Adder	34.17
274773	LINCOLN ;4U	3.1992	50/50	3.1992
274774	LINCOLN ;5U	3.1992	50/50	3.1992
274775	LINCOLN ;6U	3.1992	50/50	3.1992
274776	LINCOLN ;7U	3.1992	50/50	3.1992
274777	LINCOLN ;8U	3.1992	50/50	3.1992
274788	SE CHICAG;5U (Deactivation : 01/06/2020)	8.3814	Adder	9.86
274789	SE CHICAG;6U (Deactivation : 01/06/2020)	8.4035	Adder	9.89
274790	SE CHICAG;7U (Deactivation : 01/06/2020)	8.5141	Adder	10.02
274791	SE CHICAG;8U (Deactivation : 01/06/2020)	8.5141	Adder	10.02
274792	SE CHICAG;9U (Deactivation : 01/06/2020)	8.5180	Adder	10.02
274793	SE CHICAG;0U (Deactivation : 01/06/2020)	8.5180	Adder	10.02

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274794	SE CHICAG;1U (Deactivation : 01/06/2020)	8.5180	Adder	10.02
274795	SE CHICAG;2U (Deactivation : 01/06/2020)	8.5180	Adder	10.02
275149	KELLYCK ;1E	30.5890	Adder	35.99
276169	Z1-107 E	4.3256	Adder	5.09
293061	N-015 E	25.9498	Adder	30.53
293799	PILOT HIL;1E	30.5890	Adder	35.99
294392	P-010 E	32.9563	Adder	38.77
910542	X3-005 E	1.2337	Adder	1.45
927451	AC1-142A 1	6.9314	Adder	8.15
927461	AC1-142A 2	6.9314	Adder	8.15
930501	AB1-091 CT	67.0164	Adder	78.84
930502	AB1-091 ST	53.2807	Adder	62.68
932601	AC2-080 C O1	5.6008	Adder	6.59
932602	AC2-080 E O1	37.4823	Adder	44.1
933281	AC2-140 C	1.7699	50/50	1.7699
933282	AC2-140 E	0.5904	50/50	0.5904
933411	AC2-154 C	4.1514	Adder	4.88
933412	AC2-154 E	6.7733	Adder	7.97
934721	AD1-100 C	32.6426	Adder	38.4
934722	AD1-100 E	152.3319	Adder	179.21
936141	AD2-020 C O1	13.7557	Adder	16.18
936142	AD2-020 E O1	8.4667	Adder	9.96
936371	AD2-047 C O1	7.4287	Adder	8.74
936372	AD2-047 E O1	36.2698	Adder	42.67
936461	AD2-060	4.3699	Adder	5.14
936631	AD2-079 C O1	3.1902	50/50	3.1902
936632	AD2-079 E O1	2.1268	50/50	2.1268
937041	AD2-138 C	7.5826	Adder	8.92
937042	AD2-138 E	35.5005	Adder	41.77
937401	AD2-194 1	12.9372	Adder	15.22
937411	AD2-194 2	12.9382	Adder	15.22
938511	AE1-070 1	15.2024	Adder	17.89
938521	AE1-070 2	13.9075	Adder	16.36
939351	AE1-166 C O1	9.0114	Adder	20.0
939352	AE1-166 E O1	8.3182	Adder	18.46
939395	AE1-170 C	16.6704	50/50	16.6704
939396	AE1-170 E	23.0211	50/50	23.0211
939631	AE1-193 C	14.3457	Adder	16.88
939632	AE1-193 E	96.0056	Adder	112.95
939641	AE1-194 C	14.3457	Adder	16.88
939642	AE1-194 E	96.0056	Adder	112.95
939651	AE1-195 C	14.3457	Adder	16.88
939652	AE1-195 E	96.0056	Adder	112.95
939681	AE1-198 C	42.5956	Adder	50.11
939682	AE1-198 E	36.1952	Adder	42.58
940581	AE2-045 C O1	18.1552	Adder	21.36
940582	AE2-045 E O1	24.9279	Adder	29.33
940752	AE2-062 E	0.1147	Adder	0.25
941551	AE2-152 C O1	10.3978	Adder	23.08

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
941552	AE2-152 E O1	6.9318	Adder	15.39
941561	AE2-153 C O1	7.6915	Adder	9.05
941562	AE2-153 E O1	36.0104	Adder	42.37
942241	AE2-236 C O1	10.2464	50/50	10.2464
942242	AE2-236 E O1	4.3913	50/50	4.3913
943001	AE2-323 C	14.6477	Adder	17.23
943002	AE2-323 E	7.1820	Adder	8.45
943021	AE2-325 C	6.9601	Adder	8.19
943022	AE2-325 E	4.6400	Adder	5.46
943781	AF1-046 C	6.8371	Adder	8.04
943782	AF1-046 E	4.5580	Adder	5.36
944161	AF1-084 C	11.9584	Adder	14.07
944162	AF1-084 E	6.8302	Adder	8.04
944241	AF1-092 C O1	25.6662	Adder	30.2
944242	AF1-092 E O1	7.8115	Adder	9.19
944911	AF1-156 C	19.6659	Adder	23.14
944912	AF1-156 E	13.1106	Adder	15.42
944931	AF1-158 C O1	24.1020	50/50	24.1020
944932	AF1-158 E O1	16.0680	50/50	16.0680
944961	AF1-161 C	5.5556	Adder	6.54
944962	AF1-161 E	5.5556	Adder	6.54
945111	AF1-176 C O1	34.6404	Adder	40.75
945112	AF1-176 E O1	32.1110	Adder	37.78
945351	AF1-200 FTIR	526.3121	Merchant Transmission	526.3121
945501	AF1-215 C O1	39.7678	Adder	46.79
945502	AF1-215 E O1	26.5118	Adder	31.19
957371	AF2-031 C O1	1.7684	Adder	2.08
957372	AF2-031 E O1	2.6526	Adder	3.12
957401	AF2-034 C	2.3285	Adder	2.74
957402	AF2-034 E	1.9835	Adder	2.33
957891	AF2-083 C O1	26.3540	50/50	26.3540
957892	AF2-083 E O1	13.1770	50/50	13.1770
958001	AF2-094 C	5.8921	Adder	6.93
958002	AF2-094 E	3.0353	Adder	3.57
958011	AF2-095 C O1	29.7150	Adder	34.96
958012	AF2-095 E O1	13.9835	Adder	16.45
958021	AF2-096 C	55.7026	Adder	65.53
958022	AF2-096 E	26.2130	Adder	30.84
958381	AF2-132 C O1	39.3470	Adder	46.29
958382	AF2-132 E O1	26.2313	Adder	30.86
958391	AF2-133 C O1	39.1298	Adder	46.04
958392	AF2-133 E O1	26.0865	Adder	30.69
958401	AF2-134 C O1	13.2559	Adder	15.6
958402	AF2-134 E O1	8.8373	Adder	10.4
959001	AF2-191 C O1	17.6425	50/50	17.6425
959002	AF2-191 E O1	11.7616	50/50	11.7616
959141	AF2-205 C	25.9814	Adder	30.57
959142	AF2-205 E	17.3210	Adder	20.38
960591	AF2-350 C O1	13.1096	Adder	15.42
960592	AF2-350 E O1	8.7397	Adder	10.28
960601	AF2-351 C O1	1.7479	Adder	2.06
960602	AF2-351 E O1	2.6219	Adder	3.08

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960681	AF2-359 C	20.2095	50/50	20.2095
960682	AF2-359 E	13.4730	50/50	13.4730
960981	AF2-389 C	7.9098	50/50	7.9098
960982	AF2-389 E	5.2732	50/50	5.2732
961051	AF2-396 O1	44.4601	Adder	52.31
961501	AF2-441 C O1	17.6372	Adder	20.75
961502	AF2-441 E O1	26.4557	Adder	31.12
961633	AG1-003 BAT	29.7750	50/50	29.7750
961642	AG1-004 BAT	59.5500	50/50	59.5500
962601	AG1-109	2.9445	Adder	6.54
963701	AG1-222 C	9.5913	Adder	21.29
963702	AG1-222 E	7.7633	Adder	17.23
963851	AG1-238 C	25.6086	50/50	25.6086
963852	AG1-238 E	17.0724	50/50	17.0724
964361	AG1-298 O2	58.3082	Adder	129.43
964401	AG1-302 C O2	20.8661	Adder	46.32
964402	AG1-302 E O2	13.9107	Adder	30.88
964861	AG1-349 C O2	18.0418	Adder	40.05
964862	AG1-349 E O2	12.0278	Adder	26.7
965491	AG1-417 C O2	7.9950	50/50	7.9950
965492	AG1-417 E O2	5.3300	50/50	5.3300
965681	AG1-436 C	20.2095	50/50	20.2095
965682	AG1-436 E	13.4730	50/50	13.4730
965791	AG1-447	14.8203	50/50	14.8203
965801	AG1-448	14.8203	50/50	14.8203
966091	AG1-478 C	1.8220	Adder	4.04
966092	AG1-478 E	0.4584	Adder	1.02
966431	AG1-512 C	1.8634	Adder	4.14
966432	AG1-512 E	2.7951	Adder	6.2
WEC	WEC	7.6123	Confirmed LTF	7.6123
LGEE	LGEE	4.4232	Confirmed LTF	4.4232
CBM-W2	CBM-W2	108.4518	Confirmed LTF	108.4518
NY	NY	3.5475	Confirmed LTF	3.5475
TVA	TVA	9.0468	Confirmed LTF	9.0468
O-066	O-066	43.7248	Confirmed LTF	43.7248
SIGE	SIGE	1.9925	Confirmed LTF	1.9925
CBM-S1	CBM-S1	2.4955	Confirmed LTF	2.4955
G-007	G-007	6.8208	Confirmed LTF	6.8208
HAMLET	HAMLET	1.3271	Confirmed LTF	1.3271
MEC	MEC	31.6624	Confirmed LTF	31.6624
LAGN	LAGN	15.6397	Confirmed LTF	15.6397
CATAWBA	CATAWBA	0.5883	Confirmed LTF	0.5883
CBM-W1	CBM-W1	269.3382	Confirmed LTF	269.3382

12.5.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
17445229	255204	17REYNOLDS	NIPS	243207	05GRNTWN	AEP	1	AEP_P4_#8648_05JEFR SO 765_B	breaker	2669.0	102.82	104.07	DC	63.69

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	22.8611	50/50	22.8611
243443	05RKG2	21.9170	50/50	21.9170
243859	05FR-11G C	1.1126	50/50	1.1126
243862	05FR-12G C	0.5411	50/50	0.5411
243864	05FR-21G C	0.5628	50/50	0.5628
243866	05FR-22G C	0.5628	50/50	0.5628
243870	05FR-3G C	0.5411	50/50	0.5411
243873	05FR-4G C	1.2598	50/50	1.2598
246909	05MDL-1G C	1.2928	50/50	1.2928
246910	05MDL-2G C	0.7587	50/50	0.7587
246976	05MDL-3G C	0.7637	50/50	0.7637
246979	05MDL-4G C	0.5890	50/50	0.5890
247556	05MDL-5G	1.0083	50/50	1.0083
247900	05FR-11G E	21.4855	50/50	21.4855
247901	05FR-12G E	21.1288	50/50	21.1288
247902	05FR-21G E	22.5831	50/50	22.5831
247903	05FR-22G E	21.6227	50/50	21.6227
247904	05FR-3G E	43.7942	50/50	43.7942
247905	05FR-4G E	34.3000	50/50	34.3000
247906	05MDL-1G E	50.5259	50/50	50.5259
247907	05MDL-2G E	25.3104	50/50	25.3104
247912	05MDL-3G E	25.3104	50/50	25.3104
247913	05MDL-4G E	25.3104	50/50	25.3104
247943	T-127 E	25.3104	50/50	25.3104
930041	AB1-006 C	1.2978	50/50	1.2978
930042	AB1-006 E	55.0501	50/50	55.0501
930461	AB1-087 CT1	32.7695	50/50	32.7695
930462	AB1-087 ST1	26.0530	50/50	26.0530
930471	AB1-088 CT1	32.7695	50/50	32.7695
930472	AB1-088 ST1	26.0530	50/50	26.0530
932601	AC2-080 C O1	7.4711	50/50	7.4711
932602	AC2-080 E O1	49.9989	50/50	49.9989
933446	AC2-157 1C	4.0641	50/50	4.0641
933447	AC2-157 2C	4.0641	50/50	4.0641
933448	AC2-157 1E	6.6309	50/50	6.6309
933449	AC2-157 2E	6.6309	50/50	6.6309
937041	AD2-138 C	10.1147	50/50	10.1147
937042	AD2-138 E	47.3553	50/50	47.3553
940581	AE2-045 C O1	24.2179	50/50	24.2179
940582	AE2-045 E O1	33.2521	50/50	33.2521
941341	AE2-130 C	51.2928	50/50	51.2928
941342	AE2-130 E	34.1952	50/50	34.1952

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
941571	AE2-154 C	10.2823	50/50	10.2823
941572	AE2-154 E	68.8126	50/50	68.8126
942601	AE2-276	5.3475	50/50	5.3475
944201	AF1-088 FTIR	106.9500	50/50	106.9500
945391	AF1-204 C O1	7.7195	50/50	7.7195
945392	AF1-204 E O1	23.1585	50/50	23.1585
945421	AF1-207 C O1	11.3217	50/50	11.3217
945422	AF1-207 E O1	48.6165	50/50	48.6165
945501	AF1-215 C O1	36.6552	50/50	36.6552
945502	AF1-215 E O1	24.4368	50/50	24.4368
946581	AF1-322 C	26.5759	50/50	26.5759
946582	AF1-322 E	36.7001	50/50	36.7001
954941	J968 C	6.2824	PJM External (MISO)	6.2824
954942	J968 E	33.9894	PJM External (MISO)	33.9894
955841	J1069 C	9.2115	PJM External (MISO)	9.2115
955842	J1069 E	49.8365	PJM External (MISO)	49.8365
957141	AF2-008 FTIR	53.4750	50/50	53.4750
957142	AF2-008 NFTI	106.9500	50/50	106.9500
957841	AF2-078 C O1	39.9588	50/50	39.9588
957842	AF2-078 E O1	26.6392	50/50	26.6392
958381	AF2-132 C O1	43.0380	50/50	43.0380
958382	AF2-132 E O1	28.6920	50/50	28.6920
958391	AF2-133 C O1	46.3428	50/50	46.3428
958392	AF2-133 E O1	30.8952	50/50	30.8952
958401	AF2-134 C O1	12.2184	50/50	12.2184
958402	AF2-134 E O1	8.1456	50/50	8.1456
958971	AF2-188 C O1	22.4663	50/50	22.4663
958972	AF2-188 E O1	14.9775	50/50	14.9775
959141	AF2-205 C	32.4852	50/50	32.4852
959142	AF2-205 E	21.6568	50/50	21.6568
963741	AG1-226 C O2	81.8971	50/50	81.8971
963742	AG1-226 E O2	29.2754	50/50	29.2754
963841	AG1-237 C O2	5.5052	50/50	5.5052
963842	AG1-237 E O2	36.8428	50/50	36.8428
964401	AG1-302 C O2	42.6888	50/50	42.6888
964402	AG1-302 E O2	28.4592	50/50	28.4592
964861	AG1-349 C O2	38.2153	50/50	38.2153
964862	AG1-349 E O2	25.4769	50/50	25.4769
966531	AG1-522 C	19.2438	50/50	19.2438
966532	AG1-522 E	12.8292	50/50	12.8292
966541	AG1-523 C	19.2438	50/50	19.2438
966542	AG1-523 E	12.8292	50/50	12.8292
966551	AG1-524 C	19.2438	50/50	19.2438
966552	AG1-524 E	12.8292	50/50	12.8292
966561	AG1-525 C	19.2438	50/50	19.2438
966562	AG1-525 E	12.8292	50/50	12.8292
966841	AG1-555 C O2	18.8858	50/50	18.8858
966842	AG1-555 E O2	6.7510	50/50	6.7510
WEC	WEC	1.1680	Confirmed LTF	1.1680
LGEE	LGEE	1.3490	Confirmed LTF	1.3490
CBM-W2	CBM-W2	35.6429	Confirmed LTF	35.6429
NY	NY	0.5585	Confirmed LTF	0.5585

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
TVA	TVA	3.0086	Confirmed LTF	3.0086
O-066	O-066	6.9184	Confirmed LTF	6.9184
SIGE	SIGE	0.5926	Confirmed LTF	0.5926
CBM-S1	CBM-S1	0.8166	Confirmed LTF	0.8166
G-007	G-007	1.0794	Confirmed LTF	1.0794
HAMLET	HAMLET	0.1784	Confirmed LTF	0.1784
MEC	MEC	6.5022	Confirmed LTF	6.5022
LAGN	LAGN	4.6568	Confirmed LTF	4.6568
CATAWBA	CATAWBA	0.0640	Confirmed LTF	0.0640
CBM-W1	CBM-W1	43.6302	Confirmed LTF	43.6302

12.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
AEP_P1-2_#363_1682	CONTINGENCY 'AEP_P1-2_#363_1682' / 873 OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
AEP_P7-1_#11043-A	CONTINGENCY 'AEP_P7-1_#11043-A' OPEN BRANCH FROM BUS 243229 TO BUS 958380 CKT 1 / 243229 05OLIVE 345 958380 AF2-132 TAP 345 1 OPEN BRANCH FROM BUS 243229 TO BUS 945500 CKT 2 / 243229 05OLIVE 345 945500 AF1-215 TAP 345 2 END
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765 242934 05CORNU 345 1 REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 1A REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 1B REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 1S REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 2A REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 2B REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 2S END
Base Case	
AEP_P4_#7334_05JEFRSO 765_A2	CONTINGENCY 'AEP_P4_#7334_05JEFRSO 765_A2' / 2874 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 243208 TO BUS 242865 CKT 2 / 243208 05JEFRSO 765 242865 05JEFRSO 345 2 OPEN BRANCH FROM BUS 242865 TO BUS 248000 CKT Z1 / 242865 05JEFRSO 345 248000 06CLIFTY 345 Z1 END
AEP_P4_#8648_05JEFRSO 765_B	CONTINGENCY 'AEP_P4_#8648_05JEFRSO 765_B' / 1305 OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243208 TO BUS 242865 CKT 2 / 243208 05JEFRSO 765 242865 05JEFRSO 345 2 OPEN BRANCH FROM BUS 242865 TO BUS 248000 CKT Z1 / 242865 05JEFRSO 345 248000 06CLIFTY 345 Z1 END

Contingency Name	Contingency Definition
255205 17REYNOLDS 345 945420 AF1-207 TAP 345 1	CONTINGENCY '255205 17REYNOLDS 345 945420 AF1-207 TAP 345 1' / 1048 OPEN BRANCH FROM BUS 255205 TO BUS 945420 CKT 1 / 255205 17REYNOLDS 345 945420 AF1-207 TAP 345 1 END

AEP_P5_#11277_05OLIV_05OLIV	CONTINGENCY 'AEP_P5_#11277_05OLIV_05OLIV'	/ 1135
	OPEN BRANCH FROM BUS 243215 TO BUS 243229 CKT 1 243229 05OLIVE 345 1	/ 243215 05COOK 345
	OPEN BRANCH FROM BUS 243229 TO BUS 243918 CKT 1 243918 05ELDERBERRY 345 1	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243229 TO BUS 958380 CKT 1 958380 AF2-132 TAP 345 1	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243229 TO BUS 945500 CKT 2 945500 AF1-215 TAP 345 2	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243229 TO BUS 270771 CKT 1 270771 GREENACRE; T 345 1	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243229 TO BUS 960680 CKT 1 960680 AF2-359 TAP 345 1	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2 243353 05OLIVE 138 2	/ 243229 05OLIVE 345
	OPEN BRANCH FROM BUS 243286 TO BUS 246075 CKT ZA 246075 05EDISON1 138 ZA	/ 243286 05EDISON2 138
	OPEN BRANCH FROM BUS 243353 TO BUS 246075 CKT 1 246075 05EDISON1 138 1	/ 243353 05OLIVE 138
	OPEN BRANCH FROM BUS 243297 TO BUS 243352 CKT 1 243352 05NTRDAM 138 1	/ 243297 05GERMAN 138
	OPEN BRANCH FROM BUS 243297 TO BUS 243353 CKT 1 243353 05OLIVE 138 1	/ 243297 05GERMAN 138
	OPEN BRANCH FROM BUS 243353 TO BUS 246092 CKT 1 246092 05NEW CAR_BP 138 1	/ 243353 05OLIVE 138
	OPEN BRANCH FROM BUS 246092 TO BUS 246994 CKT 1 138 246994 05RICKMN 138 1	/ 246092 05NEW CAR_BP
	OPEN BRANCH FROM BUS 243349 TO BUS 244930 CKT Z1 138 244930 05NEW CARLI1 138 Z1	/ 243349 05NEW CARLI2
	OPEN BRANCH FROM BUS 243353 TO BUS 244930 CKT 1 244930 05NEW CARLI1 138 1	/ 243353 05OLIVE 138
	OPEN BRANCH FROM BUS 243353 TO BUS 244173 CKT 1 244173 05SILVER LAK 138 1	/ 243353 05OLIVE 138
	OPEN BRANCH FROM BUS 243353 TO BUS 246345 CKT 1 246345 05OLIVE 69.0 1	/ 243353 05OLIVE 138
	OPEN BRANCH FROM BUS 246342 TO BUS 247599 CKT Z1 69.0 247599 05SNOWBRY SS 69.0 Z1	/ 246342 05MONOFRAX
	OPEN BRANCH FROM BUS 246345 TO BUS 247599 CKT 1 247599 05SNOWBRY SS 69.0 1	/ 246345 05OLIVE 69.0
	REMOVE LOAD C1 FROM BUS 246075 DISPATCH	/* 246075 05EDISON1 138 DEFAULT
	REMOVE LOAD D1 FROM BUS 243297 DISPATCH	/* 243297 05GERMAN 138 DEFAULT
	REMOVE LOAD D2 FROM BUS 243297 DISPATCH	/* 243297 05GERMAN 138 DEFAULT
	REMOVE LOAD D1 FROM BUS 243349 DEFAULT DISPATCH	/* 243349 05NEW CARLI2 138
	REMOVE LOAD C1 FROM BUS 243352 DISPATCH	/* 243352 05NTRDAM 138 DEFAULT
	REMOVE LOAD D4 FROM BUS 243353 DISPATCH	/* 243353 05OLIVE 138 DEFAULT
	REMOVE LOAD D5 FROM BUS 243353 DISPATCH	/* 243353 05OLIVE 138 DEFAULT
	REMOVE LOAD D1 FROM BUS 246994 DISPATCH	/* 246994 05RICKMN 138 DEFAULT
	REMOVE LOAD D2 FROM BUS 244173 DEFAULT DISPATCH	/* 244173 05SILVER LAK 138

Contingency Name	Contingency Definition
	REMOVE LOAD D3 FROM BUS 244173 /* 244173 05SILVER LAK 138 DEFAULT DISPATCH REMOVE LOAD C1 FROM BUS 246342 /* 246342 05MONOFRAX 69.0 DEFAULT DISPATCH END
AEP_P1-2_#709_546	CONTINGENCY 'AEP_P1-2_#709_546' / 1848 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P7-1_#11043-B	CONTINGENCY 'AEP_P7-1_#11043-B' OPEN BRANCH FROM BUS 243229 TO BUS 958380 CKT 1 / 243229 05OLIVE 345 958380 AF2-132 TAP 345 1 OPEN BRANCH FROM BUS 945500 TO BUS 964400 CKT 2 / 945500 AF1-215 TAP 345 964400 AG1-302 TAP 345 2 END

13 Affected Systems

13.1 TVA

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

13.2 Duke Energy Progress

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

13.3 MISO

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

13.4 LG&E

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