Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-391

CENTRAL HARDIN 69 KV

72 MW Capacity / 120 MW Energy

July 2020

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1 Introduction

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

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; Storage generating facility located in Hardin County, Kentucky. The installed facilities will have a total capability of 120 MW with 72 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 15, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-391
Project Name	CENTRAL HARDIN 69 KV
State	Kentucky
County	Hardin
Transmission Owner	EKPC
MFO	120
MWE	120
MWC	72
Fuel	Solar; Storage
Basecase Study Year	2023

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

4 Point of Interconnection

AF2-391 will interconnect with the EKPC transmission system along one of the following Points of Interconnection:

Primary POI: Central Hardin 69 kV substation

Secondary POI: Central Hardin to Stephensburg 69 kV line

5 Cost Summary

The AF2-391 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$910,000
Total System Network Upgrade Costs	$1,790,000
Total Costs	$2,700,000

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

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

6 Transmission Owner Scope of Work

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.

	Total Cost
Install necessary equipment (a 69 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panels) at Central Hardin substation, to accept the IC generator lead line/bus (Estimated time to implement is 12 months)	$780,000
Total Attachment Facility Costs	$780,000

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
Total Direct Connection Facility Costs	$0

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
Install necessary microwave infrastructure at Central Hardin for telecommunications/telemetry needs.	$130,000
Total Non-Direct Connection Facility Costs	$130,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

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

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

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

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 AF2-391 was evaluated as a 120.0 MW (Capacity 72.0 MW) injection at the Central Hardin 69 kV substation in the EKPC area. Project AF2-391 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-391 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)

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
102045974	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	Base Case	single	89.0	85.34	119.65	DC	30.53

10.2 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
157526574	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-2_CENT HARD 138	bus	98.0	35.2	127.07	DC	90.03
157526575	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-3_CHARD W124-804	bus	98.0	33.95	125.23	DC	89.45
157526824	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-5_CHARD W124-848	breaker	98.0	35.2	127.07	DC	90.03
157526825	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-2_CHARD W124-804	breaker	98.0	33.95	125.23	DC	89.45
157526826	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-2_CHARD W124-814	breaker	98.0	31.54	122.82	DC	89.45
157526827	341713	2KARGLE	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-6_CHARD W124-91T	breaker	98.0	31.44	122.71	DC	89.45
112349989	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-3_CHARD W124-814	bus	98.0	90.96	122.14	DC	30.55
157526550	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-3_CHARD W124-804	bus	98.0	90.96	122.14	DC	30.55
157526551	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-4_CHARD W124-91T	bus	98.0	90.96	122.14	DC	30.55
157526841	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-6_CHARD W124-91T	breaker	98.0	90.96	122.14	DC	30.55

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
15752684 2	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-2_CHARD W124-804	breaker	98.0	90.96	122.14	DC	30.55
15752684 3	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-2_CHARD W124-814	breaker	98.0	90.96	122.14	DC	30.55
15752684 4	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P4-5_CHARD W124-848	breaker	98.0	87.21	117.79	DC	29.97

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
98932084	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	single	1451.0	129.85	130.93	DC	15.61
98932088	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	single	1134.0	114.02	115.38	DC	15.39
10204596 9	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	single	98.0	148.25	189.96	DC	40.88
10204555 1	342307	2STEPHENSBRG	69.0	EKPC	342403	2UPTON T	69.0	EKPC	1	EKPC_P2-2_KU HODG 69	bus	39.0	107.85	117.51	DC	8.36
10204554 8	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-2_KU HODG 69	bus	98.0	118.24	135.17	DC	16.59

10.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
98932081	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	operation	1451.0	134.42	136.21	DC	26.02
98932087	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	operation	1134.0	121.81	124.07	DC	25.66
102045968	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHAR D-HARD138	operation	98.0	184.7	254.22	DC	68.13
102045970	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	Base Case	operation	89.0	102.99	160.16	DC	50.88
102046286	342307	2STEPHENSBRG	69.0	EKPC	342403	2UPTON T	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	39.0	98.04	110.1	DC	10.44
102046288	342307	2STEPHENSBRG	69.0	EKPC	342403	2UPTON T	69.0	EKPC	1	Base Case	operation	35.0	91.73	100.81	DC	7.05
112823930	342568	4CENT HARDIN	138.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P1-2_CHAR D-HARD138	operation	175.0	92.62	109.03	DC	28.72
102046217	960170	AF2-308 TAP	69.0	EKPC	342307	2STEPHENSBRG	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	98.0	90.49	123.33	DC	32.18
102046220	960170	AF2-308 TAP	69.0	EKPC	342307	2STEPHENSBRG	69.0	EKPC	1	Base Case	operation	89.0	80.44	102.49	DC	19.62
102046348	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	Base Case	operation	89.0	96.94	118.98	DC	19.62
157526463	960170	AF2-308 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P1-2_CHAR D-HRDBG138	operation	98.0	90.7	111.88	DC	20.76

10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
102045548,112349989,157526843,157526842,157526841,157526844,157526551,157526550	3	AF2-308 TAP 69.0 kV - 2CENT HARDIN 69.0 kV Ckt 1	EKPC EKPC-r0087 (1459) : Increase the maximum operating temperature of the 556 MCM ACSR conductor in the AF2-308 Tap-Central Hardin 69 kV line section to 302 degrees F (4.15 miles) Project Type : FAC Cost : $280,000 Time Estimate : 9.0 Months	$280,000
98932088,98932084	4	7TRIMBL REAC 345.0 kV - 06CLIFTY 345.0 kV Ckt 1	LGEE NonPJMArea (1634) : The external (i.e. Non-PJM) Transmission Owner, LGEE, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : N/A Months	$0
157526825,157526824,157526827,157526826,157526575,157526574	2	2KARGLE 69.0 kV - 2CENT HARDIN 69.0 kV Ckt 1	EKPC EKPC-r0086b (1454) : Replace the 556 MCM ACSR jumpers at the Central Hardin substation using bundled 500 MCM copper or equivalent Project Type : FAC Cost : $15,000 Time Estimate : 6.0 Months EKPC-r0086c (1455) : Rebuild the Central Hardin-Kargle 69 kV line section using 954 MCM ACSS conductor at 392 degrees F (0.6 miles) Project Type : FAC Cost : $450,000 Time Estimate : 12.0 Months	$465,000

ID	Idx	Facility	Upgrade Description	Cost
102045974,102045969	1	2CENT HARDIN 69.0 kV - 2KARGLE 69.0 kV Ckt 1	**EKPC** **EKPC-r0086a (1480) : Increase the maximum operating temperature of the 556 MCM ACSR conductor in the Central Hardin-Kargle 69 kV line section to 302 degrees F (0.6 miles)** **Project Type : FAC** **Cost : $40,000** **Time Estimate : 6.0 Months** **EKPC-r0086b (1481) : Replace the 556 MCM ACSR jumpers at the Central Hardin substation using bundled 500 MCM copper or equivalent** **Project Type : FAC** **Cost : $15,000** **Time Estimate : 6.0 Months** **EKPC-r0086c (1482) : Rebuild the Central Hardin-Kargle 69 kV line section using 954 MCM ACSS conductor at 392 degrees F (0.6 miles)** **Project Type : FAC** **Cost : $450,000** **Time Estimate : 12.0 Months** **EKPC-r0086d (1483) : Change the Zone 3 relay setting at Central Hardin associated with the line protection to at least 190 MVA LTE rating.** **Project Type : FAC** **Cost : $0** **Time Estimate : 6.0 Months** **EKPC-r0086e (1484) : Replace the 750 MCM ACSR jumpers at the Central Hardin substation using bundled 500 MCM copper or equivalent** **Project Type : FAC** **Cost : $15,000** **Time Estimate : 6.0 Months** **EKPC-r0086f (1485) : Replace the 1200A disconnect switches W124-623 and W124-625 at Central Hardin substation and W80-605 at the Kargle tap location..** **Project Type : FAC** **Cost : $300,000** **Time Estimate : 12.0 Months**	$780,000
102045551	5	2STEPHENSBRG 69.0 kV - 2UPTON T 69.0 kV Ckt 1	**EKPC** **EKPC-r0089 (1488) : Increase the maximum operating temperature of the 4/0 ACSR conductor in the Stephensburg-Upton Tap 69 kV line section to 212 degrees F (10.75 miles)** **Project Type : FAC** **Cost : $730,000** **Time Estimate : 18.0 Months**	$730,000
			TOTAL COST	**$1,790,000**

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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
102045969	341287	2CENT HARDIN	EKPC	341713	2KARGLE	EKPC	1	EKPC_P1-2_CHARD-HARD138	single	98.0	148.25	189.96	DC	40.88

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952821	J762	13.4600	PJM External (MISO)	13.4600
957961	AF2-090 C	29.7580	80/20	29.7580
959691	AF2-260 C O1	19.1730	80/20	19.1730
960171	AF2-308	11.7765	80/20	11.7765
960181	AF2-309 C	17.6648	80/20	17.6648
960741	AF2-365 C O1	1.6191	80/20	1.6191
961001	AF2-391 C O1	40.8773	80/20	40.8773
WEC	WEC	0.0438	Confirmed LTF	0.0438
CPLE	CPLE	0.0814	Confirmed LTF	0.0814
CBM-W2	CBM-W2	3.5708	Confirmed LTF	3.5708
NY	NY	0.0061	Confirmed LTF	0.0061
CBM-W1	CBM-W1	1.5387	Confirmed LTF	1.5387
TVA	TVA	0.7840	Confirmed LTF	0.7840
CBM-S2	CBM-S2	0.9768	Confirmed LTF	0.9768
CBM-S1	CBM-S1	2.8457	Confirmed LTF	2.8457
MADISON	MADISON	0.8588	Confirmed LTF	0.8588
MEC	MEC	0.4147	Confirmed LTF	0.4147
BLUEG	BLUEG	1.1024	Confirmed LTF	1.1024
TRIMBLE	TRIMBLE	0.3066	Confirmed LTF	0.3066

10.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
157526824	341713	2KARGLE	EKPC	341287	2CENT HARDIN	EKPC	1	EKPC_P4-5_CHARDW124-848	breaker	98.0	35.2	127.07	DC	90.03

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960172	AF2-308 BAT	15.8222	50/50	15.8222
961003	AF2-391 BAT	90.0300	50/50	90.0300
LGEE	LGEE	0.1877	Confirmed LTF	0.1877
NEWTON	NEWTON	0.0312	Confirmed LTF	0.0312
FARMERCITY	FARMERCITY	0.0062	Confirmed LTF	0.0062
CALDERWOOD	CALDERWOOD	0.1287	Confirmed LTF	0.1287
NY	NY	0.0028	Confirmed LTF	0.0028
PRAIRIE	PRAIRIE	0.3642	Confirmed LTF	0.3642
O-066	O-066	0.0672	Confirmed LTF	0.0672
CHEOAH	CHEOAH	0.1276	Confirmed LTF	0.1276
EDWARDS	EDWARDS	0.0042	Confirmed LTF	0.0042
G-007	G-007	0.0104	Confirmed LTF	0.0104
CATAWBA	CATAWBA	0.0473	Confirmed LTF	0.0473

10.6.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
102045548	960170	AF2-308 TAP	EKPC	341287	2CENT HARDIN	EKPC	1	EKPC_P2-2_KU HODG 69	bus	98.0	118.24	135.17	DC	16.59

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959691	AF2-260 C O1	36.8184	50/50	36.8184
959692	AF2-260 E O1	18.4092	50/50	18.4092
960171	AF2-308	20.0096	50/50	20.0096
960181	AF2-309 C	30.0145	50/50	30.0145
960182	AF2-309 E	20.0096	50/50	20.0096
960741	AF2-365 C O1	3.3723	50/50	3.3723
960742	AF2-365 E O1	2.2482	50/50	2.2482
961003	AF2-391 BAT	16.5936	50/50	16.5936
WEC	WEC	0.0079	Confirmed LTF	0.0079
CPLE	CPLE	0.0880	Confirmed LTF	0.0880
G-007A	G-007A	0.0240	Confirmed LTF	0.0240
VFT	VFT	0.0645	Confirmed LTF	0.0645
CBM-W2	CBM-W2	1.8018	Confirmed LTF	1.8018
CBM-W1	CBM-W1	0.3378	Confirmed LTF	0.3378
TVA	TVA	0.6342	Confirmed LTF	0.6342
CBM-S2	CBM-S2	1.0057	Confirmed LTF	1.0057
CBM-S1	CBM-S1	2.4623	Confirmed LTF	2.4623
TILTON	TILTON	0.0189	Confirmed LTF	0.0189
MADISON	MADISON	0.4778	Confirmed LTF	0.4778
MEC	MEC	0.1891	Confirmed LTF	0.1891
GIBSON	GIBSON	0.0513	Confirmed LTF	0.0513
BLUEG	BLUEG	0.8802	Confirmed LTF	0.8802
TRIMBLE	TRIMBLE	0.2460	Confirmed LTF	0.2460

10.6.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
98932084	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	129.85	130.93	DC	15.61

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	14.5062	80/20	14.5062
243443	05RKG2	14.2864	80/20	14.2864
342900	1COOPER1 G	2.4207	80/20	2.4207
342903	1COOPER2 G	4.6942	80/20	4.6942
342918	1JKCT 1G	1.8896	80/20	1.8896
342921	1JKCT 2G	1.3706	80/20	1.3706
342924	1JKCT 3G	1.8896	80/20	1.8896
342927	1JKCT 4G	1.2540	80/20	1.2540
342930	1JKCT 5G	1.2472	80/20	1.2472
342933	1JKCT 6G	1.2540	80/20	1.2540
342936	1JKCT 7G	1.2540	80/20	1.2540
342939	1JKCT 9G	1.2895	80/20	1.2895
342942	1JKCT 10G	1.2895	80/20	1.2895
342945	1LAUREL 1G	1.3659	80/20	1.3659
925981	AC1-074 C O1	3.9855	80/20	3.9855
930461	AB1-087	35.0735	80/20	35.0735
930471	AB1-088	35.0735	80/20	35.0735
932551	AC2-075 C	0.9466	80/20	0.9466
933441	AC2-157 C	4.8465	80/20	4.8465
936381	AD2-048 C	3.4301	80/20	3.4301
936571	AD2-072 C O1	10.1176	80/20	10.1176
939131	AE1-143 C	9.5735	80/20	9.5735
940041	AE1-246 C O1	11.9517	80/20	11.9517
940831	AE2-071 C	3.0314	80/20	3.0314
941341	AE2-130 C	30.5808	80/20	30.5808
941411	AE2-138 C	15.1422	80/20	15.1422
941981	AE2-210 C O1	5.2176	80/20	5.2176
942411	AE2-254 C O1	4.0278	80/20	4.0278
942591	AE2-275 C O1	6.8134	80/20	6.8134
942601	AE2-276	3.1885	80/20	3.1885
942891	AE2-308 C O1	11.5071	80/20	11.5071
943111	AE2-339 C	2.5623	80/20	2.5623
943701	AF1-038 C	4.6588	80/20	4.6588
943821	AF1-050 C	5.4126	80/20	5.4126
944151	AF1-083 C O1	4.9790	80/20	4.9790
944201	AF1-088 FTIR	63.7700	80/20	63.7700
944511	AF1-116 C	10.7366	80/20	10.7366
944621	AF1-127 C O1	4.4322	80/20	4.4322
945381	AF1-203 C	1.7322	80/20	1.7322
945541	AF1-219 C O1	3.2077	80/20	3.2077
945861	AF1-251 C	10.7144	80/20	10.7144
946021	AF1-267 C	3.8151	80/20	3.8151

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952811	J759	9.7391	PJM External (MISO)	9.7391
952821	J762	30.0320	PJM External (MISO)	30.0320
952861	J783 C	9.3334	PJM External (MISO)	9.3334
953611	J800	14.1350	PJM External (MISO)	14.1350
953931	J856	9.4496	PJM External (MISO)	9.4496
955451	J1027	13.7985	PJM External (MISO)	13.7985
955461	J1028	15.2805	PJM External (MISO)	15.2805
955891	J1074	23.0880	PJM External (MISO)	23.0880
956911	J1189	0.4479	PJM External (MISO)	0.4479
957141	AF2-008 FTIR	31.8850	80/20	31.8850
957961	AF2-090 C	16.4592	80/20	16.4592
959691	AF2-260 C O1	11.9778	80/20	11.9778
960151	AF2-306	1.6749	80/20	1.6749
960161	AF2-307 C	2.5510	80/20	2.5510
960171	AF2-308	5.7854	80/20	5.7854
960181	AF2-309 C	8.6780	80/20	8.6780
960621	AF2-353 C	35.6776	80/20	35.6776
960641	AF2-355 C O1	15.1214	80/20	15.1214
960741	AF2-365 C O1	4.7367	80/20	4.7367
961001	AF2-391 C O1	15.6096	80/20	15.6096
961281	AF2-419 C	1.8240	80/20	1.8240
961291	AF2-420 C	1.8240	80/20	1.8240
WEC	WEC	0.6634	Confirmed LTF	0.6634
LGEE	LGEE	18.1402	Confirmed LTF	18.1402
CPLE	CPLE	1.1986	Confirmed LTF	1.1986
CBM-W2	CBM-W2	56.1670	Confirmed LTF	56.1670
NY	NY	0.2737	Confirmed LTF	0.2737
CBM-W1	CBM-W1	19.6532	Confirmed LTF	19.6532
TVA	TVA	9.5130	Confirmed LTF	9.5130
CBM-S2	CBM-S2	14.7563	Confirmed LTF	14.7563
CBM-S1	CBM-S1	97.4858	Confirmed LTF	97.4858
MADISON	MADISON	12.3480	Confirmed LTF	12.3480
MEC	MEC	6.0890	Confirmed LTF	6.0890

10.6.5 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
102045551	342307	2STEPHENSBRG	EKPC	342403	2UPTON T	EKPC	1	EKPC_P2-2_KU HODG 69	bus	39.0	107.85	117.51	DC	8.36

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959691	AF2-260 C O1	11.8140	50/50	11.8140
959692	AF2-260 E O1	5.9070	50/50	5.9070
960171	AF2-308	4.0634	50/50	4.0634
960181	AF2-309 C	6.0950	50/50	6.0950
960182	AF2-309 E	4.0634	50/50	4.0634
961001	AF2-391 C O1	2.2608	Adder	5.02
961002	AF2-391 E O1	1.5072	Adder	3.35
WEC	WEC	0.0063	Confirmed LTF	0.0063
LGEE	LGEE	0.1090	Confirmed LTF	0.1090
FARMERCITY	FARMERCITY	0.0021	Confirmed LTF	0.0021
CALDERWOOD	CALDERWOOD	0.1004	Confirmed LTF	0.1004
NY	NY	0.0044	Confirmed LTF	0.0044
CBM-W1	CBM-W1	0.1751	Confirmed LTF	0.1751
PRAIRIE	PRAIRIE	0.1007	Confirmed LTF	0.1007
O-066	O-066	0.0739	Confirmed LTF	0.0739
CHEOAH	CHEOAH	0.0991	Confirmed LTF	0.0991
G-007	G-007	0.0114	Confirmed LTF	0.0114
CATAWBA	CATAWBA	0.0350	Confirmed LTF	0.0350

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
AB1-087	Sullivan 345kV #1	Active
AB1-088	Sullivan 345kV #2	Active
AC1-074	Jacksonville-Renaker 138kV I	Active
AC2-075	Great Blue Heron Solar	Active
AC2-157	Sullivan 345 kV	Active
AD2-048	Cynthia-Headquarters 69 kV	Active
AD2-072	Van Arsdell-Mercer Industrial 69kV	Active
AE1-143	Marion County 161 kV	Active
AE1-246	Barren County-Summer Shade 161 kV	Active
AE2-071	Patton Rd-Summer Shade 69 kV	Active
AE2-130	Rockport 765 kV	Active
AE2-138	Avon-North Clark 345 kV	Active
AE2-210	Avon-North Clark 345 kV	Active
AE2-254	Garrard County-Tommy-Gooch 69 kV	Active
AE2-275	JK Smith-Fawkes 138 kV	Active
AE2-276	Sullivan 345kV	Active
AE2-308	Three Forks-Dale 138 kV	Active
AE2-339	Avon 138 kV	Active
AF1-038	Sewellton Jct-Webbs Crossroads 69 kV	Active
AF1-050	Summer Shade - Green County 161 kV	Active
AF1-083	Green County-Saloma 161 kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-116	Marion County 161 kV	Active
AF1-127	Avon 345 kV	Active
AF1-203	Patton Rd-Summer Shade 69 kV	Active
AF1-219	Hunt Farm 69 kV	Active
AF1-251	Avon-North Clark 345 kV	Active
AF1-267	Union City Tap 138 kV	Active
AF2-008	Sullivan 345 kV	Active
AF2-090	Central Hardin 138 kV	Active
AF2-260	Stephensburg 69 kV	Active
AF2-306	Hope-Blevins Valley Tap 69 kV	Active
AF2-307	Hope-Blevins Valley Tap 69 kV	Active
AF2-308	Central Hardin-Stephensburg 69 kV	Active
AF2-309	Central Hardin-Stephensburg 69 kV	Active
AF2-353	Rockport 765 kV	Active
AF2-355	West Gerrard-J.K. Smith 345 nkV	Active
AF2-365	Munfordville KU Tap-Horse Cave Jct. 69 kV	Active
AF2-391	Central Hardin 69 kV	Active

Queue Number	Project Name	Status
AF2-419	Hunt Farm-Ballard 69 kV	Active
AF2-420	Hunt Farm-Ballard 69 kV	Active
J1027	MISO	MISO
J1028	MISO	MISO
J1074	MISO	MISO
J1189	MISO	MISO
J759	MISO	MISO
J762	MISO	MISO
J783	MISO	MISO
J800	MISO	MISO
J856	MISO	MISO

10.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
EKPC_P4-2_CHARD W124-814	CONTINGENCY 'EKPC_P4-2_CHARD W124-814' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P2-4_CHARD W124-91T	CONTINGENCY 'EKPC_P2-4_CHARD W124-91T' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P4-2_CHARD W124-804	CONTINGENCY 'EKPC_P4-2_CHARD W124-804' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
EKPC_P2-3_CHARD W124-814	CONTINGENCY 'EKPC_P2-3_CHARD W124-814' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P1-2_CHARD-HRDBG138	CONTINGENCY 'EKPC_P1-2_CHARD-HRDBG138' /* CENTRAL HARDIN - HARDINSBURG OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 END

Contingency Name	Contingency Definition
EKPC_P2-3_CHARD W124-804	CONTINGENCY 'EKPC_P2-3_CHARD W124-804' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 END
EKPC_P4-5_CHARD W124-848	CONTINGENCY 'EKPC_P4-5_CHARD W124-848' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 END
EKPC_P1-2_CHARD-HARD138	CONTINGENCY 'EKPC_P1-2_CHARD-HARD138' /* CENTRAL HARDIN - KU HARDIN OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P2-2_CENT HARD 138	CONTINGENCY 'EKPC_P2-2_CENT HARD 138' /* CENTRAL HARDIN 138 BUS OPEN BRANCH FROM BUS 341287 TO BUS 342568 CKT 1 /* 341287 2CENT HARDIN69.000 342568 4CENT HARDIN138.00 END
Base Case	
EKPC_P4-6_CHARD W124-91T	CONTINGENCY 'EKPC_P4-6_CHARD W124-91T' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P1-2_C HAR-KU ETN69	CONTINGENCY 'EKPC_P1-2_C HAR-KU ETN69' /* CENTRAL HARDIN - KU ETOWN OPEN BRANCH FROM BUS 341287 TO BUS 341713 CKT 1 /* 341287 2CENT HARDIN69.000 341713 2KARGLE 69.000 OPEN BRANCH FROM BUS 324519 TO BUS 341713 CKT 1 /* 324519 2ETOWN KU 69.000 341713 2KARGLE 69.000 END
EKPC_P2-2_KU HODG 69	CONTINGENCY 'EKPC_P2-2_KU HODG 69' /* KU HODGENVILLE 69 TIE OPEN BUS 341632 /* 2HODGENVILLE END

11 Light Load Analysis

Light Load Studies (As applicable)

To be determined during later study phases.

12 Short Circuit Analysis – Primary POI

The following Breakers are overdutied:

To be determined during later study phases.

13 Stability and Reactive Power Assessment

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

To be determined during later study phases.

14 Affected Systems

14.1 LG&E

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

14.2 MISO

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

14.3 TVA

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

14.4 Duke Energy Progress

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

15 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AF2-391 was evaluated as a 120.0 MW (Capacity 72.0 MW) injection tapping the Central Hardin to Stephensburg 69 kV line in the EKPC area. Project AF2-391 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-391 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

15.1 Generation Deliverability

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

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
10204597 4	34128 7	2CENT HARDIN	69. 0	EKPC	34171 3	2KARGLE	69. 0	EKPC	1	Base Case	singl e	89.0	91.98	121.43	DC	26.22
15357063 7	95969 0	AF2-260 TAP	69. 0	EKPC	34230 7	2STEPHENSBR G	69. 0	EKPC	1	EKPC_P1-2_CHARD - HARD138	singl e	98.0	96.82	118.68	DC	21.42
15357063 8	95969 0	AF2-260 TAP	69. 0	EKPC	34230 7	2STEPHENSBR G	69. 0	EKPC	1	Base Case	singl e	89.0	96.59	118.57	DC	19.57
15357080 9	96017 0	AF2-308 TAP	69. 0	EKPC	95969 0	AF2-260 TAP	69. 0	EKPC	1	EKPC_P1-2_C HAR-KU ETN69	singl e	98.0	79.48	106.05	DC	26.04
15357054 9	96100 0	AF2-391 TAP	69. 0	EKPC	34128 7	2CENT HARDIN	69. 0	EKPC	1	Base Case	singl e	89.0	71.42	130.34	DC	52.43
15357055 0	96100 0	AF2-391 TAP	69. 0	EKPC	34128 7	2CENT HARDIN	69. 0	EKPC	1	EKPC_P1-2_STEPH-KUEAST6 9	singl e	98.0	64.52	121.53	DC	55.88

15.2 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
10204555 1	34230 7	2STEPHENSBR G	69. 0	EKPC	34240 3	2UPTO N T	69. 0	EKPC	1	EKPC_P2-2_KU HODG 69	bus	39.0	97.67	131.41	DC	13.16

15.3 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
98932084	32401 0	7TRIMBL REAC	345. 0	LGEE	24800 0	06CLIFTY	345. 0	OVEC	1	AEP_P1-2_#363	singl e	1451. 0	129.83	130.88	DC	15.22
98932085	32401 0	7TRIMBL REAC	345. 0	LGEE	24800 0	06CLIFTY	345. 0	OVEC	1	AEP_P1-2_#1013 6	singl e	1451. 0	124.25	125.31	DC	15.25
98932088	32401 0	7TRIMBL REAC	345. 0	LGEE	24800 0	06CLIFTY	345. 0	OVEC	1	Base Case	singl e	1134. 0	114.0	115.33	DC	15.0
10204596 9	34128 7	2CENT HARDIN	69.0	EKPC	34171 3	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHAR D-HARD138	singl e	98.0	154.74	190.72	DC	35.26
15309012 8	34128 7	2CENT HARDIN	69.0	EKPC	34171 3	2KARGLE	69.0	EKPC	1	EKPC_P2-4_CHAR D W124-91T	bus	98.0	189.42	268.73	DC	77.72

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
100346027	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	180.98	227.37	DC	35.26
100346032	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	Base Case	single	66.0	102.66	142.38	DC	26.22
153570636	959690	AF2-260 TAP	69.0	EKPC	342307	2STEPHENSBRG	69.0	EKPC	1	EKPC_P1-2_C HAR-KU ETN69	single	98.0	107.69	134.26	DC	26.04
153090108	961000	AF2-391 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-2_STEPBG 69	bus	98.0	191.73	314.18	DC	120.0
153090109	961000	AF2-391 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P2-2_KU HODG 69	bus	98.0	130.32	226.3	DC	94.05

15.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
98932081	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	operation	1451.0	134.37	136.12	DC	25.37
98932087	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	operation	1134.0	121.76	123.96	DC	25.0
102045968	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	operation	98.0	193.52	253.49	DC	58.77
102045970	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	Base Case	operation	89.0	111.31	160.4	DC	43.69
102046346	341533	2GLENDALE	69.0	EKPC	341632	2HODGENVILLE	69.0	EKPC	1	EKPC_P1-2_C HAR-KU ETN69	operation	66.0	85.6	110.18	DC	16.22
100346026	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	operation	76.0	230.99	308.32	DC	58.77
100346028	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	Base Case	operation	66.0	128.74	194.94	DC	43.69

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
102046286	342307	2STEPHENSBRG	69.0	EKPC	342403	2UPTON T	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	39.0	90.94	126.3	DC	13.79
100346320	342568	4CENT HARDIN	138.0	EKPC	324261	4HARDIN CO	138.0	LGEE	1	EKPC_P1-2_CHAR-KUETN69	operation	265.0	93.75	117.17	DC	62.06
153570631	959690	AF2-260 TAP	69.0	EKPC	342307	2STEPHENSBRG	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	98.0	132.95	177.24	DC	43.4
153570633	959690	AF2-260 TAP	69.0	EKPC	342307	2STEPHENSBRG	69.0	EKPC	1	Base Case	operation	89.0	119.73	156.37	DC	32.61
153570804	960170	AF2-308 TAP	69.0	EKPC	959690	AF2-260 TAP	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	98.0	90.59	134.87	DC	43.4
153570806	960170	AF2-308 TAP	69.0	EKPC	959690	AF2-260 TAP	69.0	EKPC	1	Base Case	operation	89.0	80.56	117.2	DC	32.61
153570544	961000	AF2-391 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	Base Case	operation	89.0	115.51	213.7	DC	87.39
153570545	961000	AF2-391 TAP	69.0	EKPC	341287	2CENT HARDIN	69.0	EKPC	1	EKPC_P1-2_STEPH-KUEAST69	operation	98.0	108.39	203.42	DC	93.13
153571012	961000	AF2-391 TAP	69.0	EKPC	960170	AF2-308 TAP	69.0	EKPC	1	EKPC_P1-2_CHAR-KUETN69	operation	98.0	62.01	106.29	DC	43.4

15.5 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".

15.5.1 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
153090128	341287	2CENT HARDIN	EKPC	341713	2KARGLE	EKPC	1	EKPC_P2-4_CHARDW124-91T	bus	98.0	189.42	268.73	DC	77.72

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
957961	AF2-090 C	54.8614	50/50	54.8614
957962	AF2-090 E	27.1326	50/50	27.1326
959691	AF2-260 C O2	32.5398	50/50	32.5398
959692	AF2-260 E O2	16.2699	50/50	16.2699
960171	AF2-308	15.7094	50/50	15.7094
960181	AF2-309 C	23.5641	50/50	23.5641
960182	AF2-309 E	15.7094	50/50	15.7094
960741	AF2-365 C O2	4.1397	50/50	4.1397
960742	AF2-365 E O2	2.7598	50/50	2.7598
961001	AF2-391 C O2	46.6337	50/50	46.6337
961002	AF2-391 E O2	31.0891	50/50	31.0891
WEC	WEC	0.0069	Confirmed LTF	0.0069
CPLE	CPLE	0.0728	Confirmed LTF	0.0728
G-007A	G-007A	0.0192	Confirmed LTF	0.0192
VFT	VFT	0.0516	Confirmed LTF	0.0516
CBM-W2	CBM-W2	1.5315	Confirmed LTF	1.5315
CBM-W1	CBM-W1	0.3002	Confirmed LTF	0.3002
TVA	TVA	0.5264	Confirmed LTF	0.5264
CBM-S2	CBM-S2	0.8323	Confirmed LTF	0.8323
CBM-S1	CBM-S1	2.0192	Confirmed LTF	2.0192
TILTON	TILTON	0.0132	Confirmed LTF	0.0132
MADISON	MADISON	0.4012	Confirmed LTF	0.4012
MEC	MEC	0.1589	Confirmed LTF	0.1589
GIBSON	GIBSON	0.0349	Confirmed LTF	0.0349
BLUEG	BLUEG	0.7673	Confirmed LTF	0.7673
TRIMBLE	TRIMBLE	0.2137	Confirmed LTF	0.2137

15.5.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
153570636	959690	AF2-260 TAP	EKPC	342307	2STEPHENSBRG	EKPC	1	EKPC_P1-2_C HAR-KU ETN69	single	98.0	107.69	134.26	DC	26.04

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
957961	AF2-090 C	5.0482	80/20	5.0482
959691	AF2-260 C O2	27.7452	80/20	27.7452
960171	AF2-308	12.4463	80/20	12.4463
960181	AF2-309 C	18.6694	80/20	18.6694
961001	AF2-391 C O2	26.0381	80/20	26.0381
WEC	WEC	0.0013	Confirmed LTF	0.0013
LGEE	LGEE	0.1820	Confirmed LTF	0.1820
NEWTON	NEWTON	0.0043	Confirmed LTF	0.0043
FARMERCITY	FARMERCITY	0.0053	Confirmed LTF	0.0053
CALDERWOOD	CALDERWOOD	0.1342	Confirmed LTF	0.1342
NY	NY	0.0044	Confirmed LTF	0.0044
PRAIRIE	PRAIRIE	0.3100	Confirmed LTF	0.3100
CHEOAH	CHEOAH	0.1326	Confirmed LTF	0.1326
CATAWBA	CATAWBA	0.0486	Confirmed LTF	0.0486

15.5.3 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
153570809	960170	AF2-308 TAP	EKPC	959690	AF2-260 TAP	EKPC	1	EKPC_P1-2_C HAR-KU ETN69	single	98.0	79.48	106.05	DC	26.04

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
957961	AF2-090 C	5.0482	80/20	5.0482
960171	AF2-308	12.4463	80/20	12.4463
960181	AF2-309 C	18.6694	80/20	18.6694
961001	AF2-391 C O2	26.0381	80/20	26.0381
WEC	WEC	0.0013	Confirmed LTF	0.0013
LGEE	LGEE	0.1820	Confirmed LTF	0.1820
NEWTON	NEWTON	0.0043	Confirmed LTF	0.0043
FARMERCITY	FARMERCITY	0.0053	Confirmed LTF	0.0053
CALDERWOOD	CALDERWOOD	0.1342	Confirmed LTF	0.1342
NY	NY	0.0044	Confirmed LTF	0.0044
PRAIRIE	PRAIRIE	0.3100	Confirmed LTF	0.3100
CHEOAH	CHEOAH	0.1326	Confirmed LTF	0.1326
CATAWBA	CATAWBA	0.0486	Confirmed LTF	0.0486

15.5.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
153090108	961000	AF2-391 TAP	EKPC	341287	2CENT HARDIN	EKPC	1	EKPC_P2-2_STEPBG 69	bus	98.0	191.73	314.18	DC	120.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959691	AF2-260 C O2	60.0000	50/50	60.0000
959692	AF2-260 E O2	30.0000	50/50	30.0000
960171	AF2-308	28.0000	50/50	28.0000
960181	AF2-309 C	42.0000	50/50	42.0000
960182	AF2-309 E	28.0000	50/50	28.0000
961001	AF2-391 C O2	72.0000	50/50	72.0000
961002	AF2-391 E O2	48.0000	50/50	48.0000

15.5.5 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
102045551	342307	2STEPHENSBRG	EKPC	342403	2UPTON T	EKPC	1	EKPC_P2-2_KU HODG 69	bus	39.0	97.67	131.41	DC	13.16

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
959691	AF2-260 C O2	9.1668	50/50	9.1668
959692	AF2-260 E O2	4.5834	50/50	4.5834
960171	AF2-308	4.0634	50/50	4.0634
960181	AF2-309 C	6.0950	50/50	6.0950
960182	AF2-309 E	4.0634	50/50	4.0634
961001	AF2-391 C O2	7.8962	50/50	7.8962
961002	AF2-391 E O2	5.2642	50/50	5.2642
WEC	WEC	0.0063	Confirmed LTF	0.0063
LGEE	LGEE	0.1090	Confirmed LTF	0.1090
FARMERCITY	FARMERCITY	0.0021	Confirmed LTF	0.0021
CALDERWOOD	CALDERWOOD	0.1004	Confirmed LTF	0.1004
NY	NY	0.0044	Confirmed LTF	0.0044
CBM-W1	CBM-W1	0.1751	Confirmed LTF	0.1751
PRAIRIE	PRAIRIE	0.1007	Confirmed LTF	0.1007
O-066	O-066	0.0739	Confirmed LTF	0.0739
CHEOAH	CHEOAH	0.0991	Confirmed LTF	0.0991
G-007	G-007	0.0114	Confirmed LTF	0.0114
CATAWBA	CATAWBA	0.0350	Confirmed LTF	0.0350

15.5.6 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
98932084	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	single	1451.0	129.83	130.88	DC	15.22

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
243442	05RKG1	14.5062	80/20	14.5062
243443	05RKG2	14.2864	80/20	14.2864
342900	1COOPER1 G	2.4207	80/20	2.4207
342903	1COOPER2 G	4.6942	80/20	4.6942
342918	1JKCT 1G	1.8896	80/20	1.8896
342921	1JKCT 2G	1.3706	80/20	1.3706
342924	1JKCT 3G	1.8896	80/20	1.8896
342927	1JKCT 4G	1.2540	80/20	1.2540
342930	1JKCT 5G	1.2472	80/20	1.2472
342933	1JKCT 6G	1.2540	80/20	1.2540
342936	1JKCT 7G	1.2540	80/20	1.2540
342939	1JKCT 9G	1.2895	80/20	1.2895
342942	1JKCT 10G	1.2895	80/20	1.2895
342945	1LAUREL 1G	1.3659	80/20	1.3659
925981	AC1-074 C O1	3.9855	80/20	3.9855
930461	AB1-087	35.0735	80/20	35.0735
930471	AB1-088	35.0735	80/20	35.0735
932551	AC2-075 C	0.9466	80/20	0.9466
933441	AC2-157 C	4.8465	80/20	4.8465
936381	AD2-048 C	3.4301	80/20	3.4301
936571	AD2-072 C O1	10.1176	80/20	10.1176
939131	AE1-143 C	9.5735	80/20	9.5735
940041	AE1-246 C O1	11.9517	80/20	11.9517
940831	AE2-071 C	3.0314	80/20	3.0314
941341	AE2-130 C	30.5808	80/20	30.5808
941411	AE2-138 C	15.1422	80/20	15.1422
941981	AE2-210 C O1	5.2176	80/20	5.2176
942411	AE2-254 C O1	4.0278	80/20	4.0278
942591	AE2-275 C O1	6.8134	80/20	6.8134
942601	AE2-276	3.1885	80/20	3.1885
942891	AE2-308 C O1	11.5071	80/20	11.5071
943111	AE2-339 C	2.5623	80/20	2.5623
943701	AF1-038 C	4.6588	80/20	4.6588
943821	AF1-050 C	5.4126	80/20	5.4126
944151	AF1-083 C O1	4.9790	80/20	4.9790
944201	AF1-088 FTIR	63.7700	80/20	63.7700
944511	AF1-116 C	10.7366	80/20	10.7366
944621	AF1-127 C O1	4.4322	80/20	4.4322
945381	AF1-203 C	1.7322	80/20	1.7322
945541	AF1-219 C O1	3.2077	80/20	3.2077
945861	AF1-251 C	10.7144	80/20	10.7144
946021	AF1-267 C	3.8151	80/20	3.8151

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952811	J759	9.7391	PJM External (MISO)	9.7391
952821	J762	30.0320	PJM External (MISO)	30.0320
952861	J783 C	9.3334	PJM External (MISO)	9.3334
953611	J800	14.1350	PJM External (MISO)	14.1350
953931	J856	9.4496	PJM External (MISO)	9.4496
955451	J1027	13.7985	PJM External (MISO)	13.7985
955461	J1028	15.2805	PJM External (MISO)	15.2805
955891	J1074	23.0880	PJM External (MISO)	23.0880
956911	J1189	0.4479	PJM External (MISO)	0.4479
957141	AF2-008 FTIR	31.8850	80/20	31.8850
957961	AF2-090 C	16.4592	80/20	16.4592
959691	AF2-260 C O2	12.3348	80/20	12.3348
960151	AF2-306	1.6749	80/20	1.6749
960161	AF2-307 C	2.5510	80/20	2.5510
960171	AF2-308	5.7854	80/20	5.7854
960181	AF2-309 C	8.6780	80/20	8.6780
960621	AF2-353 C	35.6776	80/20	35.6776
960641	AF2-355 C O2	14.1574	80/20	14.1574
960741	AF2-365 C O2	5.1087	80/20	5.1087
961001	AF2-391 C O2	15.2215	80/20	15.2215
961281	AF2-419 C	1.8240	80/20	1.8240
961291	AF2-420 C	1.8240	80/20	1.8240
WEC	WEC	0.6634	Confirmed LTF	0.6634
LGEE	LGEE	18.1402	Confirmed LTF	18.1402
CPLE	CPLE	1.1986	Confirmed LTF	1.1986
CBM-W2	CBM-W2	56.1670	Confirmed LTF	56.1670
NY	NY	0.2737	Confirmed LTF	0.2737
CBM-W1	CBM-W1	19.6657	Confirmed LTF	19.6657
TVA	TVA	9.5130	Confirmed LTF	9.5130
CBM-S2	CBM-S2	14.7563	Confirmed LTF	14.7563
CBM-S1	CBM-S1	97.4858	Confirmed LTF	97.4858
MADISON	MADISON	12.3480	Confirmed LTF	12.3480
MEC	MEC	6.0890	Confirmed LTF	6.0890

15.5.7 Index 7

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
100346027	341713	2KARGLE	EKPC	324519	2ETOWN KU	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	180.98	227.37	DC	35.26

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952821	J762	13.4600	PJM External (MISO)	13.4600
957961	AF2-090 C	29.7580	80/20	29.7580
959691	AF2-260 C O2	24.3390	80/20	24.3390
960171	AF2-308	11.7765	80/20	11.7765
960181	AF2-309 C	17.6648	80/20	17.6648
960741	AF2-365 C O2	2.8143	80/20	2.8143
961001	AF2-391 C O2	35.2620	80/20	35.2620
WEC	WEC	0.0438	Confirmed LTF	0.0438
CPLE	CPLE	0.0814	Confirmed LTF	0.0814
CBM-W2	CBM-W2	3.5708	Confirmed LTF	3.5708
NY	NY	0.0061	Confirmed LTF	0.0061
CBM-W1	CBM-W1	1.5387	Confirmed LTF	1.5387
TVA	TVA	0.7840	Confirmed LTF	0.7840
CBM-S2	CBM-S2	0.9768	Confirmed LTF	0.9768
CBM-S1	CBM-S1	2.8457	Confirmed LTF	2.8457
MADISON	MADISON	0.8588	Confirmed LTF	0.8588
MEC	MEC	0.4147	Confirmed LTF	0.4147
BLUEG	BLUEG	1.1024	Confirmed LTF	1.1024
TRIMBLE	TRIMBLE	0.3066	Confirmed LTF	0.3066

15.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
EKPC_P2-4_CHARD W124-91T	CONTINGENCY 'EKPC_P2-4_CHARD W124-91T' /* CENTRAL HARDIN OPEN BRANCH FROM BUS 324047 TO BUS 342568 CKT 1 /* 324047 4BLACKBRNCH 138.00 342568 4CENT HARDIN138.00 OPEN BRANCH FROM BUS 324047 TO BUS 324260 CKT 1 /* 324047 4BLACKBRNCH 138.00 324260 4HARDBG 138.00 OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
EKPC_P1-2_STEPH-KUEAST69	CONTINGENCY 'EKPC_P1-2_STEPH-KUEAST69' /* STEPHENSBURG - KU EASTVIEW OPEN BRANCH FROM BUS 324509 TO BUS 342307 CKT 1 /* 324509 2EASTVW 69.000 342307 2STEPHENSBRG69.000 END
EKPC_P2-2_STEPBG 69	CONTINGENCY 'EKPC_P2-2_STEPBG 69' /* STEPHENSBURG 69 BUS OPEN BUS 342307 /* 2STEPHENSBRG END
EKPC_P1-2_CHARD-HARD138	CONTINGENCY 'EKPC_P1-2_CHARD-HARD138' /* CENTRAL HARDIN - KU HARDIN OPEN BRANCH FROM BUS 324261 TO BUS 342568 CKT 1 /* 324261 4HARDN 138.00 342568 4CENT HARDIN138.00 END
AEP_P1-2_#10136	CONTINGENCY 'AEP_P1-2_#10136' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243209 TO BUS 243443 CKT 2 / 243209 05ROCKPT 765 243443 05RKG2 26.0 2 REMOVE UNIT 2H FROM BUS 243443 / 243443 05RKG2 26.0 REMOVE UNIT 2L FROM BUS 243443 / 243443 05RKG2 26.0 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
Base Case	

Contingency Name	Contingency Definition
EKPC_P1-2_C HAR-KU ETN69	CONTINGENCY 'EKPC_P1-2_C HAR-KU ETN69' /* CENTRAL HARDIN - KU ETOWN OPEN BRANCH FROM BUS 341287 TO BUS 341713 CKT 1 /* 341287 2CENT HARDIN69.000 341713 2KARGLE 69.000 OPEN BRANCH FROM BUS 324519 TO BUS 341713 CKT 1 /* 324519 2ETOWN KU 69.000 341713 2KARGLE 69.000 END
EKPC_P2-2_KU HODG 69	CONTINGENCY 'EKPC_P2-2_KU HODG 69' /* KU HODGENVILLE 69 TIE OPEN BUS 341632 /* 2HODGENVILLE END

16 Light Load Analysis – Secondary POI

Light Load Studies (As applicable)

To be determined during later study phases.

17 Short Circuit Analysis – Secondary POI

The following Breakers are overdutied:

To be determined during later study phases.

18 Stability and Reactive Power Assessment – Secondary POI

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

To be determined during later study phases.

19 Affected Systems – Secondary POI

19.1 LG&E

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

19.2 MISO

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

19.3 TVA

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

19.4 Duke Energy Progress

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