Generation Interconnection

Feasibility Study Report

For

Queue Project AF2-260

STEPHENSBURG 69 KV

60 MW Capacity / 90 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.

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 Hardin County, Kentucky. The installed facilities will have a total capability of 90 MW with 60 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-260
Project Name	STEPHENSBURG 69 KV
State	Kentucky
County	Hardin
Transmission Owner	EKPC
MFO	90
MWE	90
MWC	60
Fuel	Solar
Basecase Study Year	2023

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

4 Point of Interconnection

AF2-260 will interconnect with the EKPC transmission system along one of the following Points of Interconnection:

Primary POI: Stephensburg 69 kV substation.

Secondary POI: Tap Stephensburg - Central Hardin 69 kV line

5 Cost Summary

The AF2-260 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$
Total System Network Upgrade Costs	$140,000
Total Costs	$

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

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

6 Transmission Owner Scope of Work

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

6.1 Attachment Facilities

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

Description	Total Cost
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 Stephensburg substation, to accept the IC generator lead line/bus (Estimated time to implement is 12 months)	$1,560,000
Total Attachment Facility Costs	**$1,560,000**

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 a SCADA radio at Stephensburg for telecommunications/telemetry needs	$25,000
Total Non-Direct Connection Facility Costs	**$25,000**

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 AF2-260 was evaluated as a 90.0 MW (Capacity 60.0 MW) injection at the Stephensburg 69 kV substation in the EKPC area. Project AF2-260 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-260 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
101860589	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	single	98.0	96.99	116.55	DC	19.17

10.2 Multiple Facility Contingency

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

None

10.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
98821232	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	single	1134.0	109.59	110.63	DC	11.79
100166723	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	106.51	131.74	DC	19.17

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
98821225	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	operation	1451.0	127.5	128.74	DC	17.97
98821231	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	operation	1134.0	115.03	116.59	DC	17.68
101860588	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	operation	98.0	112.05	141.4	DC	28.76

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
100166722	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	operation	76.0	125.94	163.78	DC	28.76

10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
98821232	2	**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
101860589	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**	$40,000
100166723	3	**2KARGLE 69.0 kV - 2ETOWN KU 69.0 kV Ckt 1**	EKPC **EKPC-r0090a (1489) : Increase the maximum operating temperature of the 556 MCM ACSR conductor in the Kargle-KU Elizabethtown 69 kV line section to 302 degrees F (1.45 miles)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 9.0 Months** 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**	$100,000
			TOTAL COST	**$140,000**

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
101860589	341287	2CENT HARDIN	EKPC	341713	2KARGLE	EKPC	1	EKPC_P1-2_CHARD-HARD138	single	98.0	96.99	116.55	DC	19.17

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
98821232	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	109.59	110.63	DC	11.79

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
342900	1COOPER1 G	2.4061	80/20	2.4061
342903	1COOPER2 G	4.6659	80/20	4.6659
342918	1JKCT 1G	1.9082	80/20	1.9082
342921	1JKCT 2G	1.3841	80/20	1.3841
342924	1JKCT 3G	1.9082	80/20	1.9082
342927	1JKCT 4G	1.2664	80/20	1.2664
342930	1JKCT 5G	1.2594	80/20	1.2594
342933	1JKCT 6G	1.2664	80/20	1.2664
342936	1JKCT 7G	1.2664	80/20	1.2664
342939	1JKCT 9G	1.3026	80/20	1.3026
342942	1JKCT 10G	1.3026	80/20	1.3026
342945	1LAUREL 1G	1.3616	80/20	1.3616
925981	AC1-074 C O1	4.0858	80/20	4.0858
932551	AC2-075 C	0.9704	80/20	0.9704
936381	AD2-048 C	3.5137	80/20	3.5137
936571	AD2-072 C O1	10.1068	80/20	10.1068
939131	AE1-143 C	9.4721	80/20	9.4721
940041	AE1-246 C O1	11.7160	80/20	11.7160
940831	AE2-071 C	2.9730	80/20	2.9730
941411	AE2-138 C	15.4118	80/20	15.4118
941981	AE2-210 C O1	5.3105	80/20	5.3105
942411	AE2-254 C O1	4.0269	80/20	4.0269
942591	AE2-275 C O1	6.8722	80/20	6.8722
942891	AE2-308 C O1	11.6061	80/20	11.6061
943111	AE2-339 C	2.5945	80/20	2.5945
943701	AF1-038 C	4.6019	80/20	4.6019
943821	AF1-050 C	5.3273	80/20	5.3273
944151	AF1-083 C O1	4.9157	80/20	4.9157
944511	AF1-116 C	10.6229	80/20	10.6229
944621	AF1-127 C O1	4.5062	80/20	4.5062
945381	AF1-203 C	1.6988	80/20	1.6988
945541	AF1-219 C O1	3.2016	80/20	3.2016
945861	AF1-251 C	10.8979	80/20	10.8979
946021	AF1-267 C	3.8473	80/20	3.8473
952811	J759	9.7195	PJM External (MISO)	9.7195
952821	J762	30.3840	PJM External (MISO)	30.3840
952861	J783 C	9.2991	PJM External (MISO)	9.2991
953611	J800	12.5675	PJM External (MISO)	12.5675
953931	J856	9.2400	PJM External (MISO)	9.2400
955451	J1027	12.8910	PJM External (MISO)	12.8910
955461	J1028	14.5680	PJM External (MISO)	14.5680
955891	J1074	22.4080	PJM External (MISO)	22.4080

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
956911	J1189	0.4233	PJM External (MISO)	0.4233
957961	AF2-090 C	16.2340	80/20	16.2340
959691	AF2-260 C O1	11.7852	80/20	11.7852
960151	AF2-306	1.7217	80/20	1.7217
960161	AF2-307 C	2.6223	80/20	2.6223
960171	AF2-308	5.6980	80/20	5.6980
960181	AF2-309 C	8.5470	80/20	8.5470
960641	AF2-355 C O1	15.2172	80/20	15.2172
960741	AF2-365 C O1	4.6410	80/20	4.6410
961001	AF2-391 C O1	15.3943	80/20	15.3943
961281	AF2-419 C	1.8218	80/20	1.8218
961291	AF2-420 C	1.8218	80/20	1.8218
WEC	WEC	0.4401	Confirmed LTF	0.4401
LGEE	LGEE	18.1636	Confirmed LTF	18.1636
CPLE	CPLE	1.2840	Confirmed LTF	1.2840
CBM-W2	CBM-W2	48.1244	Confirmed LTF	48.1244
NY	NY	0.1106	Confirmed LTF	0.1106
CBM-W1	CBM-W1	13.0229	Confirmed LTF	13.0229
TVA	TVA	8.8564	Confirmed LTF	8.8564
CBM-S2	CBM-S2	15.0800	Confirmed LTF	15.0800
CBM-S1	CBM-S1	94.2908	Confirmed LTF	94.2908
MADISON	MADISON	9.7998	Confirmed LTF	9.7998
MEC	MEC	4.6002	Confirmed LTF	4.6002

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
100166723	341713	2KARGLE	EKPC	324519	2ETOWN KU	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	106.51	131.74	DC	19.17

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952821	J762	13.4600	PJM External (MISO)	13.4600
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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

10.7 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
AC1-074	Jacksonville-Renaker 138kV I	Active
AC2-075	Great Blue Heron Solar	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
AE2-138	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
AE2-308	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
AF1-116	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
AF2-090	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
AF2-355	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
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

Queue Number	Project Name	Status
J783	MISO	MISO
J800	MISO	MISO
J856	MISO	MISO

10.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
Base Case	
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_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

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 TVA

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

14.2 Duke Energy Progress

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

14.3 MISO

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

14.4 LG&E

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

15 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AF2-260 was evaluated as a 90.0 MW (Capacity 60.0 MW) injection tapping the Stephensburg to Central Hardin 69 kV line in the EKPC area. Project AF2-260 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-260 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
101860589	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	single	98.0	96.99	121.82	DC	24.34

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
153065080	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P2-4_CHARD W124-91T	bus	98.0	76.47	126.28	DC	48.81

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
98821232	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	single	1134.0	109.59	110.66	DC	12.15
100166723	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	106.51	138.54	DC	24.34

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
98821225	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	operation	1451.0	127.5	128.77	DC	18.5

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
98821231	324010	7TRIMBL REAC	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	operation	1134.0	115.03	116.64	DC	18.22
101860588	341287	2CENT HARDIN	69.0	EKPC	341713	2KARGLE	69.0	EKPC	1	EKPC_P1-2_CHARD-HARD138	operation	98.0	112.05	149.31	DC	36.51
100166722	341713	2KARGLE	69.0	EKPC	324519	2ETOWN KU	69.0	LGEE	1	EKPC_P1-2_CHARD-HARD138	operation	76.0	125.94	173.97	DC	36.51

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
153065080	341287	2CENT HARDIN	EKPC	341713	2KARGLE	EKPC	1	EKPC_P2-4_CHARDW124-91T	bus	98.0	76.47	126.28	DC	48.81

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
98821232	324010	7TRIMBL REAC	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	109.59	110.66	DC	12.15

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
342900	1COOPER1 G	2.4061	80/20	2.4061
342903	1COOPER2 G	4.6659	80/20	4.6659
342918	1JKCT 1G	1.9082	80/20	1.9082
342921	1JKCT 2G	1.3841	80/20	1.3841
342924	1JKCT 3G	1.9082	80/20	1.9082
342927	1JKCT 4G	1.2664	80/20	1.2664
342930	1JKCT 5G	1.2594	80/20	1.2594
342933	1JKCT 6G	1.2664	80/20	1.2664
342936	1JKCT 7G	1.2664	80/20	1.2664
342939	1JKCT 9G	1.3026	80/20	1.3026
342942	1JKCT 10G	1.3026	80/20	1.3026
342945	1LAUREL 1G	1.3616	80/20	1.3616
925981	AC1-074 C O1	4.0858	80/20	4.0858
932551	AC2-075 C	0.9704	80/20	0.9704
936381	AD2-048 C	3.5137	80/20	3.5137
936571	AD2-072 C O1	10.1068	80/20	10.1068
939131	AE1-143 C	9.4721	80/20	9.4721
940041	AE1-246 C O1	11.7160	80/20	11.7160
940831	AE2-071 C	2.9730	80/20	2.9730
941411	AE2-138 C	15.4118	80/20	15.4118
941981	AE2-210 C O1	5.3105	80/20	5.3105
942411	AE2-254 C O1	4.0269	80/20	4.0269
942591	AE2-275 C O1	6.8722	80/20	6.8722
942891	AE2-308 C O1	11.6061	80/20	11.6061
943111	AE2-339 C	2.5945	80/20	2.5945
943701	AF1-038 C	4.6019	80/20	4.6019
943821	AF1-050 C	5.3273	80/20	5.3273
944151	AF1-083 C O1	4.9157	80/20	4.9157
944511	AF1-116 C	10.6229	80/20	10.6229
944621	AF1-127 C O1	4.5062	80/20	4.5062
945381	AF1-203 C	1.6988	80/20	1.6988
945541	AF1-219 C O1	3.2016	80/20	3.2016
945861	AF1-251 C	10.8979	80/20	10.8979
946021	AF1-267 C	3.8473	80/20	3.8473
952811	J759	9.7195	PJM External (MISO)	9.7195
952821	J762	30.3840	PJM External (MISO)	30.3840
952861	J783 C	9.2991	PJM External (MISO)	9.2991
953611	J800	12.5675	PJM External (MISO)	12.5675
953931	J856	9.2400	PJM External (MISO)	9.2400
955451	J1027	12.8910	PJM External (MISO)	12.8910
955461	J1028	14.5680	PJM External (MISO)	14.5680
955891	J1074	22.4080	PJM External (MISO)	22.4080

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
956911	J1189	0.4233	PJM External (MISO)	0.4233
957961	AF2-090 C	16.2340	80/20	16.2340
959691	AF2-260 C O2	12.1470	80/20	12.1470
960151	AF2-306	1.7217	80/20	1.7217
960161	AF2-307 C	2.6223	80/20	2.6223
960171	AF2-308	5.6980	80/20	5.6980
960181	AF2-309 C	8.5470	80/20	8.5470
960641	AF2-355 C O2	14.2776	80/20	14.2776
960741	AF2-365 C O2	5.0091	80/20	5.0091
961001	AF2-391 C O2	15.0012	80/20	15.0012
961281	AF2-419 C	1.8217	80/20	1.8217
961291	AF2-420 C	1.8217	80/20	1.8217
WEC	WEC	0.4401	Confirmed LTF	0.4401
LGEE	LGEE	18.1636	Confirmed LTF	18.1636
CPLE	CPLE	1.2840	Confirmed LTF	1.2840
CBM-W2	CBM-W2	48.1244	Confirmed LTF	48.1244
NY	NY	0.1106	Confirmed LTF	0.1106
CBM-W1	CBM-W1	13.0229	Confirmed LTF	13.0229
TVA	TVA	8.8564	Confirmed LTF	8.8564
CBM-S2	CBM-S2	15.0800	Confirmed LTF	15.0800
CBM-S1	CBM-S1	94.2908	Confirmed LTF	94.2908
MADISON	MADISON	9.7998	Confirmed LTF	9.7998
MEC	MEC	4.6002	Confirmed LTF	4.6002

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
100166723	341713	2KARGLE	EKPC	324519	2ETOWN KU	LGEE	1	EKPC_P1-2_CHARD-HARD138	single	76.0	106.51	138.54	DC	24.34

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
Base Case	
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
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_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

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 TVA

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

19.2 Duke Energy Progress

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

19.3 MISO

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

19.4 LG&E

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