Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-127

AVON 345 KV

53.6 MW Capacity / 80 MW Energy

January, 2020

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1 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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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.

2 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Fayette County, KY. The installed facilities will have a total capability of 80 MW with 53.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 12/1/2023. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-127**
Project Name	AVON 345 KV
State	Kentucky
County	Fayette
Transmission Owner	EKPC
MFO	80
MWE	80
MWC	53.6
Fuel	Solar
Basecase Study Year	2023

2.1 Point of Interconnection

AF1-127 will interconnect with the EKPC transmission system at the Avon 345 kV substation.

2.2 Cost Summary

The AF1-127 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,800,000
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$900,000
Total Costs	$2,700,000

In addition, the AF1-127 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$33,230,000

Cost allocations for these upgrades will be provided in the System Impact Study Report.

3 Transmission Owner Scope of Work

4 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 345 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breakers and associated switches, bus supports and bus, and relay panels) at Avon substation, to accept the IC generator lead line/bus (Estimated time to implement is 15 months)	$1,800,000
Total Attachment Facility Costs	$1,800,000

5 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
None	$0
Total Direct Connection Facility Costs	$0

6 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 additional equipment (circuit breakers, switches, and bus/bus supports) to establish a 345 kV bus and provide facilities for connection of the IC generator lead line/bus to the Avon substation (Estimated time to implement is 12 months)	$900,000
Total Non-Direct Connection Facility Costs	$900,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

8 Interconnection Customer Requirements

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 Sections 24.1 and 24.2.

9.2 EKPC Requirements

The Interconnection Customer will be required to comply with all EKPC Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "EKPC Facility Connection Requirements" document located at the following link:

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

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

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

10.2 EKPC Requirements

[Please enter any TO revenue metering and SCADA Requirements]

11 Network Impacts

The Queue Project AF1-127 was evaluated as a 80.0 MW (Capacity 53.6 MW) injection at the Avon 345 kV substation in the EKPC area. Project AF1-127 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-127 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

12 Generation Deliverability

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

None

13 Multiple Facility Contingency

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

None

14 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
4379452 1	246800		138.0	AEP	247034	05EMERSS	138.0	AEP	1	DAY_P734541 34553	tower	185.0	102.03	103.09	DC	4.36
4379442 5	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P734541 34553	tower	185.0	154.77	155.83	DC	4.36
4379452 2	247034	05EMERSS	138.0	AEP	246946	05WLDCAT	138.0	AEP	1	DAY_P734541 34553	tower	185.0	100.79	101.85	DC	4.36
4345476 0	324267	4KENTON	138.0	LGEE	246800		138.0	AEP	1	DAY_P734541 34553	tower	185.0	105.06	106.12	DC	4.36
4099074 5	342559	4BOONECO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	110.48	111.62	DC	7.12
4099071 2	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1532.0	117.36	119.05	DC	25.79
4121251 4	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	single	1240.0	117.45	118.75	DC	16.11
4121251 5	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	single	1532.0	112.16	113.29	DC	17.28
4154563 4	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 816_SILVERGROVE	breaker	1532.0	117.5	119.19	DC	25.81
4154563 5	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 1493_RED BANK	breaker	1532.0	117.41	119.1	DC	25.78
4180405 5	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	117.34	119.03	DC	25.78

15 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
4121251 2	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	120.14	122.09	DC	24.05
4121251 3	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	operation	1532.0	117.3	118.99	DC	25.78

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
40990745	5	4BOONE CO 138.0 kV - 08LONGBR 138.0 kV Ckt 1	r0009 (10) : Increase MOT of Boone-Longbranch 138kV line section 954 MCM conductor to 275F (~2.25 miles) Project Type : FAC Cost : $200,000 Time Estimate : 6.0 Months r0010 (11) : Upgrade bus and jumpers associated with Boone 138 kV bus using 2-500 MCM 37 CU conductor or equivalent Project Type : FAC Cost : $170,000 Time Estimate : 6.0 Months	$370,000
43794522	3	05EMERSS 138.0 kV - 05WLDCAT 138.0 kV Ckt 1	AEPO0006a (388) : Perform sag study on AEP's portion of Wildcat-Kenton 138kV circuit, , 1.3 miles of 477 ACSR 26/7 Hawk. Project Type : FAC Cost : $20,000 Time Estimate : 6-12 Months	$20,000
43794521	1	138.0 kV - 05EMERSS 138.0 kV Ckt 1	AEPO0039a (567) : A Sag Study will be required on the 4.5 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $18,000 (no remediations required, just sag study) and $6.75 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. 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 : $18,000 Time Estimate : Sag Study : 6 - 12 months Months	$18,000

ID	Index	Facility	Upgrade Description	Cost
41545634,41545635, 41212514,41212515, 40990712,41804055	6	7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1	**EKPC** **r0040 (42) : Replace the 1500A interconnection metering CTs with 2000A equipment.** **Project Type : FAC** **Cost : $150,000** **Time Estimate : 9.0 Months** **DAYTON** **DAYr190039 (309) : Reconductor Stuart-Spurlock line with twin bundle 1033 Curlew ACCR conductor** **Project Type : FAC** **Cost : $17,000,000** **Time Estimate : 18.0 Months** **DAYr190040 (310) : Replace Stuart substation riser conductor with 2500AAC (parallel)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **DAYr190041 (311) : Reconductor Stuart substation conductor with twin bundle 1033 Curlew ACCR conductor** **Project Type : FAC** **Cost : $250,000** **Time Estimate : 12.0 Months**	$17,500,000
43794425	2	05WLDCAT 138.0 kV - 05HILLSB 138.0 kV Ckt 1	**N5472 (412) : A Sag Study will be required on the 10 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $40,000 (no remediations required, just sag study) and $15 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. 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 : $186,000** **Time Estimate : 6-12 Months** **N5857 (413) : Rebuild / reconductor 10 miles of ACSR ~ 477 ~ 26/7 ~ HAWK- Conductor Section 1. Estimated cost: $15 million.** **Project Type : FAC** **Cost : $15,040,000** **Time Estimate : 24-36 Months**	$15,226,000

ID	Index	Facility	Upgrade Description	Cost
43454760	4	4KENTON 138.0 kV - 138.0 kV Ckt 1	**AEPO0040a (568) : A Sag Study will be required on the 24 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $96,000 (no remediations required, just sag study) and $36 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. 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 : $96,000** **Time Estimate : Sag Study : 6 - 12 months Months**	$96,000
			TOTAL COST	**$33,230,000**

17 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

17.1 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
43794521	246800		AEP	247034	05EMERSS	AEP	1	DAY_P734541 34553	tower	185.0	102.03	103.09	DC	4.36

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

17.2 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
43794425	246946	05WLDCAT	AEP	243019	05HILLSB	AEP	1	DAY_P734541 34553	tower	185.0	154.77	155.83	DC	4.36

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
926101	AC1-089 C O1	40.2705
926102	AC1-089 E O1	65.7045
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

17.3 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
43794522	247034	05EMERSS	AEP	246946	05WLDCAT	AEP	1	DAY_P734541 34553	tower	185.0	100.79	101.85	DC	4.36

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

17.4 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
43454760	324267	4KENTON	LGEE	246800		AEP	1	DAY_P734541 34553	tower	185.0	105.06	106.12	DC	4.36

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

17.5 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
40990745	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DAY_P734541 34553	tower	284.0	110.48	111.62	DC	7.12

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O1	1.5157
944212	AF1-089 E O1	0.4638
944621	AF1-127 C O1	2.1479
944622	AF1-127 E O1	1.0579
945541	AF1-219 C O1	0.6926
945542	AF1-219 E O1	0.2248
945681	AF1-233 C O1	16.4726
945682	AF1-233 E O1	8.1379
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O1	1.1808
946022	AF1-267 E O1	0.5425

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

17.6 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
41804055	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	117.34	119.03	DC	25.78

Bus #	Bus	MW Impact
251968	08ZIMRHP	39.2669
251969	08ZIMRLP	21.5033
251970	08MELDL1	1.9892
251971	08MELDL2	1.9892
251972	08MELDL3	1.9946
342957	1SPURLK1G	20.1913
342960	1SPURLK2G	38.4191
342963	1SPURLK3G	20.1889
342966	1SPURLK4G	20.1889
925921	AC1-068 C	-3.5400
925922	AC1-068 E	-1.6555
925931	AC1-069 C	-3.5400
925932	AC1-069 E	-1.6555
925981	AC1-074 C O1	15.7063
925982	AC1-074 E O1	6.7313
926101	AC1-089 C O1	4.0790
926102	AC1-089 E O1	6.6552
926791	AC1-165 C	-3.4983
926792	AC1-165 E	-1.6971
926801	AC1-166 C	-3.4983
926802	AC1-166 E	-1.6971
926951	AC1-182	6.6980
932461	AC2-066 C	-3.1887
932462	AC2-066 E	-5.2027
932551	AC2-075 C	3.7303
932552	AC2-075 E	1.8791
936381	AD2-048 C	10.7895
936382	AD2-048 E	5.3832
936571	AD2-072 C O1	8.5203
936572	AD2-072 E O1	4.1776
936821	AD2-105 C O1	3.6360
936822	AD2-105 E O1	5.3196
936831	AD2-106 C O1	2.5615
936832	AD2-106 E O1	3.5374
936841	AD2-107 C O1	2.0318
936842	AD2-107 E O1	2.8059
939131	AE1-143 C	6.3754
939132	AE1-143 E	3.1579
939141	AE1-144 C O1	32.8515
939142	AE1-144 E O1	16.3029

Bus #	Bus	MW Impact
940531	AE2-038 C O1	21.9147
940532	AE2-038 E O1	10.8549
941411	AE2-138 C	63.0876
941412	AE2-138 E	23.3338
941961	AE2-208	2.1989
941981	AE2-210 C O1	21.7383
941982	AE2-210 E O1	8.1768
942411	AE2-254 C O1	4.2815
942412	AE2-254 E O1	2.8543
942591	AE2-275 C O1	13.4850
942592	AE2-275 E O1	5.0723
942891	AE2-308 C O1	22.6036
942892	AE2-308 E O1	8.2195
943111	AE2-339 C	7.4394
943112	AE2-339 E	3.6642
943701	AF1-038 C	1.6966
943702	AF1-038 E	1.1310
943772	AF1-045 BAT	4.6964
943821	AF1-050 C	1.5068
943822	AF1-050 E	1.0045
944151	AF1-083 C O1	1.5843
944152	AF1-083 E O1	1.0562
944211	AF1-089 C O1	2.4799
944212	AF1-089 E O1	0.7588
944511	AF1-116 C	3.7895
944512	AF1-116 E	2.5263
944621	AF1-127 C O1	17.2758
944622	AF1-127 E O1	8.5090
945541	AF1-219 C O1	2.0568
945542	AF1-219 E O1	0.6674
945681	AF1-233 C O1	62.3740
945682	AF1-233 E O1	30.8142
945861	AF1-251 C	43.2419
945862	AF1-251 E	28.8279
945911	AF1-256 C	20.2128
945912	AF1-256 E	13.4752
946021	AF1-267 C O1	3.9648
946022	AF1-267 E O1	1.8217
LGEE	LGEE	4.6422
CPLE	CPLE	0.4545
WEC	WEC	0.3597
LGE-0012019	LGE-0012019	6.2986
CBM-W2	CBM-W2	24.2260
NY	NY	0.7897
CBM-W1	CBM-W1	9.0572
TVA	TVA	5.1954
O-066	O-066	9.2400
CBM-S2	CBM-S2	7.3522
CBM-S1	CBM-S1	38.6212
G-007	G-007	1.4248
MADISON	MADISON	3.2780
MEC	MEC	2.9190

Affected Systems

18 Affected Systems

18.1 LG&E

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

18.2 MISO

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

18.3 TVA

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

18.4 Duke Energy Progress

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

18.5 NYISO

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

19 Contingency Descriptions

Contingency Name	Contingency Definition
DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY 'DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 / 249989 08BKJ246 138 250080 08NWTWN2 138 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 / 250079 08NWTWN1 138 250080 08NWTWN2 138 Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 / 250079 08NWTWN1 138 250092 08REDBK1 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
DEOK_P2-3_C2 816_SILVERGROVE	CONTINGENCY 'DEOK_P2-3_C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 / 249988 08BKJ135 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 / 250042 08HANDS1 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 / 250052 08KYUNIV 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 / 250053 08LAFARG 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DEOK_P2-3_C2 1493_RED BANK	CONTINGENCY 'DEOK_P2-3_C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 / 249571 08REDBK1 345 250092 08REDBK1 138 1 END
DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	CONTINGENCY 'DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END

Contingency Name	Contingency Definition
DAY_P734541 34553	CONTINGENCY 'DAY_P734541 34553' OPEN BRANCH FROM BUS 249581 TO BUS 342838 CKT 1 /* 249581 08MELDAL 345.00 342838 7SPURLOCK 345.00 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* 253077 09STUART 345.00 342838 7SPURLOCK 345.00 END
Base Case	
DEOK_P2-2_C1 SILVER GROVE 345 BUS	CONTINGENCY 'DEOK_P2-2_C1 SILVER GROVE 345 BUS' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END

Short Circuit

20 Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue

Secondary Point of Interconnection

21 Network Impacts – Secondary POI

The Queue Project AF1-127 was evaluated as a 80.0 MW (Capacity 53.6 MW) injection at the Avon 138 kV substation in the EKPC area. Project AF1-127 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-127 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

22 Generation Deliverability

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

None

23 Multiple Facility Contingency

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

None

24 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
43794521	246800		138.0	AEP	247034	05EMERSS	138.0	AEP	1	DAY_P734541 34553	tower	185.0	102.03	103.01	DC	4.04
43794425	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P734541 34553	tower	185.0	154.77	155.76	DC	4.04
43794522	247034	05EMERSS	138.0	AEP	246946	05WLDCAT	138.0	AEP	1	DAY_P734541 34553	tower	185.0	100.79	101.77	DC	4.04
40990769	250054	08LONGBR	138.0	DEO&K	250077	08MTZION	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	103.16	104.33	DC	7.37
43454760	324267	4KENTON	138.0	LGEE	246800		138.0	AEP	1	DAY_P734541 34553	tower	185.0	105.06	106.04	DC	4.04
40990745	342559	4BOONE CO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	110.48	111.66	DC	7.37
40990712	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1532.0	117.35	118.8	DC	22.21
41212514	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	single	1240.0	117.45	118.58	DC	13.95
41545634	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 816_SILVERGROVE	breaker	1532.0	117.5	118.96	DC	22.24
41545635	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 1493_RED BANK	breaker	1532.0	117.41	118.86	DC	22.21
41804055	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	117.34	118.8	DC	22.21

25 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
4121251 2	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	120.14	121.83	DC	20.83
4121251 3	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	operation	1532.0	117.3	118.76	DC	22.21

26 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

26.1 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
43794521	246800		AEP	247034	05EMERSS	AEP	1	DAY_P734541 34553	tower	185.0	102.03	103.01	DC	4.04

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

26.2 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
43794425	246946	05WLDCAT	AEP	243019	05HILLSB	AEP	1	DAY_P734541 34553	tower	185.0	154.77	155.76	DC	4.04

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
926101	AC1-089 C O1	40.2705
926102	AC1-089 E O1	65.7045
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

26.3 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
43794522	247034	05EMERSS	AEP	246946	05WLDCAT	AEP	1	DAY_P734541 34553	tower	185.0	100.79	101.77	DC	4.04

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

26.4 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
40990769	250054	08LONGBR	DEO&K	250077	08MTZION	DEO&K	1	DAY_P734541 34553	tower	284.0	103.16	104.33	DC	7.37

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O2	1.5123
944212	AF1-089 E O2	0.4627
944621	AF1-127 C O2	2.2259
944622	AF1-127 E O2	1.0963
945541	AF1-219 C O2	0.7318
945542	AF1-219 E O2	0.2375
945681	AF1-233 C O2	16.5976
945682	AF1-233 E O2	8.1996
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O2	1.1750
946022	AF1-267 E O2	0.5398

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

26.5 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
43454760	324267	4KENTON	LGEE	246800		AEP	1	DAY_P734541 34553	tower	185.0	105.06	106.04	DC	4.04

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

26.6 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
40990745	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DAY_P734541 34553	tower	284.0	110.48	111.66	DC	7.37

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O2	1.5123
944212	AF1-089 E O2	0.4627
944621	AF1-127 C O2	2.2259
944622	AF1-127 E O2	1.0963
945541	AF1-219 C O2	0.7318
945542	AF1-219 E O2	0.2375
945681	AF1-233 C O2	16.5976
945682	AF1-233 E O2	8.1996
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O2	1.1750
946022	AF1-267 E O2	0.5398

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

26.7 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
41804055	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	117.34	118.8	DC	22.21

Bus #	Bus	MW Impact
251968	08ZIMRHP	39.2669
251969	08ZIMRLP	21.5033
251970	08MELDL1	1.9892
251971	08MELDL2	1.9892
251972	08MELDL3	1.9946
342957	1SPURLK1G	20.1913
342960	1SPURLK2G	38.4191
342963	1SPURLK3G	20.1889
342966	1SPURLK4G	20.1889
925921	AC1-068 C	-3.5400
925922	AC1-068 E	-1.6555
925931	AC1-069 C	-3.5400
925932	AC1-069 E	-1.6555
925981	AC1-074 C O1	15.7063
925982	AC1-074 E O1	6.7313
926101	AC1-089 C O1	4.0790
926102	AC1-089 E O1	6.6552
926791	AC1-165 C	-3.4983
926792	AC1-165 E	-1.6971
926801	AC1-166 C	-3.4983
926802	AC1-166 E	-1.6971
926951	AC1-182	6.6980
932461	AC2-066 C	-3.1887
932462	AC2-066 E	-5.2027
932551	AC2-075 C	3.7303
932552	AC2-075 E	1.8791
936381	AD2-048 C	10.7895
936382	AD2-048 E	5.3832
936571	AD2-072 C O1	8.5203
936572	AD2-072 E O1	4.1776
936821	AD2-105 C O1	3.6360
936822	AD2-105 E O1	5.3196
936831	AD2-106 C O1	2.5615
936832	AD2-106 E O1	3.5374
936841	AD2-107 C O1	2.0318
936842	AD2-107 E O1	2.8059
939131	AE1-143 C	6.3754
939132	AE1-143 E	3.1579
939141	AE1-144 C O1	32.8515
939142	AE1-144 E O1	16.3029

Bus #	Bus	MW Impact
940531	AE2-038 C O1	21.9147
940532	AE2-038 E O1	10.8549
941411	AE2-138 C	63.0876
941412	AE2-138 E	23.3338
941961	AE2-208	2.1989
941981	AE2-210 C O1	21.7383
941982	AE2-210 E O1	8.1768
942411	AE2-254 C O1	4.2815
942412	AE2-254 E O1	2.8543
942591	AE2-275 C O1	13.4850
942592	AE2-275 E O1	5.0723
942891	AE2-308 C O1	22.6036
942892	AE2-308 E O1	8.2195
943111	AE2-339 C	7.4394
943112	AE2-339 E	3.6642
943701	AF1-038 C	1.6966
943702	AF1-038 E	1.1310
943772	AF1-045 BAT	4.6964
943821	AF1-050 C	1.5068
943822	AF1-050 E	1.0045
944151	AF1-083 C O2	1.5818
944152	AF1-083 E O2	1.0545
944211	AF1-089 C O2	2.4784
944212	AF1-089 E O2	0.7583
944511	AF1-116 C	3.7895
944512	AF1-116 E	2.5263
944621	AF1-127 C O2	14.8788
944622	AF1-127 E O2	7.3284
945541	AF1-219 C O2	2.1707
945542	AF1-219 E O2	0.7044
945681	AF1-233 C O2	62.9915
945682	AF1-233 E O2	31.1193
945861	AF1-251 C	43.2419
945862	AF1-251 E	28.8279
945911	AF1-256 C	20.2128
945912	AF1-256 E	13.4752
946021	AF1-267 C O2	3.9319
946022	AF1-267 E O2	1.8066
LGEE	LGEE	4.6422
CPLE	CPLE	0.4545
WEC	WEC	0.3597
LGE-0012019	LGE-0012019	6.2986
CBM-W2	CBM-W2	24.2260
NY	NY	0.7897
CBM-W1	CBM-W1	9.0572
TVA	TVA	5.1954
O-066	O-066	9.2400
CBM-S2	CBM-S2	7.3522
CBM-S1	CBM-S1	38.6212
G-007	G-007	1.4248
MADISON	MADISON	3.2780
MEC	MEC	2.9190

Affected Systems

27 Affected Systems

27.1 LG&E

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

27.2 MISO

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

27.3 TVA

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

27.4 Duke Energy Progress

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

27.5 NYISO

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

28 Contingency Descriptions

Contingency Name	Contingency Definition
DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY 'DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 / 249989 08BKJ246 138 250080 08NWTWN2 138 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 / 250079 08NWTWN1 138 250080 08NWTWN2 138 Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 / 250079 08NWTWN1 138 250092 08REDBK1 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
DEOK_P2-3_C2 816_SILVERGROVE	CONTINGENCY 'DEOK_P2-3_C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 / 249988 08BKJ135 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 / 250042 08HANDS1 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 / 250052 08KYUNIV 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 / 250053 08LAFARG 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DEOK_P2-3_C2 1493_RED BANK	CONTINGENCY 'DEOK_P2-3_C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 / 249571 08REDBK1 345 250092 08REDBK1 138 1 END
DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	CONTINGENCY 'DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END

Contingency Name	Contingency Definition
DAY_P734541 34553	CONTINGENCY 'DAY_P734541 34553' OPEN BRANCH FROM BUS 249581 TO BUS 342838 CKT 1 /* 249581 08MELDAL 345.00 342838 7SPURLOCK 345.00 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* 253077 09STUART 345.00 342838 7SPURLOCK 345.00 END
Base Case	
DEOK_P2-2_C1 SILVER GROVE 345 BUS	CONTINGENCY 'DEOK_P2-2_C1 SILVER GROVE 345 BUS' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END

Short Circuit

29 Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue