Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-080

DEER CREEK-FISHER BODY-MULLIN 138 KV

20 MW Capacity / 20 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.

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.

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 an uprate (Storage generating facility) to an existing Solar generating facility (U3-002) located in Madison County, Indiana. This projects requests an increase to the install capability of 20 uprate MW with 20 of uprate MW of this output being recognized by PJM as Capacity. The installed facilities will have a total capability of 220 MW with 46 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 9/15/2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF1-080
Project Name	DEER CREEK-FISHER BODY-MULLIN 138 KV
State	Indiana
County	Madison
Transmission Owner	AEP
MFO	220
MWE	20
MWC	20
Fuel	Storage
Basecase Study Year	2023

2.1 Point of Interconnection

AF1-080 will interconnect with the AEP transmission system as an uprate to U3-002 at the Strawton 138 kV substation.

2.2 Cost Summary

This project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$0
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$0
Total Costs	$0

Note: These cost estimates assume that no relaying upgrades are required to accommodate this project. During later study phases, AEP/PJM may determine that relaying upgrades may be required depending on final project schedules for the existing project and this uprate project.

In addition, this project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$72,000

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.

Description	Total Cost
	$0
Total Attachment Facility Costs	$0

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
	$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
	$0
Total Non-Direct Connection Facility Costs	$0

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 is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the AEP Transmission circuit are not included in this report; these are assumed to be the Interconnection Customer's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power 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.

Requirement from the PJM Open Access Transmission Tariff:

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 AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link: http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

10 Network Impacts

The Queue Project AF1-080 was evaluated as a 20.0 MW (Capacity 20.0 MW) injection as an uprate to U3-002 at the Strawton 138 kV substation in the AEP area. Project AF1-080 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-080 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

11 Generation Deliverability

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

None

12 Multiple Facility Contingency

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

None

13 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
45013246	243292	05FALLC	138.0	AEP	243333	05MADISO	138.0	AEP	1	AEP_P4_#10612_05FALL C 138_F	breaker	251.0	100.29	101.8	DC	3.78
43739325	243311	05HOGAN	138.0	AEP	243275	05DELAWR	138.0	AEP	1	AEP_P4_#2965_05DESOTO 345_A2	breaker	255.0	103.7	105.38	DC	4.27
43739142	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P4_#8775_05STRWTN 138_A	breaker	205.0	123.34	132.11	DC	17.98
43739143	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	126.97	131.95	DC	10.2
43739144	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_P4_#6959_05HOGAN 138_A	breaker	205.0	121.32	126.29	DC	10.2
43739137	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P4_#8775_05STRWTN 138_A	breaker	205.0	126.17	134.94	DC	17.98
43739138	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	129.85	134.83	DC	10.2
43739139	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_P4_#6959_05HOGAN 138_A	breaker	205.0	124.19	129.17	DC	10.2

14 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
4373976 5	243311	05HOGAN	138.0	AEP	243275	05DELAWR	138.0	AEP	1	AEP_P1-2_#673-A	operation	255.0	102.77	104.49	DC	4.39
4373962 7	246763	05PIPECK	138.0	AEP	243303	05GRNTTA	138.0	AEP	1	AEP_SUBT_P1-3_#844_05HOGAN 138_1	operation	205.0	120.83	125.8	DC	10.2
4373961 5	936560	AD2-071 TAP	138.0	AEP	246763	05PIPECK	138.0	AEP	1	AEP_SUBT_P1-3_#844_05HOGAN 138_1	operation	205.0	123.66	128.63	DC	10.2

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
43739325	2	05HOGAN 138.0 kV - 05DELAWR 138.0 kV Ckt 1	AEP s0738 (842) : PJM Supplemental Upgrade s0738. Upgrade the Delaware - Hogan 138 kV risers. The supplemental project has an projected in-service date of 12/18/2021. Project Type : FAC Cost : $0 Time Estimate : 12-18 Months s1498.2 (843) : PJM Supplemental Upgrade s1498.2. Replace risers at Delaware station with 1200A AAC jumpers. The supplemental project has an projected in-service date of 12/18/2021. Project Type : FAC Cost : $0 Time Estimate : 12-18 Months	$0
43739137,43739138, 43739139	4	AD2-071 TAP 138.0 kV - 05PIPECK 138.0 kV Ckt 1	AEP AEPI0015a (1071) : A Sag Study will be required on the 5.5 mile section of ACSR ~ 556.5 ~ 26/7 ~ DOVE line to mitigate the overload. Depending on the sag study results, cost for this upgrade is expected to be between $32,800 (no remediations required just sag study) and $2.85 million (complete line reconductor/rebuild required) Project Type : FAC Cost : $22,000 Time Estimate : 6-12 Months	$22,000
43739144,43739143, 43739142	3	05PIPECK 138.0 kV - 05GRNTTA 138.0 kV Ckt 1	AEP AEPI0014a (1070) : A Sag Study will be required on the 1.9 mile section of ACSR~556.5~ 26/7~ DOVE line to mitigate the overload. Ratings after sag study : S/N :205 S/E: 284 MVA Depending on the sag study results. The cost for this upgrade is expected to be between $20,000 (no remediations required, just sag study) and $2.85 million (complete line reconductor/rebuild required) Project Type : FAC Cost : $20,000 Time Estimate : 6-12 Months	$20,000
45013246	1	05FALL C 138.0 kV - 05MADISO 138.0 kV Ckt 1	AEP AEPI0023a (1569) : A Sag Study will be required on the 7.5 miles section of ACSR ~ 795 ~ 45/7 ~ TERN line to mitigate the overload. New Ratings after the sag study S/N : 251 MVA S/E: 335 MVA. Depending on the sag study results, cost for this upgrade is expected to be between $30,000 (no remediations required just sag study) and $11.25 million (complete line reconductor/rebuild required) Project Type : FAC Cost : $30,000 Time Estimate : 6-12 Months	$30,000
			TOTAL COST	**$72,000**

16 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.

16.1 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
45013246	243292	05FALL C	AEP	243333	05MADISO	AEP	1	AEP_P4_#10612_05FALL C 138_F	breaker	251.0	100.29	101.8	DC	3.78

Bus #	Bus	MW Impact
923881	AB2-028 C	1.1865
923882	AB2-028 E	7.9408
941692	AE2-169 BAT	3.7287
941702	AE2-170 BAT	2.9815
941712	AE2-171 BAT	6.5082
941722	AE2-172 BAT	2.5160
944122	AF1-080 BAT	3.7818
954351	J903	6.0410
955491	J1031 C	3.6855
955492	J1031 E	19.9395
LGEE	LGEE	0.4844
CPLE	CPLE	0.1111
WEC	WEC	0.0680
CBM-W2	CBM-W2	7.2400
NY	NY	0.0210
CBM-W1	CBM-W1	1.8390
TVA	TVA	0.7672
O-066	O-066	0.2150
CBM-S2	CBM-S2	1.2947
CBM-S1	CBM-S1	5.1461
G-007	G-007	0.0322
MADISON	MADISON	1.4939
MEC	MEC	0.6880

16.2 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
4373932 5	24331 1	05HOGA N	AEP	24327 5	05DELAW R	AEP	1	AEP_P4_#2965_05DESOT O 345_A2	breake r	255.0	103.7	105.38	DC	4.27

Bus #	Bus	MW Impact
246991	05WLD G1 C	0.3782
247255	05WLD G2 C	0.3971
247958	05WLD G2 E	37.1821
920501	AA2-148 C OP	2.2927
920502	AA2-148 E OP	15.3438
923881	AB2-028 C	1.3592
923882	AB2-028 E	9.0959
933591	AC2-176 C O1	-0.9520
933592	AC2-176 E O1	-6.3709
934161	AD1-043 C O1	8.9987
934162	AD1-043 E O1	14.6821
936561	AD2-071 C	11.6466
936562	AD2-071 E	5.7364
941692	AE2-169 BAT	8.9387
941711	AE2-171	5.9202
942791	AE2-297 C O1	9.5453
942792	AE2-297 E O1	6.3635
944121	AF1-080	4.2738
955491	J1031 C	1.7791
955492	J1031 E	9.6254
LGEE	LGEE	0.5060
CPLE	CPLE	0.1151
WEC	WEC	0.0813
CBM-W2	CBM-W2	7.4693
NY	NY	0.0426
CBM-W1	CBM-W1	1.6138
TVA	TVA	0.8008
O-066	O-066	0.4704
CBM-S2	CBM-S2	1.3641
CBM-S1	CBM-S1	5.3761
G-007	G-007	0.0718
MADISON	MADISON	1.2056
MEC	MEC	0.7595

16.3 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
43739142	246763	05PIPECK	AEP	243303	05GRNTTA	AEP	1	AEP_P4_#8775_05STRWTN 138_A	breaker	205.0	123.34	132.11	DC	17.98

Bus #	Bus	MW Impact
246991	05WLD G1 C	1.5910
247255	05WLD G2 C	1.6703
247958	05WLD G2 E	156.4103
936561	AD2-071 C	61.5536
936562	AD2-071 E	30.3174
944121	AF1-080	17.9782
DUCKCREEK	DUCKCREEK	0.0495
LGEE	LGEE	0.0240
NEWTON	NEWTON	0.0032
FARMERCITY	FARMERCITY	0.0016
CBM-W2	CBM-W2	0.0655
NY	NY	0.0050
TVA	TVA	0.0070
PRAIRIE	PRAIRIE	0.0207
O-066	O-066	0.0538
COFFEEN	COFFEEN	0.0079
EDWARDS	EDWARDS	0.0164
CBM-S1	CBM-S1	0.0937
TILTON	TILTON	0.0082
G-007	G-007	0.0083
CATAWBA	CATAWBA	0.0007

16.4 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
43739138	936560	AD2-071 TAP	AEP	246763	05PIPECK	AEP	1	AEP_P4_#8781_05HOGAN 138_B	breaker	205.0	129.85	134.83	DC	10.2

Bus #	Bus	MW Impact
246991	05WLD G1 C	0.9028
247255	05WLD G2 C	0.9478
247958	05WLD G2 E	88.7574
920501	AA2-148 C OP	1.2589
920502	AA2-148 E OP	8.4248
934161	AD1-043 C O1	19.6873
934162	AD1-043 E O1	32.1215
936561	AD2-071 C	39.8918
936562	AD2-071 E	19.6482
941702	AE2-170 BAT	3.1470
941711	AE2-171	12.9522
941722	AE2-172 BAT	3.4084
942791	AE2-297 C O1	2.7577
942792	AE2-297 E O1	1.8384
944121	AF1-080	10.2020
955491	J1031 C	1.2241
955492	J1031 E	6.6224
DUCKCREEK	DUCKCREEK	0.2407
LGEE	LGEE	0.2647
CPLE	CPLE	0.0523
FARMERCITY	FARMERCITY	0.0050
G-007A	G-007A	0.0527
VFT	VFT	0.1354
CBM-W2	CBM-W2	1.6380
TVA	TVA	0.2212
CBM-S2	CBM-S2	0.5375
EDWARDS	EDWARDS	0.0861
CBM-S1	CBM-S1	1.8318

Affected Systems

17 Affected Systems

17.1 LG&E

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

17.2 MISO

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

17.3 TVA

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

17.4 Duke Energy Progress

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

17.5 NYISO

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

Contingency Name	Contingency Definition
AEP_P4_#6959_05HOGAN 138_A	CONTINGENCY 'AEP_P4_#6959_05HOGAN 138_A' OPEN BRANCH FROM BUS 247420 TO BUS 243311 CKT 1 / 247420 05CROSS ST Z 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 247420 TO BUS 243333 CKT 1 / 247420 05CROSS ST Z 138 243333 05MADISO 138 1 OPEN BRANCH FROM BUS 243275 TO BUS 243311 CKT 1 / 243275 05DELAWR 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246046 CKT 1 / 243311 05HOGAN 138 246046 05HOGAN 34.5 1 OPEN BRANCH FROM BUS 243311 TO BUS 246047 CKT 1 / 243311 05HOGAN 138 246047 05HOGAN L 12.0 1 END
AEP_SUBT_P1-3_#844_05HOGAN 138_1	CONTINGENCY 'AEP_SUBT_P1-3_#844_05HOGAN 138_1' OPEN BRANCH FROM BUS 247420 TO BUS 243311 CKT 1 / 247420 05CROSS ST Z 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243275 TO BUS 243311 CKT 1 / 243275 05DELAWR 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246046 CKT 1 / 243311 05HOGAN 138 246046 05HOGAN 34.5 1 OPEN BRANCH FROM BUS 243311 TO BUS 246047 CKT 1 / 243311 05HOGAN 138 246047 05HOGAN L 12.0 1 END
AEP_P4_#8775_05STRWTN 138_A	CONTINGENCY 'AEP_P4_#8775_05STRWTN 138_A' OPEN BRANCH FROM BUS 247116 TO BUS 246913 CKT 1 / 247116 05ALADDIN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 247116 TO BUS 246988 CKT 1 / 247116 05ALADDIN 138 246988 05STRWTN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243920 TO BUS 246988 CKT 1 / 243920 05MAKAHOY 138 246988 05STRWTN 138 1 END
AEP_P1-2_#673-A	CONTINGENCY 'AEP_P1-2_#673-A' OPEN BRANCH FROM BUS 243218 TO BUS 923880 CKT 1 / 243218 05DESOTO 345 923880 AB2-028 TAP 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#8781_05HOGAN 138_B	CONTINGENCY 'AEP_P4_#8781_05HOGAN 138_B' OPEN BRANCH FROM BUS 247116 TO BUS 246913 CKT 1 / 247116 05ALADDIN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 247116 TO BUS 246988 CKT 1 / 247116 05ALADDIN 138 246988 05STRWTN 138 1 OPEN BRANCH FROM BUS 247420 TO BUS 243311 CKT 1 / 247420 05CROSS ST Z 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243275 TO BUS 243311 CKT 1 / 243275 05DELAWR 138 243311 05HOGAN 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246913 CKT 1 / 243311 05HOGAN 138 246913 05JONES 138 1 OPEN BRANCH FROM BUS 243311 TO BUS 246046 CKT 1 / 243311 05HOGAN 138 246046 05HOGAN 34.5 1 OPEN BRANCH FROM BUS 243311 TO BUS 246047 CKT 1 / 243311 05HOGAN 138 246047 05HOGAN L 12.0 1 END
AEP_P4_#10612_05FALL C 138_F	CONTINGENCY 'AEP_P4_#10612_05FALL C 138_F' OPEN BRANCH FROM BUS 243276 TO BUS 243292 CKT 1 / 243276 05DELCOR 138 243292 05FALL C 138 1 OPEN BRANCH FROM BUS 243292 TO BUS 243357 CKT 1 / 243292 05FALL C 138 243357 05PEND
AEP_P4_#2965_05DESOTO 345_A2	CONTINGENCY 'AEP_P4_#2965_05DESOTO 345_A2' OPEN BRANCH FROM BUS 243218 TO BUS 923880 CKT 1 / 243218 05DESOTO 345 923880 AB2-028 TAP 345 1 OPEN BRANCH FROM BUS 243218 TO BUS 243278 CKT 1 / 243218 05DESOTO 345 243278 05DESOTO 138 1 END

Short Circuit

18 Short Circuit

The following Breakers are overduty

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