Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-278

URBANA 138 KV

90.4 MW Capacity / 150.7 MW Energy

July, 2019

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.

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 a Solar generating facility located in Champaign County, Ohio. The installed facilities will have a total capability of 150.7 MW with 90.4 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 1, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	**AE2-278**
Project Name	URBANA 138 KV
State	Ohio
County	Champaign
Transmission Owner	Dayton
MFO	150.7
MWE	150.7
MWC	90.4
Fuel	Solar
Basecase Study Year	2022

2.1 Point of Interconnection

The AE2-278 project will interconnect with the Dayton Power and Light Company transmission system at the Urbana Substation 138 kV bus.

The physical Point of Interconnection (POI) will be the last takeoff structure leaving the Urbana 138 kV yard. Dayton will own the takeoff structure and all attachment hardware. The Interconnection Customer will own the conductor terminating onto the structure.

Under the AE2-278 project, the IC will construct a single 138 kV line up to the POI in the Urbana 138 kV yard.

2.2 Cost Summary

The AE2-278 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$0
Direct Connection Network Upgrade	$1,200,000
Non Direct Connection Network Upgrades	$75,000
Total Costs	**$1,275,000**

In addition, the AE2-278 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	**$1,700,000**

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

3 Attachment Facilities

There are no Attachment Facilities to be constructed by the Transmission Owner. This report assumes that the Interconnection Customer will construct and own the attachment line from its generating facility into the proposed Point of Interconnection as depicted on the one line diagram in Attachment 1. The IC will also be responsible for the fiber/OPGW that Dayton requires on the generator line for the communication assisted trip scheme.

The metering may be classified as an Attachment Facility in future study reports.

4 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
Install new 138 kV breaker at the Urbana Substation to interconnect the AE2-278 project. This will include the installation of all physical structures, P&C equipment, communications equipment, metering equipment, and associated facilities.	$1,200,000
Total Direct Connection Facility Costs	$1,200,000

The substation direct connection cost estimate for the AE2-278 project is approximately **$1,200,000**. The substation direct connection work for this project includes the addition of two new 138 kV breakers to the Urbana Substation. The Urbana Substation is designed for a two bus, four breaker configuration. Thus, to create a reliable connection to the system will require two new breakers. One of the breakers is required to isolate the existing 138/69kV transformer and the other will be for the new generator. The 138 kV generator lead line will be constructed by the developer and will be terminated onto the 138 kV takeoff structure leaving the Urbana Substation. The new 138kV breaker will be equipped with the necessary communication systems to facilitate remote supervisory control of the breaker and status monitoring. Dayton will install the physical structures, line relaying, communications, and interconnection metering to accommodate the interconnection of the AE2-278 generator.

5 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
Protection System changes at Urbana Substation	$75,000
Total Non-Direct Connection Facility Costs	**$75,000**

The substation non-direct connection cost estimate for the AE2-278 project is approximately $75,000. Remote end relaying will need to be evaluated for settings changes at Urbana Substation to facilitate the interconnection of the new generation.

6 Schedule

Based on the extent of the Dayton primary Direct Connection and Non-Direct Connection upgrades required to support the AE2-278 generation project, it is expected to take a minimum of **18 months** from the date of a fully executed Interconnection Construction Service Agreement to complete the installation subject to market conditions and vendor lead times. This includes the requirement for the Interconnection Customer to make a preliminary payment to Dayton which funds the first three months of engineering design that is related to the construction of the Non-Direct Connection facilities. It assumes that there will be no environmental or permitting issues to implement the Non-Direct Connection upgrades for this project and that all system outages will be allowed when requested.

7 Interconnection Customer Requirements

7.1 PJM Requirements

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.

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.

7.2 Dayton Interconnection Requirements

The Dayton Power and Light Company (DP&L) has prepared this Facilities Connection Requirements document to ensure compliance with North American Electric Reliability Council (NERC) Reliability Standards and applicable Regional Reliability Organization, sub regional, Power Pool, and individual Transmission Owner

planning criteria and facility connection requirements in compliance to NERC Standard FAC-001-2. These connection requirements apply to all generation facilities, transmission facilities, and end-users connecting to the DP&L transmission system. Detailed information outlining DP&L interconnection requirements can be reviewed utilizing the following link:

https://www.pjm.com/~/media/planning/plan-standards/private-dayton/dayton-facilities-connection-requirements.ashx

8 Revenue Metering and SCADA Requirements.

8.1 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.

8.2 Dayton Requirements

The Interconnection Customer will be required to comply with all Dayton Revenue Metering Requirements for Generation Interconnection Customers as outlined in the link below. The Revenue Metering Requirements may be found within the Dayton Power & Light Co. "Requirements for the Connection of Facilities to the Dayton Power & Light Co. Transmission System" document located at the following link:

http://www.pjm.com/~/media/planning/plan-standards/private-dayton/dayton-facilities-connection-requirements.ashx
http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx

9 Network Impacts

The Queue Project AE2-278 was evaluated as a 150.7 MW (Capacity 90.4 MW) injection at the **Urbana 138kV** substation in the Dayton area. Project AE2-278 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-278 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

10 Generation Deliverability

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

None

11 Multiple Facility Contingency

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

None

12 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	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
7340450	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	105.85	106.32	DC	12.47
7340451	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1203.0	103.72	104.22	DC	13.3
7340273	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	ATSI-P2-3-OES-138-010A	breaker	242.0	105.45	117.2	DC	28.43
7340274	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	ATSI-P2-3-OES-138-011	breaker	242.0	102.85	114.6	DC	28.43
7341720	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	tower	242.0	104.79	112.77	DC	19.32
7341721	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	tower	242.0	104.79	112.77	DC	19.32

13 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	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
7341461	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P1-2_#10137	operation	1203.0	96.76	97.26	DC	13.3

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
7341183	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	Base Case	operation	200.0	106.41	115.89	DC	18.96

14 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
7340450, 7340451	1	05BEATTY 345.0 kV - 05BIXBY 345.0 kV Ckt 1	**AEPO0003a (108)**: Upgrade/Replace Three 345kV 1600A switches at Beatty substation **Project Type** : FACILITY **Cost** : $1,500,000 **Time Estimate** : 12-18 Months	$1,500,000
7340274, 7340273, 7341721, 7341720	2	AE2-180 TAP 138.0 kV - 05BEATTY 138.0 kV Ckt 1	**AEPO0002a (105)**: AEP Only: Upgrade relaying at Beatty Substation **Project Type** : FACILITY Cost : $200,000 **Time Estimate** : 12-18 Months	$200,000
			TOTAL COST	**$1,700,000**

15 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, 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.

15.1 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
7340450	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	105.85	106.32	DC	12.47

Bus #	Bus	MW Impact
253038	09KILLEN	52.29
253077	09STUART	214.43
253110	09ADKINS	24.08
253261	09MON D	0.21
902531	W2-040 C	0.97
902532	W2-040 E	1.58
904722	V4-073 E	0.21
913222	Y1-054 E	1.61
914372	Y2-111 E	1.61
915582	Y3-080 E	1.07
915662	Y3-099 E	0.15
915672	Y3-100 E	0.15
916182	Z1-065 E	0.5
916272	Z1-080 E	0.49
918802	AA1-099 E	0.32
925242	AB2-178 E	1.5
925921	AC1-068 C	11.33
925922	AC1-068 E	5.3
925931	AC1-069 C	11.33
925932	AC1-069 E	5.3
925981	AC1-074 C O1	4.21
925982	AC1-074 E O1	1.8
926011	AC1-078 C O1	8.49
926012	AC1-078 E O1	14.15
926061	AC1-085 C O1	20.6
926062	AC1-085 E O1	33.61
926101	AC1-089 C O1	4.17
926102	AC1-089 E O1	6.8
926791	AC1-165 C	11.2
926792	AC1-165 E	5.43
926801	AC1-166 C	11.2
926802	AC1-166 E	5.43
927182	AC1-212 E	1.27
930062	AB1-014 E	8.46
931181	AB1-169	135.05
932381	AC2-055 C	1.77
932382	AC2-055 E	2.89
932421	AC2-060 C	6.29
932422	AC2-060 E	3.54
932431	AC2-061 C	4.26
932432	AC2-061 E	4.32
932462	AC2-066 E	0.27

Bus #	Bus	MW Impact
932481	AC2-068 C	3.29
932482	AC2-068 E	5.39
932551	AC2-075 C	1.0
932552	AC2-075 E	0.5
932651	AC2-087 C O1	4.66
932652	AC2-087 E O1	3.7
932661	AC2-088 C O1	4.24
932662	AC2-088 E O1	3.49
932841	AC2-111 C O1	2.16
932842	AC2-111 E O1	3.52
934491	AD1-073 C	1.3
934492	AD1-073 E	0.67
934561	AD1-081 C	1.7
934562	AD1-081 E	0.87
935031	AD1-136 C	0.6
935032	AD1-136 E	0.51
935041	AD1-140 C O1	12.37
935042	AD1-140 E O1	10.23
936251	AD2-031 C O1	2.51
936252	AD2-031 E O1	4.09
936281	AD2-036 C	3.01
936282	AD2-036 E	1.5
936381	AD2-048 C	3.42
936382	AD2-048 E	1.71
937111	AD2-147 C O1	13.71
937112	AD2-147 E O1	18.93
937151	AD2-151 C O1	4.66
937152	AD2-151 E O1	6.43
938051	AE1-007 C	0.94
938052	AE1-007 E	1.54
938061	AE1-008 C	0.54
938062	AE1-008 E	0.88
938271	AE1-040 C O1	4.04
938272	AE1-040 E O1	2.03
938921	AE1-120	4.8
939141	AE1-144 C O1	7.14
939142	AE1-144 E O1	3.54
940531	AE2-038 C O1	4.76
940532	AE2-038 E O1	2.36
941411	AE2-138 C	14.74
941412	AE2-138 E	5.45
941511	AE2-148 C	169.93
941512	AE2-148 E	76.86
941771	AE2-180 C	7.08
941772	AE2-180 E	4.72
941941	AE2-206 C O1	2.91
941942	AE2-206 E O1	4.02
941981	AE2-210 C O1	5.04
941982	AE2-210 E O1	1.89
942051	AE2-217 C	10.75
942052	AE2-217 E	7.17
942061	AE2-218 C	11.36

Bus #	Bus	MW Impact
942062	AE2-218 E	7.72
942091	AE2-221 C	26.7
942092	AE2-221 E	17.8
942231	AE2-235 C O1	3.55
942232	AE2-235 E O1	1.54
942521	AE2-267 C O1	2.88
942522	AE2-267 E O1	1.78
942621	AE2-278 C	7.48
942622	AE2-278 E	4.99
942781	AE2-296 O1	13.29
942951	AE2-315	3.23
942981	AE2-320 C O1	22.29
942982	AE2-320 E O1	11.03
943111	AE2-339 C	2.36
943112	AE2-339 E	1.16
943191	AE2-318 C	6.94
943192	AE2-318 E	3.39
943201	AE2-319 C O1	22.29
943202	AE2-319 E O1	11.03
CARR	CARR	0.55
CBM-S1	CBM-S1	8.63
CBM-S2	CBM-S2	0.95
CBM-W1	CBM-W1	9.32
CBM-W2	CBM-W2	59.99
CIN	CIN	8.94
CPLE	CPLE	0.14
G-007	G-007	1.49
IPL	IPL	6.15
LGEE	LGEE	3.45
MEC	MEC	10.24
MECS	MECS	1.52
O-066	O-066	9.56
RENSSELAER	RENSSELAER	0.43
WEC	WEC	1.36

15.2 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
7340273	941770	AE2-180 TAP	AEP	243469	05BEATTY	AEP	1	ATSI-P2-3-OES-138-010A	breaker	242.0	105.45	117.2	DC	28.43

Bus #	Bus	MW Impact
290286	R-052A C	2.16
290287	R-052A E	8.65
926011	AC1-078 C O1	44.64
926012	AC1-078 E O1	74.39
934561	AD1-081 C	8.93
934562	AD1-081 E	4.6
935041	AD1-140 C O1	12.19
935042	AD1-140 E O1	10.08
937241	AD2-163 C	30.1
937242	AD2-163 E	14.79
941771	AE2-180 C	37.43
941772	AE2-180 E	24.96
942051	AE2-217 C	48.29
942052	AE2-217 E	32.19
942621	AE2-278 C	17.05
942622	AE2-278 E	11.38
942861	AE2-305 C O1	7.25
942862	AE2-305 E O1	4.83
943131	AE2-342 C	2.33
943132	AE2-342 E	1.15
CARR	CARR	0.05
CBM-S1	CBM-S1	0.75
CBM-S2	CBM-S2	0.06
CBM-W1	CBM-W1	1.14
CBM-W2	CBM-W2	5.75
CIN	CIN	0.91
CPLE	CPLE	0.0
G-007	G-007	0.13
IPL	IPL	0.63
LGEE	LGEE	0.31
MEC	MEC	1.05
MECS	MECS	0.46
O-066	O-066	0.87
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.15

Affected Systems

16 Affected Systems

16.1 LG&E

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

16.2 MISO

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

16.3 TVA

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

16.4 Duke Energy Progress

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

16.5 NYISO

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

Contingency Name	Contingency Definition
ATSI-P2-3-OES-138-011	CONTINGENCY 'ATSI-P2-3-OES-138-011' /* TANGY B-2 FAILURE TO TRIP DISCONNECT BRANCH FROM BUS 239134 TO BUS 239264 CKT 1 /* 02TANGY 138 02DBP 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239218 CKT 1 /* 02TANGY 138 02SSCIOT 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 238574 CKT 1 /* 02TANGY 138 02BELPT+ 138 DISCONNECT BRANCH FROM BUS 239264 TO BUS 238640 CKT 1 /* 02DBP 138 02CRISS 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 240706 CKT 1 /* 02TANGY 138 02NATIONAL 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 3 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 4 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 5 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239135 CKT 1 /* 02TANGY 138 02TANGY 69 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239135 CKT 2 /* 02TANGY 138 02TANGY 69 REMOVE LOAD R FROM BUS 239264 /* 02DBP 138 DISCONNECT BUS 239134 /* 02TANGY 138 DISCONNECT BUS 239264 /* 02DBP 138 END
ATSI-P2-3-OES-138-010A	CONTINGENCY 'ATSI-P2-3-OES-138-010A' /* TANGY B-155 FAILURE TO TRIP DISCONNECT BRANCH FROM BUS 239134 TO BUS 239264 CKT 1 /* 02TANGY 138 02DBP 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239218 CKT 1 /* 02TANGY 138 02SSCIOT 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 238574 CKT 1 /* 02TANGY 138 02BELPT+ 138 DISCONNECT BRANCH FROM BUS 238964 TO BUS 238574 CKT 1 /* 02MLCRK+ 138 02BELPT+ 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 240706 CKT 1 /* 02TANGY 138 02NATIONAL 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 3 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 4 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239133 TO BUS 239134 CKT 5 /* 02TANGY 345 02TANGY 138 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239135 CKT 1 /* 02TANGY 138 02TANGY 69 DISCONNECT BRANCH FROM BUS 239134 TO BUS 239135 CKT 2 /* 02TANGY 138 02TANGY 69 DISCONNECT BRANCH FROM BUS 937240 TO BUS 238964 CKT 1 /* AD2-163 TAP 138 02MLCRK+ 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD REMOVE LOAD O FROM BUS 238574 /* 02BELPT+ 138 REMOVE LOAD O FROM BUS 238964 /* 02MLCRK+ 138 DISCONNECT BUS 239134 /* 02TANGY 138 DISCONNECT BUS 238964 /* 02MLCRK+ 138 DISCONNECT BUS 238574 /* 02BELPT+ 138 END
AEP_P1-2_#10137	CONTINGENCY 'AEP_P1-2_#10137' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 END
Base Case	
AEP_P4_#10715_05COLE 345_C	CONTINGENCY 'AEP_P4_#10715_05COLE 345_C' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 OPEN BRANCH FROM BUS 244022 TO BUS 244023 CKT 1 / 244022 05COLE 345 244023 05COLE 138 1 END
DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-B' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 941510 TO BUS 253248 CKT 1 / 941510 AE2-148 TAP 345 253248 09SCHARL 345 1 END

Contingency Name	Contingency Definition
DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-A' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 941510 CKT 1 / 243453 05BEATTY 345 941510 AE2-148 TAP 345 1 END
AEP_P4_#3196_05BEATTY 345_302E	CONTINGENCY 'AEP_P4_#3196_05BEATTY 345_302E' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END

Short Circuit

17 Short Circuit

The following Breakers are over duty:

None