



Revised

Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-289

FROSTBURG 138 KV

11.76 MW Capacity / 80 MW Energy

August 2019

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is The Potomac Edison Company (part of Allegheny Power System, Inc. (APS)).

2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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.

3 Revision from July 2019

The AE2-289 Feasibility Study has been revised to correct an error in the System Reinforcements total calculation and to remove the inaccurate MFO values from the One Line. Updates are in Sections 4.2 and 13.5 and Attachment 1 of this report.

4 General

The Interconnection Customer (IC) has proposed a Wind generating facility located in Somerset County, Pennsylvania. The installed facilities will have a total capability of 80 MW with 11.76 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2021. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

Queue Number	AE2-289
Project Name	FROSTBURG 138 kV
Interconnection Customer	
State	Pennsylvania
County	Somerset
Transmission Owner	APS
MFO	80
MWE	80
MWC	11.76
Fuel	Wind
Basecase Study Year	2022

4.1 Point of Interconnection

The interconnection of the project at the Primary POI will be accomplished by utilizing the Big Savage Wind Project/Mason Dixon Wind Project 138 kV interconnection point at Frostburg 138 kV substation. This project will have shared attachment facilities with both the Big Savage Wind Project and the Mason Dixon Wind Project. The project will also require non-direct connection upgrades at the Frostburg 138 kV substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-289 generation project to connect to the FirstEnergy (“FE”) transmission system. Attachment 2 provides the proposed location for the point of interconnection. IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the FE transmission system’s direct connection facilities.

4.2 Cost Summary

The AE2-289 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$0
Direct Connection Network Upgrade	\$0
Non Direct Connection Network Upgrades	\$12,500
Total Costs	\$12,500

In addition, the AE2-289 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$62,029,500

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

The costs provided above exclude the Contribution in Aid of Construction (“CIAC”) Federal Income Tax Gross Up charge. If, at a future date, it is determined that the CIAC Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AE2-289 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

5 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by utilizing the Big Savage Wind Project/Mason Dixon Wind Project 138 kV interconnection point at Frostburg 138 kV substation. This project will have shared attachment facilities with both the Big Savage Wind Project and the Mason Dixon Wind Project. The project will also require non-direct connection upgrades at the Frostburg 138 kV substation.

6 Attachment Facilities

There is no Attachment Facilities scope of work required for this project.

7 Direct Connection Cost Estimate

There is no Direct Connection scope of work required for this project.

8 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
Frostburg SS 138kV Adjust Remote Relay and Metering Settings.	\$12,500
Total Non-Direct Connection Facility Costs	\$12,500

9 Schedule

Based on the scope of work for the Non-Direct Connection facilities, it is expected to take a minimum of 6 months after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make an initial payment that compensates FE for the non-direct connection facility work and system reinforcements. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that all transmission system outages will be allowed when requested.

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimate elapsed time to complete each of the required reinforcements is identified in the “System Reinforcements” section of the report.

10 Transmission Owner Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AE2-289 project did not contribute to any overloads on the FE transmission system.

11 Interconnection Customer Requirements

11.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

11.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 138 kV circuit breaker to protect the AE2-289 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.
2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.
4. Compliance with the FE and PJM generator power factor and voltage control requirements.
5. The execution of a back-up service agreement to serve the customer load supplied from the AE2-289 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

11.3 Power Factor Requirements

The IC shall design its wind-powered Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE transmission system.

12 Revenue Metering and SCADA Requirements

12.1 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.

12.2 APS Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>

13 Network Impacts

The Queue Project AE2-289 was evaluated as an 80 MW (Capacity 11.76 MW) injection at Frostburg 138 kV substation in the APS area. Project AE2-289 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-289 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

13.1 Generation Deliverability

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

None

13.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	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
7367108	235305	01 106 J	AP	938800	AE1-106 TAP	AP	1	AP-P2-2-MP-138-001	bus	306.0	99.28	106.01	DC	20.6
7367888	235305	01 106 J	AP	938800	AE1-106 TAP	AP	1	AP-P2-3-MP-138-001	breaker	306.0	99.28	106.01	DC	20.6
7367889	235305	01 106 J	AP	938800	AE1-106 TAP	AP	1	AP-P2-3-MP-138-151	breaker	306.0	99.18	105.91	DC	20.6
7369281	235427	01WILLIM	AP	235385	01PARSNS	AP	1	AP-P7-1-MP-138-056-A	tower	179.0	98.97	100.39	DC	5.65
7367839	235449	01CARLOS	AP	235469	01GARRET	AP	1	AP-P2-3-MP-138-150	breaker	206.0	95.86	107.66	DC	24.32
7367908	235504	01RIDGLY	AP	237310	01DANSMTN	AP	1	AP-P2-3-MP-138-150	breaker	182.0	92.63	105.89	DC	24.14
7369284	235504	01RIDGLY	AP	235454	01CUMBRL	AP	1	AP-P7-1-MP-138-056-B	tower	343.0	86.81	99.31	DC	42.86
7369172	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P7-1-PE-138-012B	tower	306.0	97.32	110.38	DC	39.96

13.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	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
7367020	200746	26ROCKWOOD	PENELEC	200744	26SOMERST	PENELEC	1	AP-P2-2-MP-138-101	bus	179.0	115.13	120.16	DC	9.0
7367641	200746	26ROCKWOOD	PENELEC	200744	26SOMERST	PENELEC	1	AP-P2-3-MP-138-153	breaker	179.0	117.38	122.67	DC	9.47
7367642	200746	26ROCKWOOD	PENELEC	200744	26SOMERST	PENELEC	1	AP-P2-3-MP-138-159	breaker	179.0	116.1	121.28	DC	9.28
7367643	200746	26ROCKWOOD	PENELEC	200744	26SOMERST	PENELEC	1	AP-P2-4-MP-138-200	breaker	179.0	115.63	120.86	DC	9.36

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
7367601	235122	01LKLYNN	AP	235207	01LARDIN	AP	1	AP-P2-3-WP-500-438A	breaker	303.0	126.12	127.27	DC	7.72
7367602	235122	01LKLYNN	AP	235207	01LARDIN	AP	1	AP-P2-3-WP-500-438B	breaker	303.0	126.12	127.27	DC	7.72
7366947	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P2-2-PE-138-021A	bus	186.0	113.04	134.56	DC	40.03
7367493	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P2-3-PE-138-150	breaker	186.0	114.0	135.58	DC	40.14
7367494	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P2-3-PE-138-009A	breaker	186.0	113.04	134.56	DC	40.03
7367495	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P2-3-PE-138-008A	breaker	186.0	112.45	133.97	DC	40.03
7367521	235385	01PARSNS	AP	235362	01LOUGHL	AP	1	AP-P2-4-MP-138-200	breaker	179.0	133.14	134.31	DC	4.64
7366965	235427	01WILLIM	AP	235385	01PARSNS	AP	1	AP-P2-2-MP-138-001	bus	179.0	101.49	102.89	DC	5.55
7367475	235427	01WILLIM	AP	235385	01PARSNS	AP	1	AP-P2-4-MP-138-200	breaker	179.0	137.95	139.11	DC	4.64
9629639	235427	01WILLIM	AP	235385	01PARSNS	AP	1	AP-P2-3-MP-138-001	breaker	179.0	101.49	102.89	DC	5.55
7367736	235469	01GARRET	AP	934440	AD1-068 TAP	AP	1	AP-P2-3-MP-138-150	breaker	191.0	106.5	115.73	DC	17.65
7367690	237310	01DANSMTN	AP	235449	01CARLOS	AP	1	AP-P2-3-MP-138-150	breaker	182.0	108.39	121.66	DC	24.14
7367401	934440	AD1-068 TAP	AP	235120	01ALBRIG	AP	1	AP-P2-3-MP-138-150	breaker	191.0	135.83	145.07	DC	17.65
7366982	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P2-2-MP-138-001	bus	306.0	118.08	124.81	DC	20.6
7367615	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P2-3-MP-138-001	breaker	306.0	118.08	124.81	DC	20.6
7367616	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P2-3-MP-138-151	breaker	306.0	117.98	124.72	DC	20.6

13.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	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
7368709	235120	01ALBRIG	AP	235398	01RUTHBL	AP	1	AP-P1-2-MP-138-040-B	operation	186.0	106.22	110.97	DC	8.84
7368575	235122	01LKLYNN	AP	235207	01LARDIN	AP	1	235116 01YUKON 500 292625 T174_TAP 500 1	operation	303.0	120.26	121.43	DC	7.86
7368576	235122	01LKLYNN	AP	235207	01LARDIN	AP	1	Base Case	operation	261.0	107.58	108.89	DC	7.56
7368759	235184	01GATESH	AP	235821	01BROWNSVLE	AP	1	AP-P1-2-WP-138-026	operation	151.0	108.3	109.82	DC	5.1
7368589	235207	01LARDIN	AP	235820	01CLARKSVLE	AP	1	AP-P1-2-WP-138-025	operation	151.0	119.03	120.59	DC	5.22
7368387	235297	01HAZELT	AP	235305	01 106 J	AP	1	AP-P1-2-PE-138-044-B	operation	311.0	110.94	136.66	DC	79.98
7368411	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P1-2-MP-138-040-B	operation	186.0	118.89	130.94	DC	22.42
7368394	235468	01FROSTB	AP	940460	AE2-030 TAP	AP	1	AP-P1-2-WP-138-071-A	operation	306.0	109.59	135.72	DC	79.98
7368395	235468	01FROSTB	AP	940460	AE2-030 TAP	AP	1	AP-P1-2-AA1-047_1_FSA	operation	306.0	109.59	135.72	DC	79.98
7368704	235469	01GARRET	AP	934440	AD1-068 TAP	AP	1	PN-P1-2-PN-115-068	operation	191.0	103.19	109.94	DC	12.9
7368630	235478	01JENING	AP	918340	AA1-047 TAP	AP	1	AP-P1-2-PE-138-044-B	operation	311.0	91.24	116.95	DC	79.98
7368873	235504	01RIDGLY	AP	235454	01CUMBRL	AP	1	AP-P1-2-WP-138-071-A	operation	343.0	86.86	99.25	DC	42.48
7368816	235529	01TWINRIDGE	AP	235468	01FROSTB	AP	1	Base Case	operation	293.0	78.65	105.94	DC	79.98
7368864	235802	01CHEATL	AP	235122	01LKLYNN	AP	1	AP-P1-2-MP-138-040-B	operation	213.0	95.14	99.74	DC	9.79
7368876	237310	01DANSMTN	AP	235449	01CARLOS	AP	1	AP-P1-2-AA1-047_1_FSA	operation	182.0	87.85	100.22	DC	22.52
7368773	237317	01FINZEL	AP	235478	01JENING	AP	1	AP-P1-2-PE-138-044-B	operation	332.0	84.45	108.54	DC	79.98

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
7368348	918340	AA1-047 TAP	AP	235297	01HAZELT	AP	1	AP-P1-2-PE-138-044-B	operation	311.0	113.61	139.33	DC	79.98
7368289	934440	AD1-068 TAP	AP	235120	01ALBRIG	AP	1	PN-P1-2-PN-115-068	operation	191.0	138.15	144.91	DC	12.9
7368294	934440	AD1-068 TAP	AP	235120	01ALBRIG	AP	1	Base Case	operation	164.0	114.31	119.92	DC	9.21
7368754	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P1-2-PE-138-044-B	operation	306.0	97.0	110.02	DC	39.84
7368329	940460	AE2-030 TAP	AP	235504	01RIDGLY	AP	1	AP-P1-2-AA1-047_1_FSA	operation	306.0	115.47	141.6	DC	79.98
7368330	940460	AE2-030 TAP	AP	235504	01RIDGLY	AP	1	AP-P1-2-WP-138-071-A	operation	306.0	115.47	141.6	DC	79.98

13.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
7367736	11	01GARRET 138.0 kV - AD1-068 TAP 138.0 kV Ckt 1	PE-0001a (234) : Replace KD and KD-1 Line Relays Project Type : FAC Cost : \$325,000 Time Estimate : 12.0 Months PE-0001b (235) : Replace Disconnect Switch and Wave Trap at Garrett Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$455,000
7367889,7367888,7367108	1	01 106 J 138.0 kV - AE1- 106 TAP 138.0 kV Ckt 1	<u>7367108,7367888,7367889</u> No violation;¹ Rate A = 308 MVA, Rate B = 376 MVA	\$0
7367839	3	01CARLOS 138.0 kV - 01GARRET 138.0 kV Ckt 1	PE-0002 (237) : Replace Bus Side Disconnect Switch at Garrett and SW #1315 at Carlos Jct. Project Type : FAC Cost : \$195,000 Time Estimate : 9.0 Months	\$195,000
7367401	13	AD1-068 TAP 138.0 kV - 01ALBRIG 138.0 kV Ckt 1	MP-0001 (160) : Reconfigure Albright 138 kV SS to breaker-and-a-half layout Project Type : CON Cost : \$13,000,000 Time Estimate : 24.0 Months	\$13,000,000
7367020,7367641,7367642,7367643	7	26ROCKWOOD 115.0 kV - 26SOMERST 115.0 kV Ckt 1	PN-0011a (799) : Reconductor line with 397 ACSS high temperature conductor (8.12 miles) Project Type : FAC Cost : \$15,600,000 Time Estimate : 22.0 Months PN-0011b (800) : At Rockwood, adjust CT ratios and relay settings. Project Type : FAC Cost : \$19,500 Time Estimate : 6.0 Months	\$15,619,500

¹ If “No violation” was provided as the Upgrade Description for a facility in the System Reinforcements table then that facility met one of the following conditions:

- The loading on the facility at your queue position was less than 100%; therefore, the facility is not yet overloaded, but may be overloaded by end of the AE2 queue.
- The TO reviewed their ratings on the facility and determined that the current rating was greater than the rating in PJM’s model. This new rating was greater than the loading at your queue position making the violation invalid.
- The TO reviewed the contingency and determined that contingency was not valid; therefore the violation is invalid. Any contingency corrections will be assessed and corrected in the AE2 impact study phase.

ID	Index	Facility	Upgrade Description	Cost
7369172,7366982,7367615,7367616	6	AE1-106 TAP 138.0 kV - 01LKLYNN 138.0 kV Ckt 1	MP-0001 (160) : Reconfigure Albright 138 kV SS to breaker-and-a-half layout Project Type : CON Cost : \$13,000,000 Time Estimate : 24.0 Months WP-0014a (227) : Replace Relays at Lake Lynn Project Type : FAC Cost : \$325,000 Time Estimate : 12.0 Months	\$325,000
7367908	4	01RIDGLY 138.0 kV - 01DANSMTN 138.0 kV Ckt 1	PE-0004 (241) : Replace Breaker Risers at Ridgeley Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$130,000
7367475,7369281,7366965,9629639	2	01WILLIM 138.0 kV - 01PARSNS 138.0 kV Ckt 1	MP-0001 (160) : Reconfigure Albright 138 kV SS to breaker-and-a-half layout Project Type : CON Cost : \$13,000,000 Time Estimate : 24.0 Months b3028 (248) : PJM Baseline Upgrade b3028. Upgrade substation disconnect leads at William 138 kV Substation. The baseline project has a projected in-service date of 06/01/2021. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$0
7367601,7367602	8	01LKLYNN 138.0 kV - 01LARDIN 138.0 kV Ckt 1	b3006 (249) : PJM Baseline Upgrade b3006. Replace four Yukon 500/138 kV transformers with three transformers with higher rating and reconfigure 500 kV bus. The baseline project has an projected in-service date of 06/01/2021.² Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$0
7367521	10	01PARSNS 138.0 kV - 01LOUGHL 138.0 kV Ckt 1	MP-0001 (160) : Reconfigure Albright 138 kV SS to breaker-and-a-half layout Project Type : CON Cost : \$13,000,000 Time Estimate : 24.0 Months	\$0

² Baseline RTEP project b3006 may resolve the overload violations identified but this has not been evaluated in the Feasibility Study phase. B3006 will be modeled along with the AE2-289 project in the System Impact Study phase. If violations still exist even after the baseline is considered in the evaluation, then the AE2-289 customer may be responsible for a new system reinforcement.

ID	Index	Facility	Upgrade Description	Cost
7367495,7367494,7366947,7367493	9	01 106 J 138.0 kV - 01ALBRIG 138.0 kV Ckt 1	MP-0002a (161) : Replace CT at Albright Project Type : FAC Cost : \$325,000 Time Estimate : 12.0 Months MP-0002b (162) : Replace Wavetrap at Albright Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months MP-0002c (163) : Replace Line Riser at Albright Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months MP-0002d (164) : Reconductor 14 miles of 556 ACSR Line Conductor Project Type : FAC Cost : \$31,200,000 Time Estimate : 30.0 Months MP-0002e (165) : Replace Bus Side Breaker Risers at Albright Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months MP-0002f (166) : Replace Line Side Breaker Risers at Albright Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months MP-0002g (167) : Replace Disconnect Leads at Albright Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$32,175,000
7369284	5	01RIDGLY 138.0 kV - 01CUMBRL 138.0 kV Ckt 1	7369284 No violation.¹ Post queue loading less than 100%.	\$0
7367690	12	01DANSMTN 138.0 kV - 01CARLOS 138.0 kV Ckt 1	PE-0003 (239) : Replace SW #1316 at Carlos Jct. Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$130,000
			TOTAL COST	\$62,029,500

13.6 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.

13.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7367888	235305	01 106 J	AP	938800	AE1-106 TAP	AP	1	AP-P2-3-MP-138-001	breaker	306.0	99.28	106.01	DC	20.6

Bus #	Bus	MW Impact
200813	26YOUGH	0.09
200835	26DSGENWIN	0.69
200840	26DEEPCRK1	0.2
200841	26DEEPCRK2	0.2
235091	U2-061_E	6.88
235098	U2-073A E	31.16
235099	U2-073B E	13.65
235520	01WVACO_S38	8.49
235530	01TR_Y2_073A	0.56
235531	01TR_Y2_073B	0.25
235625	01BACKB	6.31
235854	01KL_K28_T16	0.61
236001	01WARRIOR RN	4.47
237312	01DANS_S-014	2.82
237319	01FMR_U2-030	0.28
237507	01CROSSCHOOL	0.29
237512	01ROTHROCK	0.13
290229	S-014 E	11.26
292310	K-019	0.24
292350	K-023	2.12
292401	K-028 E	15.68
292542	L-013 1	2.12
293432	R-040 E	0.12
293902	O-048 E	1.91
885642	T-016 E	4.69
913141	Y1-033 C OP1	0.06
913142	Y1-033 E OP1	3.44
917091	Z2-013	0.22
917672	Z2-108 E	1.33
918341	AA1-047 C	3.87
918342	AA1-047 E	25.75
918471	AA1-062 C	2.87
918472	AA1-062 E	19.28
918812	AA1-100 E	2.24
920072	AA2-103 E	2.95
923971	AB2-038	0.13
924001	AB2-041 C	0.12
924002	AB2-041 E	4.04
929522	U2-030 E	15.2
930261	AB1-065 C	1.44
930262	AB1-065 E	2.35

Bus #	Bus	MW Impact
932141	AC2-021	2.27
933951	AD1-018 C	1.47
933952	AD1-018 E	2.4
934441	AD1-068 C	2.48
934442	AD1-068 E	14.42
934931	AD1-125 C	1.81
934932	AD1-125 E	10.53
937361	AD2-180 C O1	2.78
937362	AD2-180 E O1	17.49
938341	AE1-052	1.47
938351	AE1-053	0.35
938831	AE1-109 C	1.45
938832	AE1-109 E	1.88
940461	AE2-030 C	1.77
940462	AE2-030 E	2.43
942731	AE2-289 C	3.03
942732	AE2-289 E	17.58
942901	AE2-309 C	3.22
942902	AE2-309 E	0.63
943212	AE2-000A E	10.91
BLUEG	BLUEG	1.18
CALDERWOOD	CALDERWOOD	0.06
CANNELTON	CANNELTON	0.07
CATAWBA	CATAWBA	0.01
CBM-N	CBM-N	0.08
CHEOAH	CHEOAH	0.06
CHILHOWEE	CHILHOWEE	0.02
COFFEEN	COFFEEN	0.12
COTTONWOOD	COTTONWOOD	0.33
CPL	CPL	0.03
DUCKCREEK	DUCKCREEK	0.28
EDWARDS	EDWARDS	0.13
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.08
G-007A	G-007A	0.4
GIBSON	GIBSON	0.05
NEWTON	NEWTON	0.32
NYISO	NYISO	0.34
PRAIRIE	PRAIRIE	0.55
SANTEETLA	SANTEETLA	0.02
SMITHLAND	SMITHLAND	0.04
TATANKA	TATANKA	0.15
TILTON	TILTON	0.16
TRIMBLE	TRIMBLE	0.13
TVA	TVA	0.26
UNIONPOWER	UNIONPOWER	0.11
VFT	VFT	1.05

13.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7367475	235427	01WILLIM	AP	235385	01PARSNS	AP	1	AP-P2-4-MP-138-200	breaker	179.0	137.95	139.11	DC	4.64

Bus #	Bus	MW Impact
235091	U2-061_E	26.17
235098	U2-073A E	7.01
235099	U2-073B E	3.07
235520	01WVACO_S38	3.59
235625	01BACKB	25.75
235854	01KL_K28_T16	0.58
237312	01DANS_S-014	0.87
237512	01ROTHROCK	0.48
290229	S-014 E	3.5
292310	K-019	0.97
292401	K-028 E	14.75
885642	T-016 E	4.41
903041	W2-057 E	3.47
918471	AA1-062 C	11.73
918472	AA1-062 E	78.68
918812	AA1-100 E	0.72
920072	AA2-103 E	12.03
924002	AB2-041 E	0.91
932141	AC2-021	0.9
933951	AD1-018 C	0.58
933952	AD1-018 E	0.95
934931	AD1-125 C	2.86
934932	AD1-125 E	16.61
937361	AD2-180 C O1	2.56
937362	AD2-180 E O1	16.13
938341	AE1-052	6.02
938831	AE1-109 C	1.1
938832	AE1-109 E	1.42
940461	AE2-030 C	0.47
940462	AE2-030 E	0.64
942731	AE2-289 C	0.68
942732	AE2-289 E	3.95
942901	AE2-309 C	1.29
942902	AE2-309 E	0.25
943212	AE2-000A E	44.51
BLUEG	BLUEG	1.26
CALDERWOOD	CALDERWOOD	0.12
CANNELTON	CANNELTON	0.07
CATAWBA	CATAWBA	0.06
CBM-N	CBM-N	0.15
CHEOAH	CHEOAH	0.11

Bus #	Bus	MW Impact
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.13
COTTONWOOD	COTTONWOOD	0.47
DUCKCREEK	DUCKCREEK	0.27
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.13
FARMERCITY	FARMERCITY	0.08
G-007A	G-007A	0.49
GIBSON	GIBSON	0.05
HAMLET	HAMLET	0.09
NEWTON	NEWTON	0.33
NYISO	NYISO	0.66
PRAIRIE	PRAIRIE	0.61
SANTEETLA	SANTEETLA	0.03
SMITHLAND	SMITHLAND	0.05
TATANKA	TATANKA	0.15
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.14
TVA	TVA	0.4
UNIONPOWER	UNIONPOWER	0.17
VFT	VFT	1.3

13.6.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7367839	235449	01CARLOS	AP	235469	01GARRET	AP	1	AP-P2-3-MP-138-150	breaker	206.0	95.86	107.66	DC	24.32

Bus #	Bus	MW Impact
235098	U2-073A E	36.78
235099	U2-073B E	16.11
235520	01WVACO_S38	8.08
235530	01TR_Y2_073A	0.67
235531	01TR_Y2_073B	0.3
235854	01KL_K28_T16	0.38
236001	01WARRIOR RN	6.67
237312	01DANS_S-014	5.44
237319	01FMR_U2-030	0.29
237507	01CROSSCHOOL	0.28
290229	S-014 E	21.78
292401	K-028 E	9.72
885642	T-016 E	2.91
917091	Z2-013	0.26
917672	Z2-108 E	1.89
918341	AA1-047 C	2.77
918342	AA1-047 E	18.39
918812	AA1-100 E	3.34
923971	AB2-038	0.16
924001	AB2-041 C	0.14
924002	AB2-041 E	4.77
929522	U2-030 E	15.87
930261	AB1-065 C	1.26
930262	AB1-065 E	2.05
932141	AC2-021	2.02
933951	AD1-018 C	2.36
933952	AD1-018 E	3.86
934931	AD1-125 C	1.3
934932	AD1-125 E	7.55
937361	AD2-180 C O1	1.99
937362	AD2-180 E O1	12.55
938351	AE1-053	0.5
938831	AE1-109 C	1.58
938832	AE1-109 E	2.05
938882	AE1-116 CBAT	0.14
938883	AE1-116 EBAT	0.14
940461	AE2-030 C	2.31
940462	AE2-030 E	3.16
942731	AE2-289 C	3.57
942732	AE2-289 E	20.74
942901	AE2-309 C	5.13

Bus #	Bus	MW Impact
942902	AE2-309 E	1.01
BLUEG	BLUEG	0.68
CALDERWOOD	CALDERWOOD	0.03
CANNELTON	CANNELTON	0.04
CARR	CARR	0.06
CBM-S2	CBM-S2	0.04
CHEOAH	CHEOAH	0.03
CHILHOWEE	CHILHOWEE	0.01
COFFEEN	COFFEEN	0.07
COTTONWOOD	COTTONWOOD	0.17
CPL	CPL	0.05
DUCKCREEK	DUCKCREEK	0.16
EDWARDS	EDWARDS	0.07
ELMERSMITH	ELMERSMITH	0.06
FARMERCITY	FARMERCITY	0.04
G-007A	G-007A	0.06
GIBSON	GIBSON	0.03
NEWTON	NEWTON	0.18
PRAIRIE	PRAIRIE	0.3
RENSSELAER	RENSSELAER	0.05
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.08
TILTON	TILTON	0.09
TRIMBLE	TRIMBLE	0.08
TVA	TVA	0.13
UNIONPOWER	UNIONPOWER	0.05
VFT	VFT	0.12

13.6.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7367908	235504	01RIDGLY	AP	237310	01DANSMTN	AP	1	AP-P2-3-MP-138-150	breaker	182.0	92.63	105.89	DC	24.14

Bus #	Bus	MW Impact
235098	U2-073A E	36.52
235099	U2-073B E	15.99
235520	01WVACO_S38	7.72
235530	01TR_Y2_073A	0.66
235531	01TR_Y2_073B	0.29
235854	01KL_K28_T16	0.32
236001	01WARRIOR RN	6.62
237319	01FMR_U2-030	0.29
237507	01CROSSCHOOL	0.27
292401	K-028 E	8.14
885642	T-016 E	2.44
917091	Z2-013	0.26
917672	Z2-108 E	1.79
918341	AA1-047 C	2.75
918342	AA1-047 E	18.26
918812	AA1-100 E	3.32
923971	AB2-038	0.15
924001	AB2-041 C	0.14
924002	AB2-041 E	4.74
929522	U2-030 E	15.75
930261	AB1-065 C	1.25
930262	AB1-065 E	2.03
932141	AC2-021	1.93
934931	AD1-125 C	1.19
934932	AD1-125 E	6.91
937361	AD2-180 C O1	1.67
937362	AD2-180 E O1	10.54
938351	AE1-053	0.48
938831	AE1-109 C	1.5
938832	AE1-109 E	1.94
938882	AE1-116 CBAT	0.13
938883	AE1-116 EBAT	0.13
940461	AE2-030 C	2.29
940462	AE2-030 E	3.14
942731	AE2-289 C	3.55
942732	AE2-289 E	20.59
BLUEG	BLUEG	0.66
CALDERWOOD	CALDERWOOD	0.03
CANNELTON	CANNELTON	0.04
CARR	CARR	0.06
CBM-S2	CBM-S2	0.04

Bus #	Bus	MW Impact
CHEOAH	CHEOAH	0.03
CHILHOWEE	CHILHOWEE	0.01
COFFEEN	COFFEEN	0.07
COTTONWOOD	COTTONWOOD	0.17
CPL	CPL	0.04
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.07
ELMERSMITH	ELMERSMITH	0.06
FARMERCITY	FARMERCITY	0.04
G-007A	G-007A	0.06
GIBSON	GIBSON	0.03
NEWTON	NEWTON	0.18
PRAIRIE	PRAIRIE	0.3
RENSSELAER	RENSSELAER	0.05
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.08
TILTON	TILTON	0.09
TRIMBLE	TRIMBLE	0.07
TVA	TVA	0.13
UNIONPOWER	UNIONPOWER	0.05
VFT	VFT	0.12

13.6.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7369284	235504	01RIDGLY	AP	235454	01CUMBRL	AP	1	AP-P7-1-MP-138-056-B	tower	343.0	86.81	99.31	DC	42.86

Bus #	Bus	MW Impact
200813	26YOUGH	0.08
200840	26DEEPCRK1	0.19
200841	26DEEPCRK2	0.19
235098	U2-073A E	64.83
235099	U2-073B E	28.4
235530	01TR_Y2_073A	1.18
235531	01TR_Y2_073B	0.52
236001	01WARRIOR RN	11.75
237312	01DANS_S-014	6.39
237319	01FMR_U2-030	0.51
290229	S-014 E	25.57
913142	Y1-033 E OP1	3.34
917091	Z2-013	0.46
918341	AA1-047 C	4.88
918342	AA1-047 E	32.42
918812	AA1-100 E	5.89
923971	AB2-038	0.27
924001	AB2-041 C	0.24
924002	AB2-041 E	8.41
929522	U2-030 E	27.97
930261	AB1-065 C	2.21
930262	AB1-065 E	3.61
933951	AD1-018 C	1.33
933952	AD1-018 E	2.17
934441	AD1-068 C	1.26
934442	AD1-068 E	7.31
938831	AE1-109 C	1.47
938832	AE1-109 E	1.91
940461	AE2-030 C	4.07
940462	AE2-030 E	5.57
942731	AE2-289 C	6.3
942732	AE2-289 E	36.56
942901	AE2-309 C	2.87
942902	AE2-309 E	0.57
CALDERWOOD	CALDERWOOD	0.02
CATAWBA	CATAWBA	0.03
CBM-N	CBM-N	0.0
CBM-W1	CBM-W1	0.09
CHEOAH	CHEOAH	0.02
CHILHOWEE	CHILHOWEE	0.01
CIN	CIN	0.02

Bus #	Bus	MW Impact
COTTONWOOD	COTTONWOOD	0.05
FARMERCITY	FARMERCITY	0.0
G-007	G-007	0.13
HAMLET	HAMLET	0.07
IPL	IPL	0.02
LGEE	LGEE	0.01
MEC	MEC	0.01
MECS	MECS	0.13
NYISO	NYISO	0.02
O-066	O-066	0.81
PRAIRIE	PRAIRIE	0.01
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.0
TVA	TVA	0.05
UNIONPOWER	UNIONPOWER	0.03
WEC	WEC	0.01

13.6.6 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
7367616	938800	AE1-106 TAP	AP	235122	01LKLYNN	AP	1	AP-P2-3-MP-138-151	breaker	306.0	117.98	124.72	DC	20.6

Bus #	Bus	MW Impact
200813	26YOUGH	0.09
200835	26DSGENWIN	0.69
200840	26DEEPCRK1	0.2
200841	26DEEPCRK2	0.2
235091	U2-061_E	6.88
235098	U2-073A E	31.16
235099	U2-073B E	13.65
235520	01WVACO_S38	8.49
235530	01TR_Y2_073A	0.56
235531	01TR_Y2_073B	0.25
235625	01BACKB	6.31
235854	01KL_K28_T16	0.61
236001	01WARRIOR RN	4.47
237312	01DANS_S-014	2.82
237319	01FMR_U2-030	0.28
237507	01CROSSCHOOL	0.29
237512	01ROTHROCK	0.13
290229	S-014 E	11.26
292310	K-019	0.24
292350	K-023	2.12
292401	K-028 E	15.68
292542	L-013 1	2.12
293432	R-040 E	0.12
293902	O-048 E	1.91
885642	T-016 E	4.69
913141	Y1-033 C OP1	0.06
913142	Y1-033 E OP1	3.44
917091	Z2-013	0.22
917672	Z2-108 E	1.33
918341	AA1-047 C	3.87
918342	AA1-047 E	25.75
918471	AA1-062 C	2.87
918472	AA1-062 E	19.28
918812	AA1-100 E	2.24
920072	AA2-103 E	2.95
923971	AB2-038	0.13
924001	AB2-041 C	0.12
924002	AB2-041 E	4.04
929522	U2-030 E	15.2
930261	AB1-065 C	1.44
930262	AB1-065 E	2.35

Bus #	Bus	MW Impact
932141	AC2-021	2.27
933951	AD1-018 C	1.47
933952	AD1-018 E	2.4
934441	AD1-068 C	2.48
934442	AD1-068 E	14.42
934931	AD1-125 C	1.81
934932	AD1-125 E	10.53
937361	AD2-180 C O1	2.78
937362	AD2-180 E O1	17.49
938341	AE1-052	1.47
938351	AE1-053	0.35
938801	AE1-106 C	34.08
938802	AE1-106 E	23.45
938831	AE1-109 C	1.45
938832	AE1-109 E	1.88
940461	AE2-030 C	1.77
940462	AE2-030 E	2.43
942731	AE2-289 C	3.03
942732	AE2-289 E	17.58
942901	AE2-309 C	3.22
942902	AE2-309 E	0.63
943212	AE2-000A E	10.91
BLUEG	BLUEG	1.18
CALDERWOOD	CALDERWOOD	0.06
CANNELTON	CANNELTON	0.07
CATAWBA	CATAWBA	0.01
CBM-N	CBM-N	0.08
CHEOAH	CHEOAH	0.06
CHILHOWEE	CHILHOWEE	0.02
COFFEEN	COFFEEN	0.12
COTTONWOOD	COTTONWOOD	0.33
CPL	CPL	0.03
DUCKCREEK	DUCKCREEK	0.28
EDWARDS	EDWARDS	0.13
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.08
G-007A	G-007A	0.4
GIBSON	GIBSON	0.05
NEWTON	NEWTON	0.32
NYISO	NYISO	0.34
PRAIRIE	PRAIRIE	0.55
SANTEETLA	SANTEETLA	0.02
SMITHLAND	SMITHLAND	0.04
TATANKA	TATANKA	0.15
TILTON	TILTON	0.16
TRIMBLE	TRIMBLE	0.13
TVA	TVA	0.26
UNIONPOWER	UNIONPOWER	0.11
VFT	VFT	1.05

13.6.7 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
7367641	200746	26ROCKWOOD	PENELEC	200744	26SOMERST	PENELEC	1	AP-P2-3-MP-138-153	breaker	179.0	117.38	122.67	DC	9.47

Bus #	Bus	MW Impact
200813	26YOUGH	0.45
200835	26DSGENWIN	8.06
200840	26DEEPCRK1	0.56
200841	26DEEPCRK2	0.56
200890	26BF_G21_K23	0.48
200891	26CSLMN_L13	0.76
200892	26LOOKOUT	0.72
235098	U2-073A E	14.32
235099	U2-073B E	6.27
235530	01TR_Y2_073A	0.26
235531	01TR_Y2_073B	0.12
236001	01WARRIOR RN	2.98
237312	01DANS_S-014	2.57
237319	01FMR_U2-030	0.1
290229	S-014 E	10.27
292350	K-023	24.8
292542	L-013 1	24.8
293432	R-040 E	1.4
293902	O-048 E	22.32
913141	Y1-033 C OP1	0.41
913142	Y1-033 E OP1	22.63
917091	Z2-013	0.1
917672	Z2-108 E	15.5
918812	AA1-100 E	1.49
923971	AB2-038	0.06
924001	AB2-041 C	0.05
924002	AB2-041 E	1.86
929522	U2-030 E	5.61
933951	AD1-018 C	1.11
933952	AD1-018 E	1.81
934441	AD1-068 C	4.47
934442	AD1-068 E	25.93
938351	AE1-053	7.75
938882	AE1-116 CBAT	0.61
938883	AE1-116 EBAT	0.61
940461	AE2-030 C	0.96
940462	AE2-030 E	1.31
942731	AE2-289 C	1.39
942732	AE2-289 E	8.08
942901	AE2-309 C	2.42
942902	AE2-309 E	0.48

Bus #	Bus	MW Impact
CARR	CARR	0.22
CBM-S1	CBM-S1	0.58
CBM-S2	CBM-S2	0.35
CBM-W1	CBM-W1	0.78
CBM-W2	CBM-W2	4.01
CIN	CIN	0.38
CPLE	CPLE	0.15
G-007	G-007	0.32
IPL	IPL	0.25
LGEE	LGEE	0.11
MEC	MEC	0.73
MECS	MECS	0.33
O-066	O-066	2.17
RENSSELAER	RENSSELAER	0.18
WEC	WEC	0.1

13.6.8 Index 8

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
7367602	235122	01LKLYNN	AP	235207	01LARDIN	AP	1	AP-P2-3-WP-500-438B	breaker	303.0	126.12	127.27	DC	7.72

Bus #	Bus	MW Impact
235091	U2-061_E	3.74
235098	U2-073A E	11.67
235099	U2-073B E	5.11
235520	01WVACO_S38	4.0
235570	01LAKEL1	0.76
235571	01LAKEL2	0.76
235615	01GANS 8	1.19
235616	01GANS 9	1.19
235625	01BACKB	3.57
236000	01WVU	0.62
237312	01DANS_S-014	1.15
237319	01FMR_U2-030	0.1
290229	S-014 E	4.61
292401	K-028 E	7.44
885642	T-016 E	2.23
918341	AA1-047 C	1.28
918342	AA1-047 E	8.5
918471	AA1-062 C	1.63
918472	AA1-062 E	10.92
918812	AA1-100 E	0.91
920072	AA2-103 E	1.67
924002	AB2-041 E	1.51
929522	U2-030 E	5.49
930261	AB1-065 C	0.5
930262	AB1-065 E	0.81
931152	AB1-166 E	1.36
932141	AC2-021	1.06
933951	AD1-018 C	0.61
933952	AD1-018 E	1.0
934441	AD1-068 C	1.1
934442	AD1-068 E	6.39
934931	AD1-125 C	0.89
934932	AD1-125 E	5.14
936861	AD2-109	2.65
937361	AD2-180 C O1	1.31
937362	AD2-180 E O1	8.25
938341	AE1-052	0.44
938801	AE1-106 C	10.43
938802	AE1-106 E	7.18
938831	AE1-109 C	0.65
938832	AE1-109 E	0.85

Bus #	Bus	MW Impact
940461	AE2-030 C	0.69
940462	AE2-030 E	0.94
942731	AE2-289 C	1.13
942732	AE2-289 E	6.58
942901	AE2-309 C	1.35
942902	AE2-309 E	0.26
943212	AE2-000A E	3.27
CARR	CARR	0.28
CBM-S1	CBM-S1	0.79
CBM-S2	CBM-S2	0.88
CBM-W2	CBM-W2	4.2
CIN	CIN	0.18
CPLE	CPLE	0.41
G-007	G-007	0.47
IPL	IPL	0.11
LGEE	LGEE	0.08
MEC	MEC	0.41
O-066	O-066	3.17
RENSSELAER	RENSSELAER	0.22
WEC	WEC	0.02

13.6.9 Index 9

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
7367493	235305	01 106 J	AP	235120	01ALBRIG	AP	1	AP-P2-3-PE-138-150	breaker	186.0	114.0	135.58	DC	40.14

Bus #	Bus	MW Impact
235098	U2-073A E	60.71
235099	U2-073B E	26.59
235530	01TR_Y2_073A	1.1
235531	01TR_Y2_073B	0.49
237319	01FMR_U2-030	0.48
917091	Z2-013	0.43
918341	AA1-047 C	4.57
918342	AA1-047 E	30.35
923971	AB2-038	0.26
924001	AB2-041 C	0.23
924002	AB2-041 E	7.88
929522	U2-030 E	26.19
930261	AB1-065 C	2.07
930262	AB1-065 E	3.38
936861	AD2-109	1.08
938341	AE1-052	0.4
938801	AE1-106 C	23.71
938802	AE1-106 E	16.31
940461	AE2-030 C	3.81
940462	AE2-030 E	5.22
942731	AE2-289 C	5.9
942732	AE2-289 E	34.24
943212	AE2-000A E	2.99
CARR	CARR	0.02
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	0.1
CBM-W1	CBM-W1	0.51
CBM-W2	CBM-W2	1.04
CIN	CIN	0.17
G-007	G-007	0.09
HAMLET	HAMLET	0.03
IPL	IPL	0.11
LGEE	LGEE	0.04
MEC	MEC	0.3
MECS	MECS	0.45
O-066	O-066	0.55
RENSSELAER	RENSSELAER	0.01
WEC	WEC	0.05

13.6.10 Index 10

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
7367521	235385	01PARSNS	AP	235362	01LOUGHL	AP	1	AP-P2-4-MP-138-200	breaker	179.0	133.14	134.31	DC	4.64

Bus #	Bus	MW Impact
235091	U2-061_E	26.17
235098	U2-073A E	7.01
235099	U2-073B E	3.07
235520	01WVACO_S38	3.59
235625	01BACKB	25.75
235854	01KL_K28_T16	0.58
237312	01DANS_S-014	0.87
237512	01ROTHROCK	0.48
290229	S-014 E	3.5
292310	K-019	0.97
292401	K-028 E	14.75
885642	T-016 E	4.41
903041	W2-057 E	3.47
918471	AA1-062 C	11.73
918472	AA1-062 E	78.68
918812	AA1-100 E	0.72
920072	AA2-103 E	12.03
924002	AB2-041 E	0.91
932141	AC2-021	0.9
933951	AD1-018 C	0.58
933952	AD1-018 E	0.95
934931	AD1-125 C	2.86
934932	AD1-125 E	16.61
937361	AD2-180 C O1	2.56
937362	AD2-180 E O1	16.13
938341	AE1-052	6.02
938831	AE1-109 C	1.1
938832	AE1-109 E	1.42
940461	AE2-030 C	0.47
940462	AE2-030 E	0.64
942731	AE2-289 C	0.68
942732	AE2-289 E	3.95
942901	AE2-309 C	1.29
942902	AE2-309 E	0.25
943212	AE2-000A E	44.51
BLUEG	BLUEG	1.26
CALDERWOOD	CALDERWOOD	0.12
CANNELTON	CANNELTON	0.07
CATAWBA	CATAWBA	0.06
CBM-N	CBM-N	0.15
CHEOAH	CHEOAH	0.11

Bus #	Bus	MW Impact
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.13
COTTONWOOD	COTTONWOOD	0.47
DUCKCREEK	DUCKCREEK	0.27
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.13
FARMERCITY	FARMERCITY	0.08
G-007A	G-007A	0.49
GIBSON	GIBSON	0.05
HAMLET	HAMLET	0.09
NEWTON	NEWTON	0.33
NYISO	NYISO	0.66
PRAIRIE	PRAIRIE	0.61
SANTEETLA	SANTEETLA	0.03
SMITHLAND	SMITHLAND	0.05
TATANKA	TATANKA	0.15
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.14
TVA	TVA	0.4
UNIONPOWER	UNIONPOWER	0.17
VFT	VFT	1.3

13.6.11 Index 11

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
7367736	235469	01GARRET	AP	934440	AD1-068 TAP	AP	1	AP-P2-3-MP-138-150	breaker	191.0	106.5	115.73	DC	17.65

Bus #	Bus	MW Impact
200813	26YOUGH	0.25
200834	26SW_E13_K22	0.43
200835	26DSGENWIN	2.09
200840	26DEEPCRK1	0.58
200841	26DEEPCRK2	0.58
200864	K-013 E	1.49
200890	26BF_G21_K23	0.12
200891	26CSLMN_L13	0.2
200892	26LOOKOUT	0.19
202225	26SCI_S29B	0.04
235098	U2-073A E	26.7
235099	U2-073B E	11.7
235520	01WVACO_S38	5.59
235530	01TR_Y2_073A	0.48
235531	01TR_Y2_073B	0.22
236001	01WARRIOR RN	4.84
237312	01DANS_S-014	4.0
237319	01FMR_U2-030	0.21
290229	S-014 E	16.01
292340	K-022	0.01
292350	K-023	6.42
292401	K-028 E	5.48
292542	L-013 1	6.42
293432	R-040 E	0.36
293902	O-048 E	5.78
294903	P-060 E	4.03
885642	T-016 E	1.64
913141	Y1-033 C OP1	0.19
913142	Y1-033 E OP1	10.18
917091	Z2-013	0.19
917672	Z2-108 E	4.01
918341	AA1-047 C	2.01
918342	AA1-047 E	13.35
918812	AA1-100 E	2.43
923971	AB2-038	0.11
924001	AB2-041 C	0.1
924002	AB2-041 E	3.46
929522	U2-030 E	11.52
930261	AB1-065 C	0.91
930262	AB1-065 E	1.49
932141	AC2-021	1.4

Bus #	Bus	MW Impact
933951	AD1-018 C	1.71
933952	AD1-018 E	2.79
937361	AD2-180 C O1	1.19
937362	AD2-180 E O1	7.47
938341	AE1-052	0.41
938351	AE1-053	2.01
938831	AE1-109 C	1.06
938832	AE1-109 E	1.38
938881	AE1-116	0.54
938991	AE1-128 C	4.68
938992	AE1-128 E	3.12
940461	AE2-030 C	1.68
940462	AE2-030 E	2.29
942361	AE2-249 C	0.53
942362	AE2-249 E	0.35
942731	AE2-289 C	2.6
942732	AE2-289 E	15.06
942901	AE2-309 C	3.71
942902	AE2-309 E	0.73
943212	AE2-000A E	3.03
BLUEG	BLUEG	2.36
CALDERWOOD	CALDERWOOD	0.22
CANNELTON	CANNELTON	0.14
CATAWBA	CATAWBA	0.12
CBM-N	CBM-N	0.47
CHEOAH	CHEOAH	0.2
CHILHOWEE	CHILHOWEE	0.07
COFFEEN	COFFEEN	0.24
COTTONWOOD	COTTONWOOD	0.89
DUCKCREEK	DUCKCREEK	0.53
EDWARDS	EDWARDS	0.24
ELMERSMITH	ELMERSMITH	0.24
FARMERCITY	FARMERCITY	0.16
G-007A	G-007A	1.09
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.18
NEWTON	NEWTON	0.64
NYISO	NYISO	2.02
PRAIRIE	PRAIRIE	1.16
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.09
TATANKA	TATANKA	0.29
TILTON	TILTON	0.29
TRIMBLE	TRIMBLE	0.26
TVA	TVA	0.74
UNIONPOWER	UNIONPOWER	0.32
VFT	VFT	2.95

13.6.12 Index 12

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
7367690	237310	01DANSMTN	AP	235449	01CARLOS	AP	1	AP-P2-3-MP-138-150	breaker	182.0	108.39	121.66	DC	24.14

Bus #	Bus	MW Impact
235098	U2-073A E	36.52
235099	U2-073B E	15.99
235520	01WVACO_S38	7.72
235530	01TR_Y2_073A	0.66
235531	01TR_Y2_073B	0.29
235854	01KL_K28_T16	0.32
236001	01WARRIOR RN	6.62
237312	01DANS_S-014	5.74
237319	01FMR_U2-030	0.29
237507	01CROSSCHOOL	0.27
290229	S-014 E	22.96
292401	K-028 E	8.14
885642	T-016 E	2.44
917091	Z2-013	0.26
917672	Z2-108 E	1.79
918341	AA1-047 C	2.75
918342	AA1-047 E	18.26
918812	AA1-100 E	3.32
923971	AB2-038	0.15
924001	AB2-041 C	0.14
924002	AB2-041 E	4.74
929522	U2-030 E	15.75
930261	AB1-065 C	1.25
930262	AB1-065 E	2.03
932141	AC2-021	1.93
934931	AD1-125 C	1.19
934932	AD1-125 E	6.91
937361	AD2-180 C O1	1.67
937362	AD2-180 E O1	10.54
938351	AE1-053	0.48
938831	AE1-109 C	1.5
938832	AE1-109 E	1.94
938882	AE1-116 CBAT	0.13
938883	AE1-116 EBAT	0.13
940461	AE2-030 C	2.29
940462	AE2-030 E	3.14
942731	AE2-289 C	3.55
942732	AE2-289 E	20.59
BLUEG	BLUEG	0.66
CALDERWOOD	CALDERWOOD	0.03
CANNELTON	CANNELTON	0.04

Bus #	Bus	MW Impact
CARR	CARR	0.06
CBM-S2	CBM-S2	0.04
CHEOAH	CHEOAH	0.03
CHILHOWEE	CHILHOWEE	0.01
COFFEEN	COFFEEN	0.07
COTTONWOOD	COTTONWOOD	0.17
CPL	CPL	0.04
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.07
ELMERSMITH	ELMERSMITH	0.06
FARMERCITY	FARMERCITY	0.04
G-007A	G-007A	0.06
GIBSON	GIBSON	0.03
NEWTON	NEWTON	0.18
PRAIRIE	PRAIRIE	0.3
RENSSELAER	RENSSELAER	0.05
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.08
TILTON	TILTON	0.09
TRIMBLE	TRIMBLE	0.07
TVA	TVA	0.13
UNIONPOWER	UNIONPOWER	0.05
VFT	VFT	0.12

13.6.13 Index 13

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
7367401	934440	AD1-068 TAP	AP	235120	01ALBRIG	AP	1	AP-P2-3-MP-138-150	breaker	191.0	135.83	145.07	DC	17.65

Bus #	Bus	MW Impact
200813	26YOUGH	0.25
200834	26SW_E13_K22	0.43
200835	26DSGENWIN	2.09
200840	26DEEPCRK1	0.58
200841	26DEEPCRK2	0.58
200890	26BF_G21_K23	0.12
200891	26CSLMN_L13	0.2
200892	26LOOKOUT	0.19
202225	26SCI_S29B	0.04
235098	U2-073A E	26.7
235099	U2-073B E	11.7
235520	01WVACO_S38	5.59
235530	01TR_Y2_073A	0.48
235531	01TR_Y2_073B	0.22
236001	01WARRIOR RN	4.84
237312	01DANS_S-014	4.0
237319	01FMR_U2-030	0.21
290229	S-014 E	16.01
292340	K-022	0.01
292350	K-023	6.42
292401	K-028 E	5.48
292542	L-013 1	6.42
293432	R-040 E	0.36
293902	O-048 E	5.78
294903	P-060 E	4.03
885642	T-016 E	1.64
913141	Y1-033 C OP1	0.19
913142	Y1-033 E OP1	10.18
917091	Z2-013	0.19
917672	Z2-108 E	4.01
918341	AA1-047 C	2.01
918342	AA1-047 E	13.35
918812	AA1-100 E	2.43
923971	AB2-038	0.11
924001	AB2-041 C	0.1
924002	AB2-041 E	3.46
929522	U2-030 E	11.52
930261	AB1-065 C	0.91
930262	AB1-065 E	1.49
932141	AC2-021	1.4
933951	AD1-018 C	1.71

Bus #	Bus	MW Impact
933952	AD1-018 E	2.79
934441	AD1-068 C	8.42
934442	AD1-068 E	48.88
937361	AD2-180 C O1	1.19
937362	AD2-180 E O1	7.47
938341	AE1-052	0.41
938351	AE1-053	2.01
938831	AE1-109 C	1.06
938832	AE1-109 E	1.38
938881	AE1-116	0.54
938991	AE1-128 C	4.68
938992	AE1-128 E	3.12
940461	AE2-030 C	1.68
940462	AE2-030 E	2.29
942361	AE2-249 C	0.53
942362	AE2-249 E	0.35
942731	AE2-289 C	2.6
942732	AE2-289 E	15.06
942901	AE2-309 C	3.71
942902	AE2-309 E	0.73
943212	AE2-000A E	3.03
BLUEG	BLUEG	2.36
CALDERWOOD	CALDERWOOD	0.22
CANNELTON	CANNELTON	0.14
CATAWBA	CATAWBA	0.12
CBM-N	CBM-N	0.47
CHEOAH	CHEOAH	0.2
CHILHOWEE	CHILHOWEE	0.07
COFFEEN	COFFEEN	0.24
COTTONWOOD	COTTONWOOD	0.89
DUCKCREEK	DUCKCREEK	0.53
EDWARDS	EDWARDS	0.24
ELMERSMITH	ELMERSMITH	0.24
FARMERCITY	FARMERCITY	0.16
G-007A	G-007A	1.09
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.18
NEWTON	NEWTON	0.64
NYISO	NYISO	2.02
PRAIRIE	PRAIRIE	1.16
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.09
TATANKA	TATANKA	0.29
TILTON	TILTON	0.29
TRIMBLE	TRIMBLE	0.26
TVA	TVA	0.74
UNIONPOWER	UNIONPOWER	0.32
VFT	VFT	2.95

Affected Systems

13.7 Affected Systems

13.7.1 LG&E

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

13.7.2 MISO

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

13.7.3 TVA

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

13.7.4 Duke Energy Progress

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

13.7.5 NYISO

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

13.8 Contingency Descriptions

Contingency Name	Contingency Definition
AP-P2-3-PE-138-150	CONTINGENCY 'AP-P2-3-PE-138-150' DISCONNECT BRANCH FROM BUS 235504 TO BUS 940460 CKT 1 /* 01RIDGLY 138 AE2-030 TAP 138 /* CONTINGENCY LINE ADDED FOR AE2 BUILD DISCONNECT BRANCH FROM BUS 235484 TO BUS 235504 CKT 1 /* 01MESSCK 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 235592 CKT 1 /* 01RIDGLY 138 01HAMPS1 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237036 CKT ZB /* 01RIDGLY 138 01RIDGLY CAP138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 236001 CKT 1 /* 01RIDGLY 138 01WARRIOR RN 18 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237498 CKT 1 /* 01RIDGLY 138 01RIDGL#1 35 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237499 CKT 2 /* 01RIDGLY 138 01RIDGL#2 35 END
AP-P2-3-WP-500-438A	CONTINGENCY 'AP-P2-3-WP-500-438A' /* 449 DISCONNECT BRANCH FROM BUS 235116 TO BUS 235277 CKT 3 /* 01YUKON 500 01YUKON 138 DISCONNECT BRANCH FROM BUS 235116 TO BUS 235277 CKT 2 /* 01YUKON 500 01YUKON 138 DISCONNECT BRANCH FROM BUS 235116 TO BUS 292625 CKT 1 /* 01YUKON 500 T174_TAP 500 END
AP-P1-2-MP-138-040-B	CONTINGENCY 'AP-P1-2-MP-138-040-B' /* 1513B DISCONNECT BRANCH FROM BUS 235122 TO BUS 938800 CKT 1 /* 01LKLYNN 138 01 AE1-106 TAP 138 END
AP-P2-2-PE-138-021A	CONTINGENCY 'AP-P2-2-PE-138-021A' /* 42 DISCONNECT BRANCH FROM BUS 237310 TO BUS 235504 CKT 1 /* 01DANSMTN 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235454 TO BUS 235504 CKT 1 /* 01CUMBR 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 940460 TO BUS 235504 CKT 1 /* AE2-030 TAP 138 01RIDGLY 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235484 TO BUS 235504 CKT 1 /* 01MESSCK 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 235592 CKT 1 /* 01RIDGLY 138 01HAMPS1 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237036 CKT ZB /* 01RIDGLY 138 01RIDGLY CAP138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 236001 CKT 1 /* 01RIDGLY 138 01WARRIOR RN 18 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237498 CKT 1 /* 01RIDGLY 138 01RIDGL#1 35 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237499 CKT 2 /* 01RIDGLY 138 01RIDGL#2 35 END
AP-P2-2-MP-138-101	CONTINGENCY 'AP-P2-2-MP-138-101' /* ALBRIGHT-138-SOUTH DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1 /* 01ALBRIG 138 AD1-068 TAP 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /* 01ALBRIG 138 01METTIK 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 END
AP-P1-2-AA1-047_1_FSA	CONTINGENCY 'AP-P1-2-AA1-047_1_FSA' /* HAZELTON - AA1-047 TAP DISCONNECT BRANCH FROM BUS 235297 TO BUS 918340 CKT 1 /* 01HAZELT 138 AA1-047 TAP 138 END

Contingency Name	Contingency Definition
AP-P7-1-MP-138-056-B	CONTINGENCY 'AP-P7-1-MP-138-056-B' /* LL-BVJ-LL-RBL DISCONNECT BRANCH FROM BUS 235122 TO BUS 235802 CKT 1 /* 01LKLYNN 138 01CHEATL 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 938800 TO BUS 235305 CKT 1 /* AE1-106 TAP 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1 /* 01HAZELT 138 01 106 J 138 END
AP-P2-2-MP-138-001	CONTINGENCY 'AP-P2-2-MP-138-001' /* ALBRIGHT-138-NORTH DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1 /* 01ALBRIG 138 01KINGWD 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1 /* 01ALBRIG 138 01RUTHBL 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1 /* 01ALBRIG 138 01BRANDN 138 END
AP-P7-1-MP-138-056-A	CONTINGENCY 'AP-P7-1-MP-138-056-A' /* LL-BVJ-LL-RBL DISCONNECT BRANCH FROM BUS 235122 TO BUS 235802 CKT 1 /* 01LKLYNN 138 01CHEATL 138 DISCONNECT BRANCH FROM BUS 235122 TO BUS 938800 CKT 1 /* 01LKLYNN 138 AE1-106 TAP 138 END
AP-P1-2-WP-138-025	CONTINGENCY 'AP-P1-2-WP-138-025' /* CHARLEROI - EMERALD - GATES HILL 138KV (BROWNSVILLE JUNCTION) DISCONNECT BRANCH FROM BUS 235161 TO BUS 235821 CKT 1 /* 01CHARLR 138 01BROWNSVLE138 DISCONNECT BRANCH FROM BUS 235821 TO BUS 235176 CKT 1 /* 01BROWNSVLE138 01EMERLD 138 DISCONNECT BRANCH FROM BUS 235176 TO BUS 236376 CKT 2 /* 01EMERLD 138 01EMERALD 25 DISCONNECT BRANCH FROM BUS 235821 TO BUS 235184 CKT 1 /* 01BROWNSVLE138 01GATESH 138 DISCONNECT BRANCH FROM BUS 235184 TO BUS 235899 CKT 1 /* 01GATESH 138 01GATES HL 25 CLOSE BRANCH FROM BUS 235176 TO BUS 235820 CKT 1 DISCONNECT BUS 235184 /* 01GATESH 138 DISCONNECT BUS 235821 /* 01BROWNSVLE138 END
AP-P1-2-WP-138-026	CONTINGENCY 'AP-P1-2-WP-138-026' /* CHARLEROI- EMERALD- LARDIN 138KV (CLARKSVILLE JUNCTION) DISCONNECT BRANCH FROM BUS 235161 TO BUS 235155 CKT 1 /* 01CHARLR 138 01CALIFN 138 DISCONNECT BRANCH FROM BUS 235155 TO BUS 235815 CKT 1 /* 01CALIFN 138 01MALDEN 138 DISCONNECT BRANCH FROM BUS 235815 TO BUS 236563 CKT 1 /* 01MALDEN 138 01MALDEN 25 DISCONNECT BRANCH FROM BUS 235815 TO BUS 235214 CKT 1 /* 01MALDEN 138 01LUZERN 138 DISCONNECT BRANCH FROM BUS 235214 TO BUS 235820 CKT 1 /* 01LUZERN 138 01CLARKSVLE138 DISCONNECT BRANCH FROM BUS 235820 TO BUS 235176 CKT 1 /* 01CLARKSVLE138 01EMERLD 138 DISCONNECT BRANCH FROM BUS 235820 TO BUS 235207 CKT 1 /* 01CLARKSVLE138 01LARDIN 138 DISCONNECT BUS 235214 /* 01LUZERN 138 DISCONNECT BUS 235155 /* 01CALIFN 138 DISCONNECT BUS 235815 /* 01MALDEN 138 DISCONNECT BUS 235820 /* 01CLARKSVLE138 END

Contingency Name	Contingency Definition
AP-P2-4-MP-138-200	CONTINGENCY 'AP-P2-4-MP-138-200' /* ALBRIGHT BREAKER FAILURE - TIE BREAKER DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1 /* 01ALBRIG 138 01BRANDN 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1 /* 01ALBRIG 138 01KINGWD 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1 /* 01ALBRIG 138 01RUTHBL 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1 /* 01ALBRIG 138 AD1-068 TAP 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /* 01ALBRIG 138 01METTIK 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /* 01ALBRIG 138 01MTZION 138 END
AP-P2-3-MP-138-001	CONTINGENCY 'AP-P2-3-MP-138-001' /* ALBRIGHT-RUTHBELLE STK BKR AT ALBRIGHT DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1 /* 01ALBRIG 138 01BRANDN 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1 /* 01ALBRIG 138 01KINGWD 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1 /* 01ALBRIG 138 01RUTHBL 138 END
PN-P1-2-PN-115-068	CONTINGENCY 'PN-P1-2-PN-115-068' /* ROCKWOOD - SOMERSET 115KV DISCONNECT BRANCH FROM BUS 200744 TO BUS 200746 CKT 1 /* 26SOMERST 115 26ROCKWOOD 115 DISCONNECT BRANCH FROM BUS 200746 TO BUS 200773 CKT 1 /* 26ROCKWOOD 115 26ROCKWOOD 23 END
AP-P2-3-PE-138-009A	CONTINGENCY 'AP-P2-3-PE-138-009A' /* 30 DISCONNECT BRANCH FROM BUS 237310 TO BUS 235504 CKT 1 /* 01DANSMTN 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235454 TO BUS 235504 CKT 1 /* 01CUMBRL 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 940460 CKT 1 /* 01RIDGLY 138 AE2-030 TAP 138 /* CONTINGENCY LINE ADDED FOR AE2 BUILD DISCONNECT BRANCH FROM BUS 235484 TO BUS 235504 CKT 1 /* 01MESSCK 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 235592 CKT 1 /* 01RIDGLY 138 01HAMPs1 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237036 CKT ZB /* 01RIDGLY 138 01RIDGLY CAP138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 236001 CKT 1 /* 01RIDGLY 138 01WARRIOR RN 18 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237498 CKT 1 /* 01RIDGLY 138 01RIDGL#1 35 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237499 CKT 2 /* 01RIDGLY 138 01RIDGL#2 35 END
Base Case	
AP-P1-2-PE-138-044-B	CONTINGENCY 'AP-P1-2-PE-138-044-B' /* AE2-030 TAP - 01RIDGLY 138KV DISCONNECT BRANCH FROM BUS 940460 TO BUS 235504 CKT 1 /* AE2-030 TAP 138 01RIDGLY 138 END
AP-P2-3-WP-500-438B	CONTINGENCY 'AP-P2-3-WP-500-438B' /* 450 DISCONNECT BRANCH FROM BUS 235116 TO BUS 235277 CKT 1 /* 01YUKON 500 01YUKON 138 DISCONNECT BRANCH FROM BUS 235116 TO BUS 235277 CKT 3 /* 01YUKON 500 01YUKON 138 DISCONNECT BRANCH FROM BUS 235116 TO BUS 292625 CKT 1 /* 01YUKON 500 T174_TAP 500 END

Contingency Name	Contingency Definition
AP-P1-2-WP-138-071-A	CONTINGENCY 'AP-P1-2-WP-138-071-A' /* ALBRIGHT - HAZELTON - LAKE LYNN 138KV (BRANDONVILLE JUNCTION) DISCONNECT BRANCH FROM BUS 938800 TO BUS 235305 CKT 1 /* AE1-106 TAP 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 235305 TO BUS 235297 CKT 1 /* 01 106 J 138 01HAZELT 138 DISCONNECT BRANCH FROM BUS 235305 TO BUS 235120 CKT 1 /* 01 106 J 138 01ALBRIG 138 DISCONNECT BUS 235297 /* 01HAZELT 138 DISCONNECT BUS 235305 /* 01 106 J 138 END
AP-P2-3-PE-138-008A	CONTINGENCY 'AP-P2-3-PE-138-008A' /* 29 DISCONNECT BRANCH FROM BUS 237310 TO BUS 235504 CKT 1 /* 01DANSMTN 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235454 TO BUS 235504 CKT 1 /* 01CUMBRL 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 940460 CKT 1 /* 01RIDGLY 138 AE2-030 TAP 138 /* CONTINGENCY LINE ADDED FOR AE2 BUILD DISCONNECT BRANCH FROM BUS 235484 TO BUS 235504 CKT 1 /* 01MESSCK 138 01RIDGLY 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 235592 CKT 1 /* 01RIDGLY 138 01HAMPSS1 138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237036 CKT ZB /* 01RIDGLY 138 01RIDGLY CAP138 DISCONNECT BRANCH FROM BUS 235504 TO BUS 236001 CKT 1 /* 01RIDGLY 138 01WARRIOR RN 18 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237498 CKT 1 /* 01RIDGLY 138 01RIDGL#1 35 DISCONNECT BRANCH FROM BUS 235504 TO BUS 237499 CKT 2 /* 01RIDGLY 138 01RIDGL#2 35 DISCONNECT BRANCH FROM BUS 235467 TO BUS 235479 CKT 1 /* 01FRNCHM 138 01JUNCTN 138 DISCONNECT BRANCH FROM BUS 235467 TO BUS 235592 CKT 1 /* 01FRNCHM 138 01HAMPSS1 138 DISCONNECT BRANCH FROM BUS 237406 TO BUS 235467 CKT 1 /* 01FRENCH A 35 01FRNCHM 138 DISCONNECT BRANCH FROM BUS 237578 TO BUS 235467 CKT 2 /* 01FRENCH B 35 01FRNCHM 138 END
AP-P7-1-PE-138-012B	CONTINGENCY 'AP-P7-1-PE-138-012B' /* 109 DISCONNECT BRANCH FROM BUS 235504 TO BUS 940460 CKT 1 /* 01RIDGLY 138 AE2-030 TAP 138 DISCONNECT BUS 235449 /* 01CARLOS 138 END
AP-P2-3-MP-138-150	CONTINGENCY 'AP-P2-3-MP-138-150' /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 938800 TO BUS 235305 CKT 1 /* AE1-106 TAP 138 01 106 J 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1 /* 01HAZELT 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /* 01ALBRIG 138 01MTZION 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138 END
AP-P2-3-MP-138-151	CONTINGENCY 'AP-P2-3-MP-138-151' /* ALBRIGHT-BRANDONVILLE STK BKR AT ALBRIGHT DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1 /* 01ALBRIG 138 01RUTHBL 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1 /* 01ALBRIG 138 01KINGWD 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1 /* 01ALBRIG 138 01BRANDN 138 DISCONNECT BRANCH FROM BUS 235304 TO BUS 237504 CKT 1 /* 01BRANDN 138 01ELLIOTTS 138 END

Contingency Name	Contingency Definition
AP-P2-3-MP-138-153	CONTINGENCY 'AP-P2-3-MP-138-153' /* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /* 01ALBRIG 138 01METTIK 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /* 01ALBRIG 138 01MTZION 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1 /* 01ALBRIG 138 AD1-068 TAP 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138 DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1 /* 01SNOW T 138 01SNWYCK 138 DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1 /* 01SNOW T 138 01OAKPRK 138 DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1 /* 01SNWYCK 138 01SNOW C 66 DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1 /* 01OAKPRK 138 01KELSOG 138 END
235116 01YUKON 500 292625 T174_TAP 500 1	CONTINGENCY '235116 01YUKON 500 292625 T174_TAP 500 1' / 8375 OPEN BRANCH FROM BUS 235116 TO BUS 292625 CKT 1 / 235116 01YUKON 500 292625 T174_TAP 500 1 END
AP-P2-3-MP-138-159	CONTINGENCY 'AP-P2-3-MP-138-159' /* ALBRIGHT-DENVER STK BKR AT ALBRIGHT DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138 DISCONNECT BRANCH FROM BUS 235320 TO BUS 235810 CKT 1 /* 01DENVER 138 01INT COAL 138 DISCONNECT BRANCH FROM BUS 235338 TO BUS 235810 CKT 1 /* 01GRAFTN 138 01INT COAL 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1 /* 01ALBRIG 138 AD1-068 TAP 138 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /* 01ALBRIG 138 01MTZION 138 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138 END

Short Circuit

13.9 Short Circuit

The following Breakers are overduty:

None

14 Attachment 1 – One Line

15 Attachment 2 – Project Location