Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-208

QUINTON-ROADSTOWN 69 KV

27 MW Capacity / 45 MW Energy

January 2020

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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.

General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Salem, NJ. The installed facilities will have a total capability of 45 MW with 27 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 1, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-208**
Project Name	QUINTON-ROADSTOWN 69 KV
State	New Jersey
County	Salem
Transmission Owner	AEC
MFO	45
MWE	45
MWC	27
Fuel	Solar
Basecase Study Year	2023

Primary Point of Interconnection

AF1-208 will interconnect with the AEC transmission system tapping the Laurel to Roadstown 69 kV line.

Cost Summary

The AF1-208 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 470,000
Direct Connection Network Upgrade	$ 3,760,000
Non Direct Connection Network Upgrades	$ 470,000
Total Costs	$ 4,700,000

In addition, the AF1-208 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 191,450,000

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

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Design and construct a new 3-breaker ring bus substation. Two terminals will be designated for the Quinton – Roadstown 69 kV line, with the third terminal being designated for the interconnecting generator.

Major Equipment Included in Estimate:

- 2000A Power Circuit Breaker, 69 kV, 3 cycle Qty. 3
- Disconnect Switch, 69 kV Qty. 6
- Line Switch 69 kV Qty. 3
- Relay Panel, Transmission Bus, FL/BU (20") Qty. 1
- Control Panel, 69 kV Circuit Breaker (10") Qty. 1
- Control Enclosure, 47'x 16' Qty. 1
- CT/VT Combination Units, 69 kV Qty. 3
- CVT, 69 kV Qty. 6

Estimate Assumptions:

- The required land (≥4 acres) is available for use.
- Developer responsible for land purchase for the substation, price is not included.
- Site clearing and grading performed by Developer.

Required Relaying and Communications

Front line and back-up line protection will be required. One relay panel for each generator terminal will be required for front line and back-up protection

A breaker control relay on a breaker control panel will be required for the control and operation of each new 69 kV circuit breaker

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
Total Attachment Facility Costs	$ 470,000

Direct Connection Cost Estimate

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

Description	Total Cost
Total Direct Connection Facility Costs	$ 3,760,000

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
Total Non-Direct Connection Facility Costs	$ 470,000

Schedule

Construction Time: 36-48 months after execution of ISA/CSA.

Transmission Owner Analysis

None

Interconnection Customer Requirements

Interconnection Customer Scope of Direct Connection Work

The IC is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report and is the responsibility of the IC. Protective relaying and metering design and installation must comply with ACE's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

Additional Interconnection Customer Responsibilities:

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.

3. The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.IV of Schedule H to the Interconnection Service Agreement.

ACE Interconnection Customer Scope of Direct Connection Work Requirements:

- ACE requires that an IC circuit breaker is located within 500 feet of the ACE substation to facilitate the relay protection scheme between ACE and the IC at the Point of Interconnection (POI).

Revenue Metering and SCADA Requirements

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.

AEC Requirements

A three phase 69 kV revenue metering point will need to be established within the Interconnection Customer Facilities at the Point of Interconnection. The Interconnection Customer will purchase and install all metering instrument transformers as well as construct a metering structure per the ACE's specifications. The secondary wiring connections at the instrument transformers will be completed by the Interconnection Customer and inspected by ACE, while the connections at the metering enclosure will be completed by the ACE. The metering control cable and meter cabinets will be supplied by the ACE and installed by the Interconnection Customer. The Interconnection Customer will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined during construction. The Interconnection Customer will provide 120V power to the meter cabinet. The ACE will provide, program, install, and own the primary & backup solid state multi-function meters for the new metering position.

Each meter will be equipped with load profile, telemetry, and DNP outputs. The Interconnection Customer will be provided with one-meter DNP output for each meter. ACE will supply a wireless modem for MV90 interrogation. In the event that a wireless modem is unable to reliably communicate, the IC will be required to make provisions for a POTS (Plain Old Telephone Service) line or equivalent technology approved by ACE within approximately three feet of the ACE metering position to facilitate remote interrogation and data collection. It is the Interconnection Customer's responsibility to send the data that PJM and ACE require directly to PJM. The Interconnection Customer will grant permission for PJM to send ACE the following

telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

ACE's revenue meters will be the official meters and must be the source for reporting generation output to PJM. The Interconnection Customer is responsible for installing telemetry equipment necessary to obtain the revenue meter data and submitting the data to PJM.

Network Impacts

The Queue Project AF1-208 was evaluated as a 45.0 MW (Capacity 27.0 MW) injection tapping the Laurel to Roadstown 69 kV line in the AEC area. Project AF1-208 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-208 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

None

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
41620107	227904	MILL #2	138.0	AE	227945	LEWIS #2	138.0	AE	1	AE_P4-2 AE33	breaker	282.0	209.21	209.7	DC	3.28
41620072	227905	SCULL#1	138.0	AE	227903	MILL #1	138.0	AE	1	AE_P4-2 AE29	breaker	306.0	299.29	299.74	DC	3.3
41620082	227906	SCULL#2	138.0	AE	227904	MILL #2	138.0	AE	1	AE_P4-2 AE28	breaker	306.0	290.72	291.23	DC	3.73

41028085	227946	MILL#2	69.0	AE	227922	MILL #1	69.0	AE	1	AE_P7-1 AE2TOWER	tower	239.0	119.35	119.81	DC	2.59
41620468	227946	MILL#2	69.0	AE	227922	MILL #1	69.0	AE	1	AE_P4-2 AE22	breaker	239.0	119.26	119.76	DC	2.71
41620470	227946	MILL#2	69.0	AE	227922	MILL #1	69.0	AE	1	AE_P4-2 AE23	breaker	239.0	118.43	118.94	DC	2.75
41620067	228110	BLE	138.0	AE	227905	SCULL#1	138.0	AE	1	AE_P4-2 AE29	breaker	306.0	306.51	306.97	DC	3.3
41620077	228110	BLE	138.0	AE	227906	SCULL#2	138.0	AE	1	AE_P4-2 AE28	breaker	306.0	295.88	296.4	DC	3.73
42760990	228207	CUMB	230.0	AE	228002	ORCHARD	230.0	AE	1	AE_P7-1 AE7TOWER	tower	799.0	133.9	134.58	DC	12.22
42760991	228207	CUMB	230.0	AE	228002	ORCHARD	230.0	AE	1	AE_P7-1 AE13TOWER	tower	799.0	100.29	100.77	DC	8.95
41620513	228218	LAUREL	69.0	AE	228360	WOODTWN2	69.0	AE	1	AE_P4-2 AE47	breaker	107.0	101.03	112.78	DC	12.97
42225831	228311	CHAMBERS	230.0	AE	228312	PEDRKTWN	230.0	AE	1	AE_P4-2 AE45	breaker	552.0	123.38	124.7	DC	16.19
42225879	228313	BRIDGPRT	230.0	AE	228401	MCKLTON	230.0	AE	1	AE_P4-2 AE45	breaker	804.0	122.96	123.86	DC	16.11
41028125	228402	MONROE	230.0	AE	219100	NEWFRDM	230.0	PSE&G	1	PS_P7-1_V2274+P2242_LT	tower	804.0	109.01	109.67	DC	11.48
41028127	228402	MONROE	230.0	AE	219100	NEWFRDM	230.0	PSE&G	1	PS_P7-1_W2275+O2241_LT	tower	804.0	100.86	101.51	DC	11.51
41028023	228504	SHLDLY T	69.0	AE	228511	LANDIS T	69.0	AE	1	AE_P7-1 AE7TOWER	tower	158.0	136.08	136.84	DC	5.49
41028027	228511	LANDIS T	69.0	AE	228409	MONROE#3	69.0	AE	1	AE_P7-1 AE7TOWER	tower	158.0	136.08	136.84	DC	5.49
41027984	228714	CNTRL N	69.0	AE	228504	SHLDLY T	69.0	AE	1	AE_P7-1 AE7TOWER	tower	143.0	150.35	151.19	DC	5.49
41028020	228716	S121TAP	69.0	AE	228714	CNTRL N	69.0	AE	1	AE_P7-1 AE7TOWER	tower	107.0	136.22	137.27	DC	2.49

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
42528040	213922	RICHMOND	230.0	PECO	214012	WANEETA3	230.0	PECO	1	Base Case	operation	760.0	164.85	165.38	DC	8.95
41299312	227903	MILL #1	138.0	AE	227902	LEWIS #1	138.0	AE	1	AE_P1-2 BLE-ML-LEW2	operation	306.0	239.01	239.53	DC	3.8
41299351	227904	MILL #2	138.0	AE	227945	LEWIS #2	138.0	AE	1	AE_P1-2 BLE-ML-LEW1	operation	282.0	199.24	199.72	DC	3.23

4129928 4	227905	SCULL#1	138.0	AE	227903	MILL #1	138.0	AE	1	AE_P1-2 BLE-SC-ML2	operation	306.0	268.65	269.23	DC	4.18
4129928 6	227905	SCULL#1	138.0	AE	227903	MILL #1	138.0	AE	1	Base Case	operation	218.0	212.64	213.13	DC	2.4
4129927 4	227906	SCULL#2	138.0	AE	227904	MILL #2	138.0	AE	1	AE_P1-2 BLE-SC-ML1	operation	306.0	270.22	270.8	DC	4.19
4129927 6	227906	SCULL#2	138.0	AE	227904	MILL #2	138.0	AE	1	Base Case	operation	218.0	214.73	215.23	DC	2.41
4129986 3	227946	MILL#2	69.0	AE	227922	MILL #1	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	239.0	118.03	118.54	DC	2.78
4129925 4	228110	BLE	138.0	AE	227905	SCULL#1	138.0	AE	1	AE_P1-2 BLE-SC-ML2	operation	306.0	275.9	276.48	DC	4.18
4129925 6	228110	BLE	138.0	AE	227905	SCULL#1	138.0	AE	1	Base Case	operation	218.0	222.77	223.27	DC	2.4
4129926 4	228110	BLE	138.0	AE	227906	SCULL#2	138.0	AE	1	AE_P1-2 BLE-SC-ML1	operation	306.0	275.39	275.96	DC	4.19
4129926 6	228110	BLE	138.0	AE	227906	SCULL#2	138.0	AE	1	Base Case	operation	218.0	221.98	222.48	DC	2.41
4129988 7	228218	LAUREL	69.0	AE	228360	WOODTWN2	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	107.0	99.91	111.83	DC	13.18
4252799 8	228311	CHAMBERS	230.0	AE	228312	PEDRKTWN	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	552.0	124.07	125.22	DC	14.01
4252790 3	228312	PEDRKTWN	230.0	AE	228313	BRIDGPRT	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	552.0	141.35	142.5	DC	13.98
4252790 8	228312	PEDRKTWN	230.0	AE	228313	BRIDGPRT	230.0	AE	1	Base Case	operation	552.0	100.93	102.6	DC	9.18
4252808 3	228313	BRIDGPRT	230.0	AE	228401	MCKLTON	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	804.0	123.13	123.91	DC	13.93
4252808 4	228313	BRIDGPRT	230.0	AE	228401	MCKLTON	230.0	AE	1	Base Case	operation	650.0	117.11	117.75	DC	9.12
4129963 3	228504	SHLDLY T	69.0	AE	228511	LANDIS T	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	158.0	113.53	115.38	DC	6.65
4129965 0	228511	LANDIS T	69.0	AE	228409	MONROE#3	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	158.0	113.53	115.38	DC	6.65
4129955 3	228714	CNTRL N	69.0	AE	228504	SHLDLY T	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	143.0	125.43	127.48	DC	6.65
4130016 5	939500	AE1-179 TAP	69.0	AE	228228	SO MVLLE	69.0	AE	1	Base Case	operation	66.0	90.68	100.06	DC	6.19
5103462 6	939500	AE1-179 TAP	69.0	AE	228228	SO MVLLE	69.0	AE	1	228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1	operation	89.0	94.04	107.14	DC	11.67
5103453 0	940000	AE1-240 TAP	69.0	AE	228226	SHRMAN#2	69.0	AE	1	228228 SO MVLLE 69.0 939500 AE1-179 TAP 69.0 1	operation	93.0	101.08	119.93	DC	17.53

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
41620082	3	SCULL#2 138.0 kV - MILL #2 138.0 kV Ckt 1	**AE** **at1408r0003 (875) : To mitigate the (ACE) Mill#2 Scull#2 138 kV line (from bus 228904 to bus 227906 ckt 1) overload, it will require increasing the emergency rating of the Mill#2 to Scull#2 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at both Mill#2 to Scull#2.** **Project Type : FAC** **Cost : $12,800,000** **Time Estimate : 36-60 Months** **at1408r0004 (876) : To mitigate the (ACE) Mill#2 Scull#2 138 kV line (from bus 228904 to bus 227906 ckt 1) overload, it will require increasing the emergency rating of the Mill#2 to Scull#2 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at Mill#2.** **Project Type : FAC** **Cost : $12,500,000** **Time Estimate : 36-60 Months**	$25,300,000
41620107	1	MILL #2 138.0 kV - LEWIS #2 138.0 kV Ckt 1	**AE** **at1424r0001 (881) : To mitigate the (ACE) Mill#2 Lewis#2 138 kV line (from bus 228904 to bus 227945 ckt 1) overload, it will require increasing the emergency rating of the Mill#2 to Lewis#2 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at Lewis#2.** **Project Type : FAC** **Cost : $12,500,000** **Time Estimate : 36-60 Months** **as1424r0001 (882) : To mitigate the (ACE) Mill#2 Lewis#2 138 kV line (from bus 228904 to bus 227945 ckt 1) overload will require substation reinforcements at both, Mill#2 & Lewis#2 Substation.** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 24-36 Months**	$13,500,000
42225879	10	BRIDGPRT 230.0 kV - MCKLTON 230.0 kV Ckt 1	**AE** **at2315r0001_af1f (64) : To mitigate the (ACE) Bridgeport to Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) overload, it will require increasing the emergecy rating of the Bridgeport to Mickleton 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor.** **Project Type : FAC** **Cost : $18,000,000** **Time Estimate : 36-60 Months** **as2315r0001_af1f (65) : To mitigate the (ACE) Bridgeport to Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) overload, terminal reinforcement is required at both substation.**	$19,000,000

			Project Type : FAC **Cost : $1,000,000** **Time Estimate : 12-24 Months**	
41620513	8	**LAUREL 69.0 kV - WOODTWN2 69.0 kV Ckt 1**	**AE** **as0740r0001_af1f (67) : To mitigate the (ACE) Laurel to Woodstown 69 kV line (from bus 228218 to bus 228360 ckt 1) overload, it will require reinforcement of terminal equipment at Woodstown #2 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months** **as0740r0002_af1f (68) : To mitigate the (ACE) Laurel to Woodstown 69 kV line (from bus 228218 to bus 228360 ckt 1) overload, it will require reinforcement of terminal equipment at Woodstown #2 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months**	$200,000
42225831	9	**CHAMBERS 230.0 kV - PEDRKTWN 230.0 kV Ckt 1**	**AE** **as2312r0001_af1f (66) : To mitigate the (ACE) Chambers to Pedrickton 230 kV line (from bus 228311 to bus 228312 ckt 1) overload, it will require reinforcement of terminal equipment at both substations.** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 12-32 Months**	$1,000,000
41028027	13	**LANDIS T 69.0 kV - MONROE#3 69.0 kV Ckt 1**	**AE** **at0711r0002 (944) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload,it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor.** **Project Type : FAC** **Cost : $11,300,000** **Time Estimate : 36-48 Months** **as0711r0002 (945) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, terminal reinforcement is required at Monroe#3 substation.** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 12-24 Months** **as0711r0003 (946) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, terminal reinforcement is required at Monroe#3 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months** **as0711r0004 (947) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, terminal reinforcement is required at Monroe#3 substation.**	$11,700,000

			Project Type : FAC **Cost : $100,000** **Time Estimate : 12-24 Months**	
41620470,41028085, 41620468	4	**MILL#2 69.0 kV - MILL #1 69.0 kV Ckt 1**	**AE** **asmillr0003_ae2i (920) : To mitigate the (ACE) Mill#1 69kV Mill#2 69kV bus (from bus 227946 to bus 227922 ckt 1) overload, terminal reinforcement is required at Mill.** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 12-24 Months** **asmillr0004_af1f (921) : To mitigate the (ACE) Mill#1 69kV Mill#2 69kV bus (from bus 227946 to bus 227922 ckt 1) overload, terminal reinforcement is required at Mill.** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 12-24 Months**	$400,000
41027984	14	**CNTRL N 69.0 kV - SHLDLY T 69.0 kV Ckt 1**	**AE** **as0711r0001 (942) : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload, terminal reinforcement is required at Central North (Vineland).** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 24-36 Months** **at0711r0001 (943) : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload,it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor.** **Project Type : FAC** **Cost : $1,300,000** **Time Estimate : 24-48 Months** **at0711r0004 (950) : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload,it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. Also, upgrades to the terminal equipement at Central North Substation will be required.** **Project Type : FAC** **Cost : $4,600,000** **Time Estimate : 24-48 Months**	$6,100,000
42760991,42760990	7	**CUMB 230.0 kV - ORCHARD 230.0 kV Ckt 1**	**AE** **at2314r0001 (933) : To mitigate the (ACE) Orchard Cumberland 230 kV line (from bus 228012 to bus 228207 ckt 1) overload, it will require increasing the emergency rating of the Orchard to Cumberland 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements is required at Cumberland.** **Project Type : FAC** **Cost : $46,600,000**	$47,400,000

			Time Estimate : 36-60 Months **as2314r0001 (934)** : To mitigate the (ACE) Orchard Cumberland 230 kV line (from bus 228012 to bus 228207 ckt 1) overload, it will require reinforcement of terminal equipment at Cumberland. **Project Type** : FAC **Cost** : $300,000 **Time Estimate** : 12-24 Months **as2314r0002 (940)** : To mitigate the (ACE) Orchard Cumberland 230 kV line (from bus 228012 to bus 228207 ckt 1) overload, it will require reinforcement of terminal equipment at Cumberland. **Project Type** : FAC **Cost** : $500,000 **Time Estimate** : 12-24 Months	
41028023	12	**SHLDLY T 69.0 kV - LANDIS T 69.0 kV Ckt 1**	**AE** **at0711r0003 (949)** : To mitigate the (ACE) Sheildalloy Tap - Landis Tap 69 kV line (from bus 228504 to bus 228511 ckt 1) overload,it will require increasing the emergency rating of the Sheildalloy Tap to Landis Tap 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. **Project Type** : FAC **Cost** : $1,600,000 **Time Estimate** : 24-48 Months	$1,600,000
41028020	15	**S121TAP 69.0 kV - CNTRL N 69.0 kV Ckt 1**	**AE** **as0712r0001_ae2i (62)** : To mitigate the (ACE) S121 to Central North 69 kV line (from bus 228716 to bus 228714 ckt 1) overload, it will require increasing the emergency rating of the Vineland G-10 to Central North 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at Central North & Vineland G-10. **Project Type** : FAC **Cost** : $1,250,000 **Time Estimate** : 24-48 Months	$1,250,000
41028125,41028127	11	**MONROE 230.0 kV - NEWFRDM 230.0 kV Ckt 1**	**AE** **at2305r0001 (52)** : To mitigate the (ACE) Monroe to New Freedom 230 kV line (from bus 228402 to bus 219100 ckt 1) overload, it will require increasing the emergency rating of the Monroe to New Freedom 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. **Project Type** : FAC **Cost** : $13,400,000 **Time Estimate** : 30-60 Months	$13,400,000
41620067	5	**BLE 138.0 kV - SCULL#1 138.0 kV Ckt 1**	**AE** **at1407r0001 (883)** : To mitigate the (ACE) B.L. England Scull#1 138 kV line (from bus 228110 to bus 227905 ckt 1) overload, it will require increasing the emergency rating of the B.L. England to Scull#1 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various	$11,200,000

			terminal reinforcements are required at both B.L. England and Scull#1 **Project Type** : FAC **Cost** : $5,900,000 **Time Estimate** : 36-60 Months **at1407r0002 (884)** : To mitigate the (ACE) B.L. England Scull#1 138 kV line (from bus 228110 to bus 227905 ckt 1) overload, it will require increasing the emergency rating of the B.L. England to Scull#1 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at B.L. England#1. **Project Type** : FAC **Cost** : $5,300,000 **Time Estimate** : 36-60 Months	
41620072	2	**SCULL#1 138.0 kV - MILL #1 138.0 kV Ckt 1**	**AE** **at1407r0003 (885)** : To mitigate the (ACE) Scull#1-Mill#1 - 138 kV line (from bus 227905 to bus 227903 ckt 1) overload, it will require increasing the emergency rating of the Scull#1 to Mill#1 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements at both, Mill#1 & Scull#1. **Project Type** : FAC **Cost** : $12,800,000 **Time Estimate** : 36-60 Months **at1407r0004 (886)** : To mitigate the (ACE) Scull#1-Mill#1 - 138 kV line (from bus 227905 to bus 227903 ckt 1) overload, it will require increasing the emergency rating of the Scull#1 to Mill#1 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements at Mill#1. **Project Type** : FAC **Cost** : $12,500,000 **Time Estimate** : 36-60 Months	$25,300,000
41620077	6	**BLE 138.0 kV - SCULL#2 138.0 kV Ckt 1**	**AE** **at1408r0001 (872)** : To mitigate the (ACE) B.L. England Scull#2 138 kV line (from bus 228110 to bus 227906 ckt 1) overload, it will require increasing the emergency rating of the B.L. England to Scull#2 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at both B.L. England and Scull#2 **Project Type** : FAC **Cost** : $6,000,000 **Time Estimate** : 36-60 Months **at1408r0002 (873)** : To mitigate the (ACE) B.L. England Scull#2 138 kV line (from bus 228110 to bus 227906 ckt 1) overload, it will require increasing the emergency rating of the B.L. England to Scull#2 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. In addition, various terminal reinforcements are required at both B.L. England and Scull#2 **Project Type** : FAC **Cost** : $5,600,000	$14,100,000

			Time Estimate : 36-60 Months **as1408r0001_af1f (874)** : To mitigate the (ACE) B.L. England Scull#2 138 kV line (from bus 228110 to bus 227906 ckt 1) overload, it will require substation reinforcements at both substations. **Project Type** : FAC **Cost** : $2,500,000 **Time Estimate** : 12-24 Months	
			TOTAL COST	**$191,450,000**

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.

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
41620107	227904	MILL #2	AE	227945	LEWIS #2	AE	1	AE_P4-2 AE33	breaker	282.0	209.21	209.7	DC	3.28

Bus #	Bus	MW Impact
228100	BLE DIES	3.2073
228202	CUMB CT	1.4675
228203	P06	1.4449
228261	V4-054E	0.4784
228711	V2-041C	0.0342
228712	V2-041E	0.3996
228732	V1-021 C	0.0730
902432	W2-030 E	0.5719
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**179.2068**
924531	AB2-102 C	34.1167
924532	AB2-102 E	0.7581
938423	AE1-061 BAT	0.9339
938781	AE1-104 C O1	48.6705
938782	AE1-104 E O1	124.5226
939303	AE1-161 BAT	2.7355
939501	AE1-179 C O1	3.4564
939502	AE1-179 E O1	2.4392
940001	AE1-240 C O1	2.8769
940002	AE1-240 E O1	2.0535
940391	AE2-023 C	31.4153
940392	AE2-023 E	147.0698
941001	AE2-091 C O1	2.0463
941002	AE2-091 E O1	1.0676
941931	AE2-205 C O1	7.0963
941932	AE2-205 E O1	4.7309
944131	AF1-081 C O1	14.5565
944132	AF1-081 E O1	9.7043
945431	AF1-208 C O1	0.8870
945432	AF1-208 E O1	0.5913

945731	AF1-238 C O1	9.0474
945732	AF1-238 E O1	13.5711
945741	AF1-239 C	0.6616
945742	AF1-239 E	0.9924
999906	PVILLEG 2	-0.1873
DUCKCREEK	DUCKCREEK	0.0403
NEWTON	NEWTON	0.0376
FARMERCITY	FARMERCITY	0.0019
NY	NY	0.0846
PRAIRIE	PRAIRIE	0.0878
O-066	O-066	1.3978
COFFEEN	COFFEEN	0.0185
EDWARDS	EDWARDS	0.0122
CHEOAH	CHEOAH	0.0160
TILTON	TILTON	0.0220
G-007	G-007	0.3942
GIBSON	GIBSON	0.0191
CALDERWOOD	CALDERWOOD	0.0164
BLUEG	BLUEG	0.0608
TRIMBLE	TRIMBLE	0.0195
CATAWBA	CATAWBA	0.0109

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
41620072	227905	SCULL#1	AE	227903	MILL #1	AE	1	AE_P4-2 AE29	breaker	306.0	299.29	299.74	DC	3.3

Bus #	Bus	MW Impact
227928	V4-067E	-0.1097
228100	BLE DIES	5.0907
228202	CUMB CT	1.4430
228203	P06	1.4093
228206	SHRMN CT	1.2819
228261	V4-054E	0.4774
228711	V2-041C	0.0337
228712	V2-041E	0.3938
228731	V3-036	-0.4709
228732	V1-021 C	0.0679
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**284.4440**
924531	AB2-102 C	33.2775
924532	AB2-102 E	0.6286
938781	AE1-104 C O1	77.2517
938782	AE1-104 E O1	197.6472
939501	AE1-179 C O1	3.4281
939502	AE1-179 E O1	2.4193
940001	AE1-240 C O1	2.8525
940002	AE1-240 E O1	2.0361
940391	AE2-023 C	49.8636
940392	AE2-023 E	233.4350
941001	AE2-091 C O1	2.0342
941002	AE2-091 E O1	1.0613
941931	AE2-205 C O1	6.9217
941932	AE2-205 E O1	4.6145
944131	AF1-081 C O1	14.1984
944132	AF1-081 E O1	9.4656
945431	AF1-208 C O1	0.8909
945432	AF1-208 E O1	0.5939
945731	AF1-238 C O1	8.9220
945732	AF1-238 E O1	13.3830
945741	AF1-239 C	0.6556
945742	AF1-239 E	0.9835
999905	MARINGEN 2	-0.3394
999906	PVILLEG 2	-0.1489
DUCKCREEK	DUCKCREEK	0.0392
NEWTON	NEWTON	0.0365
FARMERCITY	FARMERCITY	0.0018
NY	NY	0.0935
PRAIRIE	PRAIRIE	0.0852
O-066	O-066	1.5590
COFFEEN	COFFEEN	0.0180

EDWARDS	EDWARDS	0.0119
CHEOAH	CHEOAH	0.0155
TILTON	TILTON	0.0214
G-007	G-007	0.4597
GIBSON	GIBSON	0.0186
CALDERWOOD	CALDERWOOD	0.0154
BLUEG	BLUEG	0.0590
TRIMBLE	TRIMBLE	0.0189
CATAWBA	CATAWBA	0.0105

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
41620082	227906	SCULL#2	AE	227904	MILL #2	AE	1	AE_P4-2 AE28	breaker	306.0	290.72	291.23	DC	3.73

Bus #	Bus	MW Impact
227928	V4-067E	-0.1248
228100	BLE DIES	4.7207
228202	CUMB CT	1.6326
228203	P06	1.5940
228206	SHRMN CT	1.4504
228261	V4-054E	0.5401
228711	V2-041C	0.0381
228712	V2-041E	0.4456
228731	V3-036	-0.5341
228732	V1-021 C	0.0765
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**263.7702**
924531	AB2-102 C	37.6380
924532	AB2-102 E	0.7109
938781	AE1-104 C O1	71.6369
938782	AE1-104 E O1	183.2820
939501	AE1-179 C O1	3.8785
939502	AE1-179 E O1	2.7371
940001	AE1-240 C O1	3.2277
940002	AE1-240 E O1	2.3039
940391	AE2-023 C	46.2395
940392	AE2-023 E	216.4686
941001	AE2-091 C O1	2.3016
941002	AE2-091 E O1	1.2008
941931	AE2-205 C O1	7.8287
941932	AE2-205 E O1	5.2191
944131	AF1-081 C O1	16.0589
944132	AF1-081 E O1	10.7059
945431	AF1-208 C O1	1.0080
945432	AF1-208 E O1	0.6720
945731	AF1-238 C O1	10.0950
945732	AF1-238 E O1	15.1425
945741	AF1-239 C	0.7418
945742	AF1-239 E	1.1127
999905	MARINGEN 2	-0.3853
999906	PVILLEG 2	-0.1684
DUCKCREEK	DUCKCREEK	0.0449
NEWTON	NEWTON	0.0419
FARMERCITY	FARMERCITY	0.0022
NY	NY	0.1056
PRAIRIE	PRAIRIE	0.1007
O-066	O-066	1.7674
COFFEEN	COFFEEN	0.0206

EDWARDS	EDWARDS	0.0137
CHEOAH	CHEOAH	0.0180
TILTON	TILTON	0.0246
G-007	G-007	0.5210
GIBSON	GIBSON	0.0213
CALDERWOOD	CALDERWOOD	0.0179
BLUEG	BLUEG	0.0677
TRIMBLE	TRIMBLE	0.0217
CATAWBA	CATAWBA	0.0119

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
41620468	227946	MILL#2	AE	227922	MILL #1	AE	1	AE_P4-2 AE22	breaker	239.0	119.26	119.76	DC	2.71

Bus #	Bus	MW Impact
227928	V4-067E	-0.2984
228100	BLE DIES	1.2905
228202	CUMB CT	1.2621
228203	P06	1.5204
228206	SHRMN CT	1.1047
228261	V4-054E	0.4027
228711	V2-041C	0.0287
228712	V2-041E	0.3358
228731	V3-036	-0.3237
228732	V1-021 C	0.0522
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**72.1056**
924531	AB2-102 C	35.9010
924532	AB2-102 E	0.7978
938781	AE1-104 C O1	19.5830
938782	AE1-104 E O1	50.1029
939501	AE1-179 C O1	2.9438
939502	AE1-179 E O1	2.0775
940001	AE1-240 C O1	2.4460
940002	AE1-240 E O1	1.7460
940391	AE2-023 C	12.6403
940392	AE2-023 E	59.1750
941001	AE2-091 C O1	1.7349
941002	AE2-091 E O1	0.9051
941931	AE2-205 C O1	7.4674
941932	AE2-205 E O1	4.9783
944131	AF1-081 C O1	15.3178
944132	AF1-081 E O1	10.2118
945431	AF1-208 C O1	0.7329
945432	AF1-208 E O1	0.4886
945731	AF1-238 C O1	3.4620
945732	AF1-238 E O1	11.5272
945741	AF1-239 C	0.5674
945742	AF1-239 E	0.8510
999905	MARINGEN 2	-0.5408
DUCKCREEK	DUCKCREEK	0.0392
NEWTON	NEWTON	0.0365
FARMERCITY	FARMERCITY	0.0019
NY	NY	0.0348
PRAIRIE	PRAIRIE	0.0878
O-066	O-066	0.5242
COFFEEN	COFFEEN	0.0180
EDWARDS	EDWARDS	0.0119

CHEOAH	CHEOAH	0.0170
TILTON	TILTON	0.0214
G-007	G-007	0.1529
GIBSON	GIBSON	0.0186
CALDERWOOD	CALDERWOOD	0.0169
BLUEG	BLUEG	0.0590
TRIMBLE	TRIMBLE	0.0189
CATAWBA	CATAWBA	0.0119

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
41620067	228110	BLE	AE	227905	SCULL#1	AE	1	AE_P4-2 AE29	breaker	306.0	306.51	306.97	DC	3.3

Bus #	Bus	MW Impact
227928	V4-067E	-0.1097
228100	BLE DIES	5.0907
228202	CUMB CT	1.4430
228203	P06	1.4093
228206	SHRMN CT	1.2819
228261	V4-054E	0.4774
228711	V2-041C	0.0337
228712	V2-041E	0.3938
228731	V3-036	-0.4709
228732	V1-021 C	0.0679
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**284.4440**
924531	AB2-102 C	33.2775
924532	AB2-102 E	0.6286
938781	AE1-104 C O1	77.2517
938782	AE1-104 E O1	197.6472
939501	AE1-179 C O1	3.4281
939502	AE1-179 E O1	2.4193
940001	AE1-240 C O1	2.8525
940002	AE1-240 E O1	2.0361
940391	AE2-023 C	49.8636
940392	AE2-023 E	233.4350
941001	AE2-091 C O1	2.0342
941002	AE2-091 E O1	1.0613
941931	AE2-205 C O1	6.9217
941932	AE2-205 E O1	4.6145
944131	AF1-081 C O1	14.1984
944132	AF1-081 E O1	9.4656
945431	AF1-208 C O1	0.8909
945432	AF1-208 E O1	0.5939
945731	AF1-238 C O1	8.9220
945732	AF1-238 E O1	13.3830
945741	AF1-239 C	0.6556
945742	AF1-239 E	0.9835
999905	MARINGEN 2	-0.3394
999906	PVILLEG 2	-0.1489
DUCKCREEK	DUCKCREEK	0.0392
NEWTON	NEWTON	0.0365
FARMERCITY	FARMERCITY	0.0018
NY	NY	0.0935
PRAIRIE	PRAIRIE	0.0852
O-066	O-066	1.5590
COFFEEN	COFFEEN	0.0180

EDWARDS	EDWARDS	0.0119
CHEOAH	CHEOAH	0.0155
TILTON	TILTON	0.0214
G-007	G-007	0.4597
GIBSON	GIBSON	0.0186
CALDERWOOD	CALDERWOOD	0.0154
BLUEG	BLUEG	0.0590
TRIMBLE	TRIMBLE	0.0189
CATAWBA	CATAWBA	0.0105

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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
41620077	228110	BLE	AE	227906	SCULL#2	AE	1	AE_P4-2 AE28	breaker	306.0	295.88	296.4	DC	3.73

Bus #	Bus	MW Impact
227928	V4-067E	-0.1248
228100	BLE DIES	4.7207
228202	CUMB CT	1.6326
228203	P06	1.5940
228206	SHRMN CT	1.4504
228261	V4-054E	0.5401
228711	V2-041C	0.0381
228712	V2-041E	0.4456
228731	V3-036	-0.5341
228732	V1-021 C	0.0765
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**263.7702**
924531	AB2-102 C	37.6380
924532	AB2-102 E	0.7109
938781	AE1-104 C O1	71.6369
938782	AE1-104 E O1	183.2820
939501	AE1-179 C O1	3.8785
939502	AE1-179 E O1	2.7371
940001	AE1-240 C O1	3.2277
940002	AE1-240 E O1	2.3039
940391	AE2-023 C	46.2395
940392	AE2-023 E	216.4686
941001	AE2-091 C O1	2.3016
941002	AE2-091 E O1	1.2008
941931	AE2-205 C O1	7.8287
941932	AE2-205 E O1	5.2191
944131	AF1-081 C O1	16.0589
944132	AF1-081 E O1	10.7059
945431	AF1-208 C O1	1.0080
945432	AF1-208 E O1	0.6720
945731	AF1-238 C O1	10.0950
945732	AF1-238 E O1	15.1425
945741	AF1-239 C	0.7418
945742	AF1-239 E	1.1127
999905	MARINGEN 2	-0.3853
999906	PVILLEG 2	-0.1684
DUCKCREEK	DUCKCREEK	0.0449
NEWTON	NEWTON	0.0419
FARMERCITY	FARMERCITY	0.0022
NY	NY	0.1056
PRAIRIE	PRAIRIE	0.1007
O-066	O-066	1.7674
COFFEEN	COFFEEN	0.0206

EDWARDS	EDWARDS	0.0137
CHEOAH	CHEOAH	0.0180
TILTON	TILTON	0.0246
G-007	G-007	0.5210
GIBSON	GIBSON	0.0213
CALDERWOOD	CALDERWOOD	0.0179
BLUEG	BLUEG	0.0677
TRIMBLE	TRIMBLE	0.0217
CATAWBA	CATAWBA	0.0119

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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
42760990	228207	CUMB	AE	228002	ORCHARD	AE	1	AE_P7-1 AE7TOWER	tower	799.0	133.9	134.58	DC	12.22

Bus #	Bus	MW Impact
228100	BLE DIES	5.2958
228202	CUMB CT	5.9894
228203	P06	7.0509
228206	SHRMN CT	5.1979
228261	V4-054E	1.8514
228711	V2-041C	0.1348
228712	V2-041E	1.5759
228732	V1-021 C	0.1780
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**295.9006**
924531	AB2-102 C	166.4865
924532	AB2-102 E	3.6997
938781	AE1-104 C O1	80.3632
938782	AE1-104 E O1	205.6079
939501	AE1-179 C O1	13.7341
939502	AE1-179 E O1	9.6923
940001	AE1-240 C O1	11.4078
940002	AE1-240 E O1	8.1428
940391	AE2-023 C	51.8720
940392	AE2-023 E	242.8371
941001	AE2-091 C O1	8.0472
941002	AE2-091 E O1	4.1985
941931	AE2-205 C O1	34.6292
941932	AE2-205 E O1	23.0861
944131	AF1-081 C O1	71.0342
944132	AF1-081 E O1	47.3562
945431	AF1-208 C O1	3.3035
945432	AF1-208 E O1	2.2023
945731	AF1-238 C O1	16.2864
945732	AF1-238 E O1	54.2277
945741	AF1-239 C	2.6577
945742	AF1-239 E	3.9865
DUCKCREEK	DUCKCREEK	0.1911
NEWTON	NEWTON	0.1784
FARMERCITY	FARMERCITY	0.0094
G-007A	G-007A	0.1654
NY	NY	0.0326
PRAIRIE	PRAIRIE	0.4314
O-066	O-066	0.0739
COFFEEN	COFFEEN	0.0877
EDWARDS	EDWARDS	0.0581
CHEOAH	CHEOAH	0.0846
TILTON	TILTON	0.1046

GIBSON	GIBSON	0.0906
CALDERWOOD	CALDERWOOD	0.0840
BLUEG	BLUEG	0.2882
TRIMBLE	TRIMBLE	0.0924
CATAWBA	CATAWBA	0.0595

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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
41620513	228218	LAUREL	AE	228360	WOODTWN2	AE	1	AE_P4-2 AE47	breaker	107.0	101.03	112.78	DC	12.97

Bus #	Bus	MW Impact
228100	BLE DIES	0.3775
228200	CARL#1CT	1.2385
228201	CARL#2CT	1.3109
228206	SHRMN CT	1.1396
228251	CARLLS#4	0.1381
228260	V4-054C	0.3345
228261	V4-054E	1.9551
228334	MANNMILG	-0.9755
228343	QUINTN#1	0.0331
228702	WEST CT	0.4786
228712	V2-041E	0.2576
228717	S121	1.1212
228727	W2-039G	1.4010
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**21.0910**
924531	AB2-102 C	19.8728
924532	AB2-102 E	0.4416
938781	AE1-104 C O1	5.7281
938782	AE1-104 E O1	14.6552
939501	AE1-179 C O1	7.0812
939502	AE1-179 E O1	4.9973
940001	AE1-240 C O1	6.1097
940002	AE1-240 E O1	4.3611
940391	AE2-023 C	3.6973
940392	AE2-023 E	17.3088
941001	AE2-091 C O1	5.8316
941002	AE2-091 E O1	3.0426
941931	AE2-205 C O1	4.1335
941932	AE2-205 E O1	2.7557
944131	AF1-081 C O1	4.4939
944132	AF1-081 E O1	2.9959
945431	AF1-208 C O1	7.7844
945432	AF1-208 E O1	5.1896
945731	AF1-238 C O1	3.5717
945732	AF1-238 E O1	5.3576
945741	AF1-239 C	1.7731
945742	AF1-239 E	2.6597
DUCKCREEK	DUCKCREEK	0.0415
NEWTON	NEWTON	0.0387
FARMERCITY	FARMERCITY	0.0020
G-007A	G-007A	0.1654
NY	NY	0.0072
PRAIRIE	PRAIRIE	0.0930

COFFEEN	COFFEEN	0.0190
EDWARDS	EDWARDS	0.0126
CHEOAH	CHEOAH	0.0180
TILTON	TILTON	0.0227
GIBSON	GIBSON	0.0197
CALDERWOOD	CALDERWOOD	0.0179
BLUEG	BLUEG	0.0625
TRIMBLE	TRIMBLE	0.0200
CATAWBA	CATAWBA	0.0126

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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
42225831	228311	CHAMBERS	AE	228312	PEDRKTWN	AE	1	AE_P4-2 AE45	breaker	552.0	123.38	124.7	DC	16.19

Bus #	Bus	MW Impact
227881	GRENWCHG	0.1916
227928	V4-067E	0.1805
228100	BLE DIES	1.4887
228203	P06	3.6483
228261	V4-054E	1.7608
228309	CCLP NUG	21.4075
228334	MANNMILG	2.5885
228343	QUINTN#1	0.0969
228357	V2-046E	3.6888
228712	V2-041E	0.7156
228721	V2-035E	0.3053
228731	V3-036	0.6795
902092	W1-130E	0.7825
902432	W2-030 E	0.7826
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**83.1787**
923532	AB1-169AC	75.4264
924531	AB2-102 C	86.1435
924532	AB2-102 E	1.9143
924701	AB2-122 C	0.0780
924702	AB2-122 E	0.1337
930001	AB1-001 C	0.0963
930002	AB1-001 E	0.1582
933962	AD1-019 E	0.9389
938421	AE1-061 C	0.6864
938422	AE1-061 E	0.6864
938781	AE1-104 C O1	22.5904
938782	AE1-104 E O1	57.7971
938871	AE1-115 C	4.6733
938872	AE1-115 E	4.6733
939301	AE1-161 C	2.8155
939302	AE1-161 E	4.2233
939501	AE1-179 C O1	9.4120
939502	AE1-179 E O1	6.6422
939931	AE1-229 C O1	36.0886
939932	AE1-229 E O1	24.4510
940001	AE1-240 C O1	7.9117
940002	AE1-240 E O1	5.6473
940361	AE2-020 C	4.7918
940362	AE2-020 E	22.4354
940371	AE2-021 C	4.7918
940372	AE2-021 E	22.4354
940381	AE2-022 C	2.7952

940382	AE2-022 E	13.0873
940391	AE2-023 C	14.5814
940392	AE2-023 E	68.2623
941001	AE2-091 C O1	6.3424
941002	AE2-091 E O1	3.3091
941931	AE2-205 C O1	17.9178
941932	AE2-205 E O1	11.9452
942101	AE2-222 C O1	10.3988
942102	AE2-222 E O1	26.1223
942381	AE2-251 C	28.6419
942382	AE2-251 E	73.2867
942571	AE2-272	0.2288
942941	**AE2-314 C (Withdrawn : 12/16/2019)**	**3.6694**
942942	**AE2-314 E (Withdrawn : 12/16/2019)**	**2.4463**
943071	AE2-334 C	2.2975
943072	AE2-334 E	1.2248
943081	AE2-335 C O1	4.2901
943082	AE2-335 E O1	1.9125
943732	AF1-041 E	0.1507
944131	AF1-081 C O1	36.7546
944132	AF1-081 E O1	24.5030
945431	AF1-208 C O1	4.3762
945432	AF1-208 E O1	2.9175
945731	AF1-238 C O1	8.9996
945732	AF1-238 E O1	13.4995
945741	AF1-239 C	1.6162
945742	AF1-239 E	2.4243
945971	AF1-262	0.1175
999905	MARINGEN 2	0.4994
999906	PVILLEG 2	0.2041
DUCKCREEK	DUCKCREEK	0.1555
NEWTON	NEWTON	0.1451
FARMERCITY	FARMERCITY	0.0076
G-007A	G-007A	1.2683
VFT	VFT	0.8578
PRAIRIE	PRAIRIE	0.3487
COFFEEN	COFFEEN	0.0713
EDWARDS	EDWARDS	0.0473
CHEOAH	CHEOAH	0.0681
TILTON	TILTON	0.0851
GIBSON	GIBSON	0.0737
CALDERWOOD	CALDERWOOD	0.0676
BLUEG	BLUEG	0.2344
TRIMBLE	TRIMBLE	0.0751
CATAWBA	CATAWBA	0.0483

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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
42225879	228313	BRIDGPRT	AE	228401	MCKLTON	AE	1	AE_P4-2 AE45	breaker	804.0	122.96	123.86	DC	16.11

Bus #	Bus	MW Impact
227881	GRENWCHG	0.1890
227928	V4-067E	0.1780
228100	BLE DIES	1.4763
228203	P06	3.6310
228261	V4-054E	1.7512
228304	LOGAN	24.7353
228306	PCLP STM	6.2919
228307	PCLP GT	6.2919
228309	CCLP NUG	21.3465
228334	MANNMILG	2.5755
228343	QUINTN#1	0.0965
228357	V2-046E	3.6689
228712	V2-041E	0.7118
228721	V2-035E	0.3034
228731	V3-036	0.6710
902092	W1-130E	0.7737
902432	W2-030 E	0.7734
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**82.4871**
923532	AB1-169AC	74.5803
924531	AB2-102 C	85.7362
924532	AB2-102 E	1.9052
924701	AB2-122 C	0.0769
924702	AB2-122 E	0.1319
930001	AB1-001 C	0.0949
930002	AB1-001 E	0.1560
933962	AD1-019 E	0.9272
938421	AE1-061 C	0.6787
938422	AE1-061 E	0.6787
938781	AE1-104 C O1	22.4025
938782	AE1-104 E O1	57.3166
938871	AE1-115 C	4.6551
938872	AE1-115 E	4.6551
939301	AE1-161 C	2.7848
939302	AE1-161 E	4.1772
939501	AE1-179 C O1	9.3582
939502	AE1-179 E O1	6.6042
939931	AE1-229 C O1	35.9266
939932	AE1-229 E O1	24.3413
940001	AE1-240 C O1	7.8670
940002	AE1-240 E O1	5.6154
940361	AE2-020 C	4.7045
940362	AE2-020 E	22.0268

940371	AE2-021 C	4.7045
940372	AE2-021 E	22.0268
940381	AE2-022 C	2.7443
940382	AE2-022 E	12.8490
940391	AE2-023 C	14.4602
940392	AE2-023 E	67.6948
941001	AE2-091 C O1	6.3068
941002	AE2-091 E O1	3.2905
941931	AE2-205 C O1	17.8331
941932	AE2-205 E O1	11.8888
942101	AE2-222 C O1	10.2666
942102	AE2-222 E O1	25.7904
942381	AE2-251 C	28.1203
942382	AE2-251 E	71.9519
942571	AE2-272	0.2275
942941	**AE2-314 C (Withdrawn : 12/16/2019)**	**3.6026**
942942	**AE2-314 E (Withdrawn : 12/16/2019)**	**2.4017**
943081	AE2-335 C O1	4.2259
943082	AE2-335 E O1	1.8839
943732	AF1-041 E	0.1487
944131	AF1-081 C O1	36.5808
944132	AF1-081 E O1	24.3872
945431	AF1-208 C O1	4.3540
945432	AF1-208 E O1	2.9027
945731	AF1-238 C O1	8.9504
945732	AF1-238 E O1	13.4257
945741	AF1-239 C	1.6064
945742	AF1-239 E	2.4096
945971	AF1-262	0.1167
999905	MARINGEN 2	0.4932
999906	PVILLEG 2	0.2015
DUCKCREEK	DUCKCREEK	0.3639
NEWTON	NEWTON	0.3395
FARMERCITY	FARMERCITY	0.0177
G-007A	G-007A	0.8343
NY	NY	0.0829
PRAIRIE	PRAIRIE	0.8162
O-066	O-066	0.3360
COFFEEN	COFFEEN	0.1670
EDWARDS	EDWARDS	0.1106
CHEOAH	CHEOAH	0.1587
TILTON	TILTON	0.1991
GIBSON	GIBSON	0.1725
CALDERWOOD	CALDERWOOD	0.1575
BLUEG	BLUEG	0.5486
TRIMBLE	TRIMBLE	0.1759
CATAWBA	CATAWBA	0.1117

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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
41028125	228402	MONROE	AE	219100	NEWFRDM	PSE&G	1	PS_P7-1_V2274+P2242_LT	tower	804.0	109.01	109.67	DC	11.48

Bus #	Bus	MW Impact
219229	EAGLEPT_G3	2.5419
219230	EAGLEPT_G1	4.7950
219231	EAGLEPT_G2	4.7950
219235	EAGLEPT_ST2	1.7331
219258	KINSLEYDEP C	0.1098
219259	KINSLEYDEP E	1.2830
219384	DEPTFDSP1_C	0.0014
219385	DEPTFDSP1_E	0.0170
219388	DEPTFDSP2_C	0.0014
219390	DEPTFDSP2_E	0.0170
219393	DEPTFDSP3_C	0.0036
219394	DEPTFDSP3_E	0.0426
219408	DEPTFDSP4_C	0.0014
219416	DEPTFDSP4_E	0.0170
219662	THOROFSP1_C	0.0060
219664	THOROFSP1_E	0.0695
219665	THOROFSP2_C	0.0060
219666	THOROFSP2_E	0.0695
219683	THOSOLAR C	0.0329
219684	THOSOLAR E	0.3849
227881	GRENWCHG	0.6141
228100	BLE DIES	0.8871
228261	V4-054E	1.2744
228304	LOGAN	10.7816
228334	MANNMILG	2.1524
228357	V2-046E	3.3396
228400	MICK 1CT	2.4769
228423	Q-090 2	42.2591
228471	VALERO1	0.8405
228472	VALERO2	0.5526
228473	VALERO3	0.5526
228484	VALERO4	0.4944
228712	V2-041E	0.3583
228720	V2-035C	0.0413
228721	V2-035E	0.4823
228728	W1-130C	0.1811
228731	V3-036	0.5556
228733	AB1-119 E	0.0865
902092	W1-130E	2.1129
902432	W2-030 E	0.5825
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**49.5683**
917471	Z2-083	4.2750

923153	AB1-116 E	0.1619
923532	AB1-169AC	202.4220
924051	AB2-049 C	0.5863
924052	AB2-049 E	0.9566
924531	AB2-102 C	27.7198
924532	AB2-102 E	0.6160
930001	AB1-001 C	0.0805
930002	AB1-001 E	0.1322
933962	AD1-019 E	0.7678
936491	AD2-064 C	0.0628
936492	AD2-064 E	0.0865
938421	AE1-061 C	1.8534
938422	AE1-061 E	1.8534
938781	AE1-104 C O1	13.4622
938782	AE1-104 E O1	34.4427
938871	AE1-115 C	2.4566
938872	AE1-115 E	2.4566
939301	AE1-161 C	8.7294
939302	AE1-161 E	13.0941
939501	AE1-179 C O1	6.5274
939502	AE1-179 E O1	4.6065
939821	AE1-218 C O1	0.2703
939822	AE1-218 E O1	0.4055
939831	AE1-219 C O1	0.6083
939832	AE1-219 E O1	0.8786
939931	AE1-229 C O1	30.6765
939932	AE1-229 E O1	20.7842
940001	AE1-240 C O1	5.3717
940002	AE1-240 E O1	3.8343
940391	AE2-023 C	8.6894
940392	AE2-023 E	40.6793
940781	AE2-065 C	0.2897
940782	AE2-065 E	0.4553
941001	AE2-091 C O1	4.4881
941002	AE2-091 E O1	2.3416
941931	AE2-205 C O1	5.7657
941932	AE2-205 E O1	3.8438
942101	AE2-222 C O1	8.7186
942102	AE2-222 E O1	21.9018
942571	AE2-272	0.2071
943071	AE2-334 C	10.7702
943072	AE2-334 E	5.7416
943081	AE2-335 C O1	20.3819
943082	AE2-335 E O1	9.0859
943732	AF1-041 E	0.1256
944131	AF1-081 C O1	6.2684
944132	AF1-081 E O1	4.1789
945431	AF1-208 C O1	3.1028
945432	AF1-208 E O1	2.0685
945731	AF1-238 C O1	4.8781
945732	AF1-238 E O1	7.3172
945741	AF1-239 C	1.1711
945742	AF1-239 E	1.7567

945971	AF1-262	0.3501
999905	MARINGEN 2	0.4011
999906	PVILLEG 2	0.1751
DUCKCREEK	DUCKCREEK	0.5113
NEWTON	NEWTON	0.4760
FARMERCITY	FARMERCITY	0.0248
NY	NY	0.5712
PRAIRIE	PRAIRIE	1.1391
O-066	O-066	8.6352
COFFEEN	COFFEEN	0.2341
EDWARDS	EDWARDS	0.1554
CHEOAH	CHEOAH	0.2172
TILTON	TILTON	0.2797
G-007	G-007	1.3156
MADISON	MADISON	0.0040
GIBSON	GIBSON	0.2419
CALDERWOOD	CALDERWOOD	0.2157
BLUEG	BLUEG	0.7690
TRIMBLE	TRIMBLE	0.2465
CATAWBA	CATAWBA	0.1491

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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
41028023	228504	SHLDLY T	AE	228511	LANDIS T	AE	1	AE_P7-1 AE7TOWER	tower	158.0	136.08	136.84	DC	5.49

Bus #	Bus	MW Impact
228100	BLE DIES	0.7280
228201	CARL#2CT	0.6292
228206	SHRMN CT	1.4972
228251	CARLLS#4	0.0668
228260	V4-054C	0.1674
228261	V4-054E	0.9785
228702	WEST CT	1.0260
228712	V2-041E	0.3227
228717	S121	2.6618
228727	W2-039G	2.1575
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**40.6774**
924531	AB2-102 C	18.8439
924532	AB2-102 E	0.4188
938781	AE1-104 C O1	11.0475
938782	AE1-104 E O1	28.2649
939501	AE1-179 C O1	7.4858
939502	AE1-179 E O1	5.2828
940001	AE1-240 C O1	5.8203
940002	AE1-240 E O1	4.1545
940391	AE2-023 C	7.1308
940392	AE2-023 E	33.3828
941001	AE2-091 C O1	4.3348
941002	AE2-091 E O1	2.2616
941931	AE2-205 C O1	3.9195
941932	AE2-205 E O1	2.6130
944131	AF1-081 C O1	4.2612
944132	AF1-081 E O1	2.8408
945431	AF1-208 C O1	1.4852
945432	AF1-208 E O1	0.9901
945731	AF1-238 C O1	10.4220
945732	AF1-238 E O1	15.6330
945741	AF1-239 C	3.1798
945742	AF1-239 E	4.7696
DUCKCREEK	DUCKCREEK	0.0599
NEWTON	NEWTON	0.0548
FARMERCITY	FARMERCITY	0.0029
NY	NY	0.0437
PRAIRIE	PRAIRIE	0.1317
O-066	O-066	0.5779
COFFEEN	COFFEEN	0.0270
EDWARDS	EDWARDS	0.0182
CHEOAH	CHEOAH	0.0255

TILTON	TILTON	0.0328
G-007	G-007	0.0676
MADISON	MADISON	0.0020
GIBSON	GIBSON	0.0284
CALDERWOOD	CALDERWOOD	0.0253
BLUEG	BLUEG	0.0903
TRIMBLE	TRIMBLE	0.0289
CATAWBA	CATAWBA	0.0175

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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
41028027	228511	LANDIS T	AE	228409	MONROE#3	AE	1	AE_P7-1 AE7TOWER	tower	158.0	136.08	136.84	DC	5.49

Bus #	Bus	MW Impact
228100	BLE DIES	0.7280
228201	CARL#2CT	0.6292
228206	SHRMN CT	1.4972
228251	CARLLS#4	0.0668
228260	V4-054C	0.1674
228261	V4-054E	0.9785
228702	WEST CT	1.0260
228712	V2-041E	0.3227
228717	S121	2.6618
228727	W2-039G	2.1575
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**40.6774**
924531	AB2-102 C	18.8439
924532	AB2-102 E	0.4188
938781	AE1-104 C O1	11.0475
938782	AE1-104 E O1	28.2649
939501	AE1-179 C O1	7.4858
939502	AE1-179 E O1	5.2828
940001	AE1-240 C O1	5.8203
940002	AE1-240 E O1	4.1545
940391	AE2-023 C	7.1308
940392	AE2-023 E	33.3828
941001	AE2-091 C O1	4.3348
941002	AE2-091 E O1	2.2616
941931	AE2-205 C O1	3.9195
941932	AE2-205 E O1	2.6130
944131	AF1-081 C O1	4.2612
944132	AF1-081 E O1	2.8408
945431	AF1-208 C O1	1.4852
945432	AF1-208 E O1	0.9901
945731	AF1-238 C O1	10.4220
945732	AF1-238 E O1	15.6330
945741	AF1-239 C	3.1798
945742	AF1-239 E	4.7696
DUCKCREEK	DUCKCREEK	0.0599
NEWTON	NEWTON	0.0548
FARMERCITY	FARMERCITY	0.0029
NY	NY	0.0437
PRAIRIE	PRAIRIE	0.1317
O-066	O-066	0.5779
COFFEEN	COFFEEN	0.0270
EDWARDS	EDWARDS	0.0182
CHEOAH	CHEOAH	0.0255

TILTON	TILTON	0.0328
G-007	G-007	0.0676
MADISON	MADISON	0.0020
GIBSON	GIBSON	0.0284
CALDERWOOD	CALDERWOOD	0.0253
BLUEG	BLUEG	0.0903
TRIMBLE	TRIMBLE	0.0289
CATAWBA	CATAWBA	0.0175

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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
41027984	228714	CNTRLN	AE	228504	SHLDLYT	AE	1	AE_P7-1 AE7TOWER	tower	143.0	150.35	151.19	DC	5.49

Bus #	Bus	MW Impact
228100	BLE DIES	0.7280
228201	CARL#2CT	0.6292
228206	SHRMN CT	1.4972
228251	CARLLS#4	0.0668
228260	V4-054C	0.1674
228261	V4-054E	0.9785
228702	WEST CT	1.0260
228712	V2-041E	0.3227
228717	S121	2.6618
228727	W2-039G	2.1575
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**40.6774**
924531	AB2-102 C	18.8439
924532	AB2-102 E	0.4188
938781	AE1-104 C O1	11.0475
938782	AE1-104 E O1	28.2649
939501	AE1-179 C O1	7.4858
939502	AE1-179 E O1	5.2828
940001	AE1-240 C O1	5.8203
940002	AE1-240 E O1	4.1545
940391	AE2-023 C	7.1308
940392	AE2-023 E	33.3828
941001	AE2-091 C O1	4.3348
941002	AE2-091 E O1	2.2616
941931	AE2-205 C O1	3.9195
941932	AE2-205 E O1	2.6130
944131	AF1-081 C O1	4.2612
944132	AF1-081 E O1	2.8408
945431	AF1-208 C O1	1.4852
945432	AF1-208 E O1	0.9901
945731	AF1-238 C O1	10.4220
945732	AF1-238 E O1	15.6330
945741	AF1-239 C	3.1798
945742	AF1-239 E	4.7696
DUCKCREEK	DUCKCREEK	0.0599
NEWTON	NEWTON	0.0548
FARMERCITY	FARMERCITY	0.0029
NY	NY	0.0437
PRAIRIE	PRAIRIE	0.1317
O-066	O-066	0.5779
COFFEEN	COFFEEN	0.0270
EDWARDS	EDWARDS	0.0182
CHEOAH	CHEOAH	0.0255

TILTON	TILTON	0.0328
G-007	G-007	0.0676
MADISON	MADISON	0.0020
GIBSON	GIBSON	0.0284
CALDERWOOD	CALDERWOOD	0.0253
BLUEG	BLUEG	0.0903
TRIMBLE	TRIMBLE	0.0289
CATAWBA	CATAWBA	0.0175

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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
41028020	228716	S121TAP	AE	228714	CNTRL N	AE	1	AE_P7-1 AE7TOWER	tower	107.0	136.22	137.27	DC	2.49

Bus #	Bus	MW Impact
228100	BLE DIES	0.3841
228261	V4-054E	0.3346
228702	WEST CT	1.7021
228712	V2-041E	0.1704
228717	S121	5.0163
913341	**Y1-077 (Withdrawn : 12/18/2019)**	**21.4596**
924531	AB2-102 C	9.9335
924532	AB2-102 E	0.2207
938781	AE1-104 C O1	5.8282
938782	AE1-104 E O1	14.9113
939501	AE1-179 C O1	1.8838
939502	AE1-179 E O1	1.3294
940001	AE1-240 C O1	3.0499
940002	AE1-240 E O1	2.1770
940391	AE2-023 C	3.7619
940392	AE2-023 E	17.6113
941001	AE2-091 C O1	1.2395
941002	AE2-091 E O1	0.6467
941931	AE2-205 C O1	2.0662
941932	AE2-205 E O1	1.3774
944131	AF1-081 C O1	2.2463
944132	AF1-081 E O1	1.4975
945431	AF1-208 C O1	0.6720
945432	AF1-208 E O1	0.4480
945731	AF1-238 C O1	2.4819
945732	AF1-238 E O1	3.7228
945741	AF1-239 C	3.8296
945742	AF1-239 E	5.7443
DUCKCREEK	DUCKCREEK	0.0472
NEWTON	NEWTON	0.0441
FARMERCITY	FARMERCITY	0.0023
NY	NY	0.0304
PRAIRIE	PRAIRIE	0.1059
O-066	O-066	0.3965
COFFEEN	COFFEEN	0.0217
EDWARDS	EDWARDS	0.0144
CHEOAH	CHEOAH	0.0205
TILTON	TILTON	0.0258
G-007	G-007	0.0499
GIBSON	GIBSON	0.0224
CALDERWOOD	CALDERWOOD	0.0204
BLUEG	BLUEG	0.0712

TRIMBLE	TRIMBLE	0.0228
CATAWBA	CATAWBA	0.0144

Affected Systems

Affected Systems

LG&E

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

MISO

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

TVA

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

Duke Energy Progress

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

NYISO

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

Contingency Name	Contingency Definition
AE_P1-2 BLE-ML-LEW1	CONTINGENCY 'AE_P1-2 BLE-ML-LEW1' DISCONNECT BUS 227903 / DISCONNECT BUS 227905 / DISCONNECT BUS 227929 / CLOSE LINE FROM BUS 227929 TO BUS 227930 CIRCUIT 1 / END
AE_P4-2 AE33	CONTINGENCY 'AE_P4-2 AE33' /*LEWIS TO CARDIFF BREAKER V DISCONNECT BRANCH FROM BUS 227902 TO BUS 227913 CKT 1 /*LEWIS CARDIFF 138 138 DISCONNECT BRANCH FROM BUS 227902 TO BUS 227903 CKT 1 /*LEWIS MILL #1 138 138 DISCONNECT BRANCH FROM BUS 227902 TO BUS 227918 CKT 1 /*LEWIS 138 69 T1 END
AE_P1-2 ORCH-CUMB	CONTINGENCY 'AE_P1-2 ORCH-CUMB' OPEN LINE FROM BUS 228002 TO BUS 228207 CIRCUIT 1 / END
AE_P4-2 AE22	CONTINGENCY 'AE_P4-2 AE22' /* CUMBERLAND TO ORCHARD BREAKER A DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD CUMBERLAND 230 230 DISCONNECT BRANCH FROM BUS 228207 TO BUS 228262 CKT 2 /* CUMB 230 138 T3 END
AE_P4-2 AE23	CONTINGENCY 'AE_P4-2 AE23' /* CUMBERLAND TO ORCHARD BREAKER B DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD CUMBERLAND 230 230 DISCONNECT BRANCH FROM BUS 228207 TO BUS 228262 CKT 1 /* CUMB 230 138 T2 END
AE_P7-1 AE13TOWER	CONTINGENCY 'AE_P7-1 AE13TOWER' DISCONNECT BRANCH FROM BUS 228500 TO BUS 228502 CKT 1 /* LANDIS TO MINO 138 KV DISCONNECT BRANCH FROM BUS 228002 TO BUS 227900 CKT 1 /* ORCH TO CARD 230 KV END
PS_P7-1_V2274+P2242_LT	CONTINGENCY 'PS_P7-1_V2274+P2242_LT' /* EAGEL POINT - GLOUCESTER & DEPTFORD - GLOUCESTER DISCONNECT BUS 219757 /* DEPTFORD SECTION 2 TRIP LINE FROM BUS 219110 TO BUS 219128 CKT 1 CLOSE LINE FROM BUS 219255 TO BUS 219256 CKT Z /* DEPTFORD CLOSE LINE FROM BUS 219180 TO BUS 219181 CKT Z /* DEPTFORD DISCONNECT BUS 219760 /* EAGLE POINT SECTION 4 MOVE 8 MW LOAD FROM BUS 219180 TO BUS 219162 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T1 MOVE 8 MW LOAD FROM BUS 219181 TO BUS 219163 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T2 MOVE 8 MW LOAD FROM BUS 219255 TO BUS 219162 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T1 MOVE 8 MW LOAD FROM BUS 219256 TO BUS 219163 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T2 END
AE_P4-2 AE28	CONTINGENCY 'AE_P4-2 AE28' /*ENGLAND TO MERION CITY BREAKER C DISCONNECT BRANCH FROM BUS 228110 TO BUS 228197 CKT 1 /*ENGLAND MERION 138 138 DISCONNECT BRANCH FROM BUS 228110 TO BUS 227905 CKT 1 /*ENGLAND #1 SCULL 138 138

	END
AE_P4-2 AE29	CONTINGENCY 'AE_P4-2 AE29' /*ENGLAND TO CORSON BREAKER D DISCONNECT BRANCH FROM BUS 228110 TO BUS 228111 CKT 1 /*ENGLAND MIDDLE TAP 138 138 DISCONNECT BRANCH FROM BUS 228110 TO BUS 227906 CKT 1 /*ENGLAND #2 SCULL 138 138 END
AE_P7-1 AE2TOWER	CONTINGENCY 'AE_P7-1 AE2TOWER' / PJM FIXED DISCONNECT BRANCH FROM BUS 228262 TO BUS 228253 CKT 1 /* SHERMAN TO CUMBERLAND 138 KV DISCONNECT BRANCH FROM BUS 228207 TO BUS 228002 CKT 1 /* ORCHARD TO CUMBERLAND 230 KV END
AE_P4-2 AE47	CONTINGENCY 'AE_P4-2 AE47' /*ORCHARD 230 BUS BREAKER NEW2 DISCONNECT BRANCH FROM BUS 228002 TO BUS 228310 CKT 1 /* ORCHARD TO CHURCHTOWN 230 230 DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD TO CUMBERLAND 230 230 END
AE_P4-2 AE45	CONTINGENCY 'AE_P4-2 AE45' /*ORCHARD 230 BUS BREAKER E DISCONNECT BRANCH FROM BUS 228002 TO BUS 227900 CKT 1 /* ORCHARD TO CARDIFF 230 230 DISCONNECT BRANCH FROM BUS 200063 TO BUS 228002 CKT 1 /*ORCHARD ORCHARD 500 230 T1 END
AE_P1-2 BLE-SC-ML1	CONTINGENCY 'AE_P1-2 BLE-SC-ML1' DISCONNECT BUS 227905 / DISCONNECT BUS 227929 / CLOSE LINE FROM BUS 227929 TO BUS 227930 CIRCUIT 1 / END
AE_P1-2 BLE-SC-ML2	CONTINGENCY 'AE_P1-2 BLE-SC-ML2' DISCONNECT BUS 227906 / DISCONNECT BUS 227930 / CLOSE LINE FROM BUS 227929 TO BUS 227930 CIRCUIT 1 / END
Base Case	
AE_P7-1 AE7TOWER	CONTINGENCY 'AE_P7-1 AE7TOWER' DISCONNECT BUS 227905 /* #1 BLE TO SCULL TO MILL 138 KV DISCONNECT BUS 227929 /* #1 SCULL 12 KV DISCONNECT BUS 227906 /* #2 BLE TO SCULL TO MILL 138 KV DISCONNECT BUS 227930 /* #2 SCULL 12 KV DISCONNECT BUS 227903 /* #1 MILL TO LEWIS 138 KV DISCONNECT BUS 227904 /* #2 MILL TO LEWIS 138 KV END
AE_P1-2 ORCHARD XF	CONTINGENCY 'AE_P1-2 ORCHARD XF' OPEN LINE FROM BUS 200063 TO BUS 228002 CIRCUIT 1 / END
AE_P1-2 BLE-ML-LEW2	

	CONTINGENCY 'AE_P1-2 BLE-ML-LEW2' DISCONNECT BUS 227904 / DISCONNECT BUS 227906 / DISCONNECT BUS 227930 / 227930 CIRCUIT 1 / CLOSE LINE FROM BUS 227929 TO BUS 227930 CIRCUIT 1 / END
228228 SO MVLLE 69.0 939500 AE1-179 TAP 69.0 1	CONTINGENCY '228228 SO MVLLE 69.0 939500 AE1-179 TAP 69.0 1' OPEN BRANCH FROM BUS 228228 TO BUS 939500 CKT 1 END
PS_P7-1_W2275+O2241_LT	CONTINGENCY 'PS_P7-1_W2275+O2241_LT' /* MICKLETON -DEPTFORD & MICKLETON - THOROFARE DISCONNECT BUS 219121 /* THOROFARE SECTION 1 DISCONNECT BUS 219109 /* DEPTFORD BUS SECTION 1 CLOSE LINE FROM BUS 219255 TO BUS 219256 CKT Z /* DEPTFORD T3 TO T4 CLOSE LINE FROM BUS 219180 TO BUS 219181 CKT Z /* DEPTFORD T1 TO T2 DISCONNECT BUS 219762 /* THOROFARE SECTION 2 DISCONNECT BUS 219759 /* EAGLE POINT BUS SECTION 3 MOVE 8 MW LOAD FROM BUS 219180 TO BUS 219162 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T1 MOVE 8 MW LOAD FROM BUS 219181 TO BUS 219163 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T2 MOVE 8 MW LOAD FROM BUS 219255 TO BUS 219162 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T1 MOVE 8 MW LOAD FROM BUS 219256 TO BUS 219163 /* INTERSTATION TIE TRANSFER LOAD FROM DEPTFORD TO BEAVERBK T2 END
228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1	CONTINGENCY '228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1' OPEN BRANCH FROM BUS 228226 TO BUS 940000 CKT 1 END

Short Circuit

Short Circuit

The following Breakers are overduty:

None.

Secondary Point of Interconnection

AF1-208 will interconnect with the AEC transmission system tapping the Quinton to Roadstown 69 kV line.

Summer Peak Load Flow

Generation Deliverability

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41299356	227904	MILL #2	138.0	AE	227945	LEWIS #2	138.0	AE	1	AE_P1-2 BLE-ML-LEW1	single	282.0	99.59	100.16	DC	1.62

Multiple Facility Contingency

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

None

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
41620082	227906	SCULL#2	138.0	AE	227904	MILL #2	138.0	AE	1	AE_P4-2 AE28	breaker	306.0	291.98	292.42	DC	3.14
41620077	228110	BLE	138.0	AE	227906	SCULL#2	138.0	AE	1	AE_P4-2 AE28	breaker	306.0	297.14	297.58	DC	3.14
42760990	228207	CUMB	230.0	AE	228002	ORCHARD	230.0	AE	1	AE_P7-1 AE7TOWER	tower	799.0	132.77	133.32	DC	9.76
41620513	228218	LAUREL	69.0	AE	228360	WOODTWN2	69.0	AE	1	AE_P4-2 AE47	breaker	107.0	101.46	110.01	DC	9.64
41028348	228401	MCKLTON	230.0	AE	213559	DELCOTAP	230.0	PECO	1	PS_P7-1_V2274+P2242_LT	tower	725.0	109.61	110.12	DC	8.03
41028350	228401	MCKLTON	230.0	AE	213559	DELCOTAP	230.0	PECO	1	AE_P7-1 W2275_O2241	tower	725.0	103.31	103.83	DC	8.05
41028125	228402	MONROE	230.0	AE	219100	NEWFRDM	230.0	PSE&G	1	PS_P7-1_V2274+P2242_LT	tower	804.0	109.15	109.82	DC	11.82
41028127	228402	MONROE	230.0	AE	219100	NEWFRDM	230.0	PSE&G	1	PS_P7-1_W2275+O2241_LT	tower	804.0	100.99	101.66	DC	11.85

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
41299312	227903	MILL #1	138.0	AE	227902	LEWIS #1	138.0	AE	1	AE_P1-2 BLE-ML-LEW2	operation	306.0	240.28	240.73	DC	3.19
41299284	227905	SCULL#1	138.0	AE	227903	MILL #1	138.0	AE	1	AE_P1-2 BLE-SC-ML2	operation	306.0	270.07	270.56	DC	3.52
41299274	227906	SCULL#2	138.0	AE	227904	MILL #2	138.0	AE	1	AE_P1-2 BLE-SC-ML1	operation	306.0	271.64	272.14	DC	3.52
41299254	228110	BLE	138.0	AE	227905	SCULL#1	138.0	AE	1	AE_P1-2 BLE-SC-ML2	operation	306.0	277.32	277.81	DC	3.52
41299264	228110	BLE	138.0	AE	227906	SCULL#2	138.0	AE	1	AE_P1-2 BLE-SC-ML1	operation	306.0	276.77	277.27	DC	3.52
41299887	228218	LAUREL	69.0	AE	228360	WOODTWN2	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	107.0	100.34	109.1	DC	9.89
42527998	228311	CHAMBERS	230.0	AE	228312	PEDRKTWN	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	552.0	135.15	137.88	DC	15.03
42527903	228312	PEDRKTWN	230.0	AE	228313	BRIDGPRT	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	552.0	152.41	155.14	DC	15.0
42527908	228312	PEDRKTWN	230.0	AE	228313	BRIDGPRT	230.0	AE	1	Base Case	operation	552.0	106.5	108.37	DC	10.25
42528083	228313	BRIDGPRT	230.0	AE	228401	MCKLTON	230.0	AE	1	AE_P1-2 ORCHARD XF	operation	804.0	130.7	132.57	DC	14.95
42528084	228313	BRIDGPRT	230.0	AE	228401	MCKLTON	230.0	AE	1	Base Case	operation	650.0	121.8	123.39	DC	10.2
41299633	228504	SHLDLY T	69.0	AE	228511	LANDIS T	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	158.0	125.22	126.73	DC	5.38
41299650	228511	LANDIS T	69.0	AE	228409	MONROE#3	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	158.0	125.22	126.73	DC	5.38
41299553	228714	CNTRL N	69.0	AE	228504	SHLDLY T	69.0	AE	1	AE_P1-2 ORCH-CUMB	operation	143.0	138.35	140.02	DC	5.38
51034626	939500	AE1-179 TAP	69.0	AE	228228	SO MVLLE	69.0	AE	1	228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1	operation	89.0	94.04	104.65	DC	9.45
51034530	940000	AE1-240 TAP	69.0	AE	228226	SHRMAN#2	69.0	AE	1	228228 SO MVLLE 69.0 939500 AE1-179 TAP 69.0 1	operation	93.0	101.08	116.35	DC	14.2