Generation Interconnection
Feasibility Study Report
Queue Position AE1-161

The Interconnection Customer (IC) has proposed a 50 MW Energy (20.0 MW Capacity) storage facility to be located at Latitude: 39.5358570, Longitude: -75.0523390 in Cumberland County, New Jersey. PJM studied the AE1-161 project as an injection into the Atlantic City Electric Company (ACE) transmission system as an injection into the Landis 138 kV Substation (PSSE bus #228500) and evaluated it for compliance with reliability criteria for summer peak conditions in 2022. The project was studied at a commercial probability of 53%. The planned in-service date, as requested by the IC, is October 01, 2021. This date may not be attainable due to required PJM studies (System Impact and Facilities) and the Transmission Owner's construction schedule.

Point of Interconnection

The Interconnection Customer requested a transmission level Point of Interconnection (POI) be evaluated for the AE1-161 project. As a result, the AE1-161 project will connect with the ACE transmission system at the Landis 138 kV Substation via an open line terminal.

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: At Landis Substation, establish a 138 kV terminal at the open position for Interconnecting Customer. The project will require the addition of a 138 kV three phase MOD, substation bus, and bus/line relaying protection.

Estimate: $800,000

Construction Time: 24-36 months

Major Equipment Included in Estimate:

- Relay Panel, Bus Line, FL/BU (20") Qty. 1
- Bus Support Structure, 3 phase, 138 kV, Steel Qty. 3
- Take-off structure, 138 kV Qty. 1

Estimate Assumptions:

- Site permitting to be performed by Interconnection Customer
- The required land is available for use.
- Land purchase for the substation is not included.

Required Relaying and Communications

New protection relays are required for the new terminals.

Front line and back-up line protection will be required. One 20" relay panel for each generator terminal will be required for front line and back-up protection.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 138 kV revenue metering points will need to be established. ACE will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by ACE's metering technicians. The metering control cable and meter cabinets will be supplied and installed by ACE. ACE will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. ACE will provide both the Primary and the Backup meters. ACE's meter technicians will program and install the Primary & Backup solid state multi-function meters for each new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. ACE will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and ACE requires directly to PJM. The IC will grant permission for PJM to send ACE the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.
The estimate for ACE to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer 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.

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).

Special Operating Requirements

1. ACE will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by ACE.

2. ACE reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by ACE.

Summer Peak Analysis - 2022

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

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
756731	219110	GLOUCSTR	PSE&G	219755	CUTHBERT_4	PSE&G	1	Base Case	single	550.0	99.97	100.3	DC	1.81
756642	228211	UPITTS	AE	228500	LANDIS	AE	1	AE_P1-2 MICK-BRIDG	single	205.0	84.15	86.05	DC	3.88

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
755336	213922	RICHMOND	PECO	214012	WANEETA3	PECO	1	PECO_P2-2_CHI230B1/* $ DELCO $ PECO_P2-2_CHI230B1 $ B	bus	1180.0	99.82	100.34	DC	11.33
756059	213922	RICHMOND	PECO	214012	WANEETA3	PECO	1	PECO_P4_CHICH045/* $ DELCO $ PECO_P4_CHICH045 $ STBK	breaker	1180.0	99.82	100.33	DC	11.33
755887	228312	PEDRKTWN	AE	228313	BRIDGPRT	AE	1	AE_P4-2 AE45	breaker	552.0	100.11	100.87	DC	7.97
755888	228312	PEDRKTWN	AE	228313	BRIDGPRT	AE	1	AE_P4-2 AE47	breaker	552.0	101.52	102.2	DC	7.89
757299	228402	MONROE	AE	219100	NEWFRDM	PSE&G	1	AE_P7-1 W2275_O2241	tower	804.0	98.37	100.57	DC	22.07

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
756203	227901	DOROTHY	AE	227949	LEWIS #3	AE	1	Base Case	single	154.0	173.26	175.91	DC	4.07
756205	227901	DOROTHY	AE	227949	LEWIS #3	AE	1	AE_P1-1Y1-077	single	205.0	148.58	150.56	DC	4.07
757298	228402	MONROE	AE	219100	NEWFRDM	PSE&G	1	PS_P7-1_V2274+P2242_LT	tower	804.0	105.3	106.85	DC	22.04
756223	228502	MNOTLA 1	AE	228500	LANDIS	AE	1	Base Case	single	230.0	124.11	125.88	DC	4.07
756226	228502	MNOTLA 1	AE	228500	LANDIS	AE	1	AE_P1-2 CARD-CEDAR	single	286.0	114.33	115.72	DC	3.97
756286	228503	MNOTLA 2	AE	228502	MNOTLA 1	AE	1	AE_P1-2 CARD-CEDAR	single	311.0	106.95	108.23	DC	3.97
756287	228503	MNOTLA 2	AE	228502	MNOTLA 1	AE	1	AE_P1-2 OY CK-CEDAR	single	311.0	106.17	107.43	DC	3.91

Summer Peak Load Flow Analysis Reinforcements

System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

ID	Index	Facility	Upgrade Description	Cost
756226,756223	7	**MNOTLA 1 138.0 kV - LANDIS 138.0 kV Ckt 1**	**AE** Description : To mitigate the (AE - AE) MNOTLA 1-LANDIS 138 kV line (from bus 228502 to bus 228500 ckt 1) overload will include rebuilding the Minotola to Landis 138 kV transmission line. Also, upgrades to the terminals at Minotola and Landis Substation will be required. Time Estimate : 36.0 Months Cost : $25,800,000	$25,800,000
755336,756059	3	**RICHMOND 230.0 kV - WANEETA3 230.0 kV Ckt 1**	**PECO** Description : No Violation. Queue Project W4-016 withdrew from the queue after the AE1 analysis run. After removing W4-016's contribution, the flowgate loading is less than 100%.	$0
756731	1	**GLOUCSTR 230.0 kV - CUTHBERT_4 230.0 kV Ckt 1**	**PSE&G** Description : New Cable: Gloucester 230kV to Camden 230kV Time Estimate : 48.0 Months Cost : $181,977,178	$181,977,178
756203,756205	6	**DOROTHY 138.0 kV - LEWIS #3 138.0 kV Ckt 1**	**AE** Description : To mitigate the overloads, it will require rebuilding the Minotola-Dorothy-Lewis 138 kV transmission line. Also, upgrading the terminals at Minotola and Dorothy will be required. Time Estimate : 36.0 Months Cost : $71,400,000	$71,400,000

ID	Index	Facility	Upgrade Description	Cost
757298,757299	5	MONROE 230.0 kV - NEWFRDM 230.0 kV Ckt 1	**PSE&G** Description : No Violation. PSE&G Terminal Equipment is Not Limiting Component **AE** Description : To mitigate the (ACE) Monroe – 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. Time Estimate : 36-60 Months Cost : $13,400,000	$13,400,000
755888,755887	4	PEDRKTWN 230.0 kV - BRIDGPRT 230.0 kV Ckt 1	**AE** Description : No Violation. Incorrect rating in case.	$0
756286,756287	8	MNOTLA 2 138.0 kV - MNOTLA 1 138.0 kV Ckt 1	**AE** Description : To mitigate the (AE - AE) MNOTLA 2-MNOTLA 1 138 kV line (from bus 228503 to bus 228502 ckt 1) overload will require substation reinforcements at Minotola Substation. Time Estimate : 18.0 Months Cost : $1,300,000	$1,300,000
756642	2	UPITTS 138.0 kV - LANDIS 138.0 kV Ckt 1	**AE** Description : No Violation. Facility loading does not exceed 100%.	$0
			TOTAL COST	**$293,877,178**

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

To be performed during later study phases as required.

Light Load Analysis - 2022

To be performed during later study phases (as required by PJM Manual 14B).

Delivery of Energy Portion of Interconnection Request

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. Only the most severely overloaded conditions are listed. 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 will 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
756202	227901	DOROTHY	AE	227949	LEWIS #3	AE	1	Base Case	operation	154.0	175.98	182.59	DC	10.17
756640	228211	UPITTS	AE	228500	LANDIS	AE	1	AE_P1-2 MICK-BRIDG	operation	205.0	85.47	90.21	DC	9.71
756643	228211	UPITTS	AE	228500	LANDIS	AE	1	Base Case	operation	154.0	57.5	64.24	DC	10.37
756750	228312	PEDRKTWN	AE	228313	BRIDGPRT	AE	1	AE_P1-2 CHUR-ORCH	operation	552.0	99.46	100.12	DC	7.7
756222	228502	MNOTLA 1	AE	228500	LANDIS	AE	1	Base Case	operation	230.0	132.26	136.01	DC	10.18
756289	228503	MNOTLA 2	AE	228502	MNOTLA 1	AE	1	Base Case	operation	311.0	97.97	100.7	DC	10.17

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.

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
756731	219110	GLOUCSTR	PSE&G	219755	CUTHBERT_4	PSE&G	1	Base Case	single	550.0	99.97	100.3	DC	1.81

Bus #	Bus	MW Impact
213400	COVANTA DELA	1.13

Bus #	Bus	MW Impact
219124	CAMDEN_STG	2.17
219126	CAMDEN_CTG	2.67
219128	GLOUCSTR_26	1.18
219229	EAGLEPT_G3	1.88
219230	EAGLEPT_G1	2.78
219231	EAGLEPT_G2	2.78
227801	ONTC&DCT	2.41
227881	GRENWCHG	0.03
228304	LOGAN	4.3
228306	PCLP STM	1.13
228307	PCLP GT	1.13
228309	CCLP NUG	3.93
228334	MANNMILG	0.13
228343	QUINTN#1	0.03
228351	V2-046C	0.11
228400	MICK 1CT	0.9
228423	Q-090 2	17.64
228471	VALERO1	0.31
228472	VALERO2	0.21
228473	VALERO3	0.21
228484	VALERO4	0.18
228720	V2-035C	0.01
291995	U4-036 C	0.05
292104	V1-030 C6	0.02
292194	V1-030 CE	0.07
903963	W3-175	5.84
905143	W4-016	34.41
914231	Y2-081 C OP1	0.89
914232	Y2-081 E OP1	0.05
915591	Y3-087 C OP1	0.04
917381	Z2-062	0.1
917471	Z2-083	1.66
918891	AA1-108	2.49
924051	AB2-049 C	0.28
924531	AB2-102 C	15.94
924701	AB2-122 C	0.04
925391	AC1-010 C	0.48
931191	AB1-169A	45.89
936411	AD2-052 C	0.67
936491	AD2-064 C	0.04
936501	AD2-065 C	0.13
937011	AD2-135 C	0.04
938301	AE1-045 C	0.17
938311	AE1-046 C	0.17
938421	AE1-061 C	0.22
938431	AE1-062 C	0.3
938781	AE1-104 C O1	9.18
938871	AE1-115 C	1.06
939301	AE1-161 C	1.81
939501	AE1-179 C O1	2.83
939821	AE1-218 C O1	0.07
939831	AE1-219 C O1	0.16

Bus #	Bus	MW Impact
939931	AE1-229 C O1	8.66
940001	AE1-240 C O1	2.35
BAYOU	BAYOU	0.25
BIG_CAJUN1	BIG_CAJUN1	0.38
BIG_CAJUN2	BIG_CAJUN2	0.76
BLUEG	BLUEG	1.22
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.07
CARR	CARR	0.26
CATAWBA	CATAWBA	0.08
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
CHOCTAW	CHOCTAW	0.25
COFFEEN	COFFEEN	0.13
COTTONWOOD	COTTONWOOD	0.98
DEARBORN	DEARBORN	0.22
DUCKCREEK	DUCKCREEK	0.28
EDWARDS	EDWARDS	0.13
ELMERSMITH	ELMERSMITH	0.13
FARMERCITY	FARMERCITY	0.08
GIBSON	GIBSON	0.05
HAMLET	HAMLET	0.25
NEWTON	NEWTON	0.34
PRAIRIE	PRAIRIE	0.62
RENSSELAER	RENSSELAER	0.21
SANTEETLA	SANTEETLA	0.03
SMITHLAND	SMITHLAND	0.05
TATANKA	TATANKA	0.15
TILTON	TILTON	0.15
TRIMBLE	TRIMBLE	0.14
TVA	TVA	0.41
UNIONPOWER	UNIONPOWER	0.18

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
756642	228211	UPITTS	AE	228500	LANDIS	AE	1	AE_P1-2 MICK-BRIDG	single	205.0	84.15	86.05	DC	3.88

Bus #	Bus	MW Impact
228304	LOGAN	4.5
228306	PCLP STM	1.24
228307	PCLP GT	1.24
228309	CCLP NUG	4.94
228334	MANNMILG	0.09
228343	QUINTN#1	0.02
228351	V2-046C	0.07

Bus #	Bus	MW Impact
228720	V2-035C	0.07
903963	W3-175	7.63
918891	AA1-108	3.25
936411	AD2-052 C	0.52
938421	AE1-061 C	0.75
938871	AE1-115 C	0.97
939301	AE1-161 C	3.88
939931	AE1-229 C O1	37.77
BAYOU	BAYOU	0.09
BIG_CAJUN1	BIG_CAJUN1	0.13
BIG_CAJUN2	BIG_CAJUN2	0.27
BLUEG	BLUEG	0.42
CALDERWOOD	CALDERWOOD	0.04
CANNELTON	CANNELTON	0.03
CARR	CARR	0.06
CATAWBA	CATAWBA	0.03
CHEOAH	CHEOAH	0.04
CHILHOWEE	CHILHOWEE	0.01
CHOCTAW	CHOCTAW	0.09
COFFEEN	COFFEEN	0.04
COTTONWOOD	COTTONWOOD	0.34
DEARBORN	DEARBORN	0.07
DUCKCREEK	DUCKCREEK	0.1
EDWARDS	EDWARDS	0.04
ELMERSMITH	ELMERSMITH	0.04
FARMERCITY	FARMERCITY	0.03
GIBSON	GIBSON	0.02
HAMLET	HAMLET	0.09
NEWTON	NEWTON	0.11
PRAIRIE	PRAIRIE	0.21
RENSSELAER	RENSSELAER	0.04
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.02
TATANKA	TATANKA	0.05
TILTON	TILTON	0.05
TRIMBLE	TRIMBLE	0.05
TVA	TVA	0.14
UNIONPOWER	UNIONPOWER	0.06

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
756059	213922	RICHMOND	PECO	214012	WANEETA3	PECO	1	PECO_P4_CHICH045/* $ DELCO $ PECO_P4_CHICH045 $ STBK	breaker	1180.0	99.82	100.33	DC	11.33

Bus #	Bus	MW Impact

Bus #	Bus	MW Impact
213918	RICHMD91	3.55
213919	RICHMD92	3.55
219124	CAMDEN_STG	3.52
219126	CAMDEN_CTG	4.33
219128	GLOUCSTR_26	1.91
219229	EAGLEPT_G3	3.14
219230	EAGLEPT_G1	4.65
219241	CAMDEN1	0.26
219242	CAMDEN2	0.03
227801	ONTC&DCT	7.23
227843	MARINGEN E	0.75
227928	V4-067E	0.3
228261	V4-054E	1.34
228357	V2-046E	3.05
228712	V2-041E	0.49
228721	V2-035E	0.28
291996	U4-036 E	1.01
292063	V1-021 E	0.06
292088	V1-030 CB	0.12
292099	V1-030 E3	0.23
292105	V1-030 E6	0.3
292115	V1-030 EB	1.32
292194	V1-030 CE	0.12
292195	V1-030 EE	1.22
292967	U2-045 E	3.26
293404	V3-036	1.03
902092	W1-130E	1.35
902432	W2-030 E	1.16
902692	W2-056 E	1.63
902842	W2-071E	0.45
903152	W2-102 E	1.03
903991	W3-080C	1.96
903992	W3-080E	3.2
904042	V4-005 E	0.43
904432	W3-124 E	0.42
905143	W4-016	67.01
905232	W4-029 E	0.44
905532	W4-063 E	0.81
905792	W4-103 E	1.03
907382	X1-070 E	0.73
907392	X1-071 E	0.26
909032	X2-013 E	0.63
910862	X3-075 E	1.06
913242	Y1-057 E	0.32
913332	Y1-075 E	0.41
915022	Y3-012 E	1.4
915072	Y3-026 E	1.6
915592	Y3-087 E OP1	0.8
916292	Z1-082 E	0.34
917381	Z2-062	0.16
918852	AA1-104 E	5.7
924051	AB2-049 C	0.86

Bus #	Bus	MW Impact
924052	AB2-049 E	1.41
924531	AB2-102 C	43.28
924532	AB2-102 E	0.96
924701	AB2-122 C	0.13
924702	AB2-122 E	0.22
925391	AC1-010 C	0.78
925392	AC1-010 E	1.34
925442	AC1-016 E	1.41
925452	AC1-017 E	0.67
925562	AC1-030 E	0.51
930002	AB1-001 E	0.27
930102	AB1-025 E	1.0
930242	AB1-063 E	0.14
930722	AB1-116 E	0.18
930732	AB1-119 E	0.16
931191	AB1-169A	119.2
932361	AC2-050 C O1	0.89
932362	AC2-050 E O1	1.45
933962	AD1-019 E	1.42
936211	AD2-027 C	1.4
936212	AD2-027 E	2.28
936321	AD2-042 C	1.84
936322	AD2-042 E	3.02
936411	AD2-052 C	1.54
936412	AD2-052 E	0.76
936491	AD2-064 C	0.12
936492	AD2-064 E	0.16
936501	AD2-065 C	0.5
936502	AD2-065 E	0.69
936541	AD2-069 C	0.52
936542	AD2-069 E	0.26
937011	AD2-135 C	0.13
937012	AD2-135 E	0.23
938301	AE1-045 C	0.43
938302	AE1-045 E	0.22
938311	AE1-046 C	0.43
938312	AE1-046 E	0.22
938421	AE1-061 C	0.58
938422	AE1-061 E	0.58
938431	AE1-062 C	1.2
938432	AE1-062 E	1.2
938611	AE1-083 C	0.51
938612	AE1-083 E	0.71
938781	AE1-104 C O1	26.49
938782	AE1-104 E O1	67.76
938871	AE1-115 C	1.26
938872	AE1-115 E	1.26
939301	AE1-161 C	2.4
939302	AE1-161 E	3.6
939501	AE1-179 C O1	7.31
939502	AE1-179 E O1	5.16
939821	AE1-218 C O1	0.19

Bus #	Bus	MW Impact
939822	AE1-218 E O1	0.28
939831	AE1-219 C O1	0.42
939832	AE1-219 E O1	0.6
939931	AE1-229 C O1	20.36
939932	AE1-229 E O1	13.79
940001	AE1-240 C O1	6.06
940002	AE1-240 E O1	4.32
BAYOU	BAYOU	1.46
BIG_CAJUN1	BIG_CAJUN1	2.24
BIG_CAJUN2	BIG_CAJUN2	4.51
BLUEG	BLUEG	6.97
CALDERWOOD	CALDERWOOD	0.76
CANNELTON	CANNELTON	0.42
CATAWBA	CATAWBA	0.48
CBM-N	CBM-N	0.79
CHEOAH	CHEOAH	0.69
CHILHOWEE	CHILHOWEE	0.25
CHOCTAW	CHOCTAW	1.49
COFFEEN	COFFEEN	0.74
COTTONWOOD	COTTONWOOD	5.78
DEARBORN	DEARBORN	1.22
DUCKCREEK	DUCKCREEK	1.6
EDWARDS	EDWARDS	0.73
ELMERSMITH	ELMERSMITH	0.73
FARMERCITY	FARMERCITY	0.49
G-007A	G-007A	12.41
GIBSON	GIBSON	0.29
HAMLET	HAMLET	1.59
NEWTON	NEWTON	1.92
NYISO	NYISO	3.41
O-066A	O-066A	3.17
PRAIRIE	PRAIRIE	3.59
SANTEETLA	SANTEETLA	0.2
SMITHLAND	SMITHLAND	0.29
TATANKA	TATANKA	0.88
TILTON	TILTON	0.88
TRIMBLE	TRIMBLE	0.77
TVA	TVA	2.43
UNIONPOWER	UNIONPOWER	1.08
VFT	VFT	22.21

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
755888	228312	PEDRKTWN	AE	228313	BRIDGPRT	AE	1	AE_P4-2 AE47	breaker	552.0	101.52	102.2	DC	7.89

Bus #	Bus	MW Impact

Bus #	Bus	MW Impact
228200	CARL#1CT	0.89
228201	CARL#2CT	0.95
228251	CARLLS#4	0.1
228260	V4-054C	0.25
228261	V4-054E	1.34
228306	PCLP STM	7.49
228307	PCLP GT	7.48
228309	CCLP NUG	26.0
228334	MANNMILG	0.49
228343	QUINTN#1	0.12
228351	V2-046C	0.36
228357	V2-046E	4.36
228712	V2-041E	0.26
228720	V2-035C	0.04
228721	V2-035E	0.4
902092	W1-130E	0.82
903963	W3-175	38.64
918891	AA1-108	16.46
924531	AB2-102 C	21.32
924532	AB2-102 E	0.47
931191	AB1-169A	72.23
936411	AD2-052 C	2.63
936412	AD2-052 E	1.29
938301	AE1-045 C	0.26
938302	AE1-045 E	0.13
938311	AE1-046 C	0.26
938312	AE1-046 E	0.13
938421	AE1-061 C	0.35
938422	AE1-061 E	0.35
938871	AE1-115 C	5.0
938872	AE1-115 E	5.0
939301	AE1-161 C	1.67
939302	AE1-161 E	2.51
939501	AE1-179 C O1	5.26
939502	AE1-179 E O1	3.71
939931	AE1-229 C O1	40.4
939932	AE1-229 E O1	27.37
940001	AE1-240 C O1	4.52
940002	AE1-240 E O1	3.22
BAYOU	BAYOU	0.39
BIG_CAJUN1	BIG_CAJUN1	0.6
BIG_CAJUN2	BIG_CAJUN2	1.22
BLUEG	BLUEG	1.87
CALDERWOOD	CALDERWOOD	0.2
CANNELTON	CANNELTON	0.11
CARR	CARR	0.12
CATAWBA	CATAWBA	0.13
CHEOAH	CHEOAH	0.19
CHILHOWEE	CHILHOWEE	0.07
CHOCTAW	CHOCTAW	0.4
COFFEEN	COFFEEN	0.2
COTTONWOOD	COTTONWOOD	1.56

Bus #	Bus	MW Impact
DEARBORN	DEARBORN	0.33
DUCKCREEK	DUCKCREEK	0.43
EDWARDS	EDWARDS	0.2
ELMERSMITH	ELMERSMITH	0.2
FARMERCITY	FARMERCITY	0.13
G-007	G-007	0.12
GIBSON	GIBSON	0.08
HAMLET	HAMLET	0.43
NEWTON	NEWTON	0.52
O-066	O-066	1.01
PRAIRIE	PRAIRIE	0.97
RENSSELAER	RENSSELAER	0.09
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.08
TATANKA	TATANKA	0.24
TILTON	TILTON	0.24
TRIMBLE	TRIMBLE	0.21
TVA	TVA	0.65
UNIONPOWER	UNIONPOWER	0.29

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
757298	228402	MONROE	AE	219100	NEWFRDM	PSE&G	1	PS_P7-1_V2274+P2242_LT	tower	804.0	105.3	106.85	DC	22.04

Bus #	Bus	MW Impact
219229	EAGLEPT_G3	3.84
219230	EAGLEPT_G1	5.68
219231	EAGLEPT_G2	5.68
227801	ONTC&DCT	4.46
227843	MARINGEN E	0.46
228261	V4-054E	1.48
228357	V2-046E	3.92
228400	MICK 1CT	2.61
228423	Q-090 2	49.81
228471	VALERO1	0.88
228472	VALERO2	0.61
228473	VALERO3	0.61
228484	VALERO4	0.52
228712	V2-041E	0.41
228720	V2-035C	0.05
228721	V2-035E	0.48
291995	U4-036 C	0.12
291996	U4-036 E	1.32
292063	V1-021 E	0.04
292104	V1-030 C6	0.04
292105	V1-030 E6	0.38

Bus #	Bus	MW Impact
292967	U2-045 E	2.01
293404	V3-036	0.64
902091	W1-130C	0.21
902092	W1-130E	2.23
902432	W2-030 E	0.69
905143	W4-016	97.12
905532	W4-063 E	0.5
909032	X2-013 E	0.83
915022	Y3-012 E	0.87
917471	Z2-083	4.69
918852	AA1-104 E	8.27
924051	AB2-049 C	0.69
924052	AB2-049 E	1.13
924531	AB2-102 C	32.0
924532	AB2-102 E	0.71
930002	AB1-001 E	0.17
930722	AB1-116 E	0.21
930732	AB1-119 E	0.1
931191	AB1-169A	196.86
933962	AD1-019 E	0.88
936411	AD2-052 C	1.83
936412	AD2-052 E	0.9
936491	AD2-064 C	0.07
936492	AD2-064 E	0.1
938301	AE1-045 C	0.72
938302	AE1-045 E	0.36
938311	AE1-046 C	0.72
938312	AE1-046 E	0.36
938421	AE1-061 C	0.96
938422	AE1-061 E	1.8
938781	AE1-104 C O1	17.79
938782	AE1-104 E O1	45.51
938871	AE1-115 C	1.54
938872	AE1-115 E	1.54
939301	AE1-161 C	8.82
939302	AE1-161 E	13.22
939501	AE1-179 C O1	7.57
939502	AE1-179 E O1	5.34
939821	AE1-218 C O1	0.3
939822	AE1-218 E O1	0.45
939831	AE1-219 C O1	0.68
939832	AE1-219 E O1	0.98
939931	AE1-229 C O1	30.48
939932	AE1-229 E O1	20.65
940001	AE1-240 C O1	6.23
940002	AE1-240 E O1	4.45
BAYOU	BAYOU	0.58
BIG_CAJUN1	BIG_CAJUN1	0.89
BIG_CAJUN2	BIG_CAJUN2	1.79
BLUEG	BLUEG	2.79
CALDERWOOD	CALDERWOOD	0.3
CANNELTON	CANNELTON	0.17

Bus #	Bus	MW Impact
CARR	CARR	0.42
CATAWBA	CATAWBA	0.19
CHEOAH	CHEOAH	0.27
CHILHOWEE	CHILHOWEE	0.1
CHOCTAW	CHOCTAW	0.59
COFFEEN	COFFEEN	0.29
COTTONWOOD	COTTONWOOD	2.29
DEARBORN	DEARBORN	0.49
DUCKCREEK	DUCKCREEK	0.64
EDWARDS	EDWARDS	0.29
ELMERSMITH	ELMERSMITH	0.29
FARMERCITY	FARMERCITY	0.19
G-007	G-007	1.48
GIBSON	GIBSON	0.12
HAMLET	HAMLET	0.62
NEWTON	NEWTON	0.77
O-066	O-066	5.0
PRAIRIE	PRAIRIE	1.43
RENSSELAER	RENSSELAER	0.33
SANTEETLA	SANTEETLA	0.08
SMITHLAND	SMITHLAND	0.11
TATANKA	TATANKA	0.35
TILTON	TILTON	0.35
TRIMBLE	TRIMBLE	0.31
TVA	TVA	0.96
UNIONPOWER	UNIONPOWER	0.43

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
756203	227901	DOROTHY	AE	227949	LEWIS #3	AE	1	Base Case	single	154.0	173.26	175.91	DC	4.07

Bus #	Bus	MW Impact
228720	V2-035C	0.02
902091	W1-130C	0.21
931191	AB1-169A	205.14
938301	AE1-045 C	0.75
938311	AE1-046 C	0.75
938421	AE1-061 C	1.84
939301	AE1-161 C	4.07
939931	AE1-229 C O1	8.45
CARR	CARR	0.03
CBM-S1	CBM-S1	0.1
CBM-S2	CBM-S2	0.05
CBM-W1	CBM-W1	0.17
CBM-W2	CBM-W2	0.71
CIN	CIN	0.07

Bus #	Bus	MW Impact
CPLE	CPLE	0.02
IPL	IPL	0.05
LGEE	LGEE	0.02
MEC	MEC	0.13
MECS	MECS	0.1
RENSSELAER	RENSSELAER	0.02
WEC	WEC	0.02

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
756223	228502	MNOTLA 1	AE	228500	LANDIS	AE	1	Base Case	single	230.0	124.11	125.88	DC	4.07

Bus #	Bus	MW Impact
227801	ONTC&DCT	4.74
227842	MARINGEN	0.07
227927	V4-067C	0.01
228014	PVILLEG	0.08
292062	V1-021 C	0.02
292966	U2-045 C	0.05
902091	W1-130C	0.37
902431	W2-030 C	0.07
905531	W4-063 C	0.01
913341	Y1-077	7.07
924701	AB2-122 C	0.07
930001	AB1-001 C	0.02
931191	AB1-169A	344.85
938301	AE1-045 C	1.25
938311	AE1-046 C	1.25
938421	AE1-061 C	3.16
938781	AE1-104 C O1	14.38
939301	AE1-161 C	4.07
BAYOU	BAYOU	0.03
BIG_CAJUN1	BIG_CAJUN1	0.05
BIG_CAJUN2	BIG_CAJUN2	0.1
BLUEG	BLUEG	0.16
CALDERWOOD	CALDERWOOD	0.02
CANNELTON	CANNELTON	0.01
CATAWBA	CATAWBA	0.01
CBM-N	CBM-N	0.06
CHEOAH	CHEOAH	0.02
CHILHOWEE	CHILHOWEE	0.01
CHOCTAW	CHOCTAW	0.03
COFFEEN	COFFEEN	0.02
COTTONWOOD	COTTONWOOD	0.13
DEARBORN	DEARBORN	0.03
DUCKCREEK	DUCKCREEK	0.04

Bus #	Bus	MW Impact
EDWARDS	EDWARDS	0.02
ELMERSMITH	ELMERSMITH	0.02
FARMERCITY	FARMERCITY	0.01
G-007A	G-007A	1.02
GIBSON	GIBSON	0.01
HAMLET	HAMLET	0.04
NEWTON	NEWTON	0.04
NYISO	NYISO	0.26
O-066A	O-066A	0.15
PRAIRIE	PRAIRIE	0.08
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.02
TILTON	TILTON	0.02
TRIMBLE	TRIMBLE	0.02
TVA	TVA	0.06
UNIONPOWER	UNIONPOWER	0.03
VFT	VFT	0.87

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
756286	228503	MNOTLA 2	AE	228502	MNOTLA 1	AE	1	AE_P1-2 CARD-CEDAR	single	311.0	106.95	108.23	DC	3.97

Bus #	Bus	MW Impact
227801	ONTC&DCT	5.19
227842	MARINGEN	0.08
227927	V4-067C	0.02
228014	PVILLEG	0.08
228202	CUMB CT	0.51
228203	P06	0.53
228711	V2-041C	0.01
292062	V1-021 C	0.03
292966	U2-045 C	0.05
902431	W2-030 C	0.07
905531	W4-063 C	0.01
913341	Y1-077	7.8
924531	AB2-102 C	11.83
924701	AB2-122 C	0.08
930001	AB1-001 C	0.02
931191	AB1-169A	348.68
938301	AE1-045 C	1.27
938311	AE1-046 C	1.27
938421	AE1-061 C	1.8
938781	AE1-104 C O1	15.87

Bus #	Bus	MW Impact
939301	AE1-161 C	3.97
BAYOU	BAYOU	0.03
BIG_CAJUN1	BIG_CAJUN1	0.05
BIG_CAJUN2	BIG_CAJUN2	0.1
BLUEG	BLUEG	0.16
CALDERWOOD	CALDERWOOD	0.02
CANNELTON	CANNELTON	0.01
CARR	CARR	0.01
CATAWBA	CATAWBA	0.01
CHEOAH	CHEOAH	0.02
CHILHOWEE	CHILHOWEE	0.01
CHOCTAW	CHOCTAW	0.03
COFFEEN	COFFEEN	0.02
COTTONWOOD	COTTONWOOD	0.13
DEARBORN	DEARBORN	0.03
DUCKCREEK	DUCKCREEK	0.04
EDWARDS	EDWARDS	0.02
ELMERSMITH	ELMERSMITH	0.02
FARMERCITY	FARMERCITY	0.01
G-007A	G-007A	0.22
GIBSON	GIBSON	0.01
HAMLET	HAMLET	0.04
NEWTON	NEWTON	0.04
PRAIRIE	PRAIRIE	0.08
RENSSELAER	RENSSELAER	0.0
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.02
TILTON	TILTON	0.02
TRIMBLE	TRIMBLE	0.02
TVA	TVA	0.05
UNIONPOWER	UNIONPOWER	0.02

Contingency Name	Contingency Definition
AE_P1-2 CHUR-ORCH	CONTINGENCY 'AE_P1-2 CHUR-ORCH' / PJM FIXED OPEN LINE FROM BUS 228002 TO BUS 228310 CIRCUIT 1 / END
AE_P1-2 MICK-BRIDG	CONTINGENCY 'AE_P1-2 MICK-BRIDG' OPEN LINE FROM BUS 228313 TO BUS 228401 CIRCUIT 1 / END

Contingency Name	Contingency Definition
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_P1-1Y1-077	CONTINGENCY 'AE_P1-1Y1-077' DISCONNECT BUS 913341 // 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 DISCONNECT BUS 219760 /* EAGLE POINT SECTION 4 TRIP LINE FROM BUS 219110 TO BUS 219128 CKT 1 /* DISCONNECT TRANSFORMER 26KV CKT 1 CLOSE LINE FROM BUS 219255 TO BUS 219256 CKT Z /* DEPTFORD CLOSE LINE FROM BUS 219180 TO BUS 219181 CKT Z /* DEPTFORD 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
PECO_P2-2_CHI230B1/* $ DELCO $ PECO_P2-2_CHI230B1 $ B	CONTINGENCY 'PECO_P2-2_CHI230B1/* $ DELCO $ PECO_P2-2_CHI230B1 $ B' DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $ PECO_P2-2_CHI230B1 $ B 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
PECO_P4_CHICH045/* $ DELCO $ PECO_P4_CHICH045 $ STBK	CONTINGENCY 'PECO_P4_CHICH045/* $ DELCO $ PECO_P4_CHICH045 $ STBK' DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $ PECO_P4_CHICH045 $ STBK DISCONNECT BUS 213627 /* FOULK8 230.00 $ DELCO $ PECO_P4_CHICH045 $ STBK END
AE_P1-2 OY CK-CEDAR	CONTINGENCY 'AE_P1-2 OY CK-CEDAR' OPEN LINE FROM BUS 206302 TO BUS 227955 CIRCUIT 1 / END
AE_P1-2 CARD-CEDAR	CONTINGENCY 'AE_P1-2 CARD-CEDAR' OPEN LINE FROM BUS 227900 TO BUS 227955 CIRCUIT 1 / END

Contingency Name	Contingency Definition
Base Case	
AE_P7-1 W2275_O2241	CONTINGENCY 'AE_P7-1 W2275_O2241' /* DOUBLE CIRCUIT TOWER W-2275(MICKLETON - DEPTFORD) AND O-2241(MICKLETON - THOROFARE) TRIP BRANCH FROM BUS 219762 TO BUS 228401 CKT 1 /* TRIP O-2241(MICKLETON - THOROFARE) 230KV TRIP BRANCH FROM BUS 219121 TO BUS 228401 CKT 1 /* TRIP (MICKLETON - THOROFARE #2) 230KV END