Generation Interconnection
Feasibility Study Report
Queue Position AE1-107

The Interconnection Customer (IC) has proposed a 53.1 MW Energy (31.0 MW Capacity) solar generating facility to be located at Latitude: 39.5377000, Longitude: -75.7526000 in New Castle County, Delaware. PJM studied the AE1-107 project as an injection into the Delmarva Power & Light Company (DPL) transmission system as a tap of the Mt. Pleasant (PSSE # 232104) to Lums Pond (PSSE # 231129) 138 kV circuit 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 September 30, 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 AE1-107 project. As a result, the AE1-107 project will connect with the DPL transmission system at a new 138 kV three-breaker ring bus substation to be constructed adjacent to the Mt. Pleasant-Lums Pond 138 kV circuit.

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Build a new 138 kV substation with a 3-position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of existing DPL Line 13842. The other position will be a terminal configured for the interconnection of the AE1-107 generation.

Estimate: $6,100,000
Construction Time: 32-48 months

Major Equipment Included in Estimate:

- Control Enclosure, 47' x 16' Qty. 1
- Power Circuit Breaker, 138 kV, 2000A, 40kA, 3 cycle Qty. 3
- Line Switch, 138 kV, 2000A, Manual, Arcing horns Qty. 3
- Disconnect Switch, 138 kV, 2000A, Manual Wormgear, Arcing Horns Qty. 6
- CT/VT Combination Units, 138 kV Qty. 3
- CVT, 138 kV Qty. 6
- Disconnect Switch Stand, High, 138 kV, Steel Qty. 8
- CT/VT Stand, Single Phase, High, 138 kV, Steel Qty. 3
- CVT Stand, Single Phase, High, 138 kV, Steel Qty. 6
- SSVT, 138 kV/240-120 V Qty. 2
- Relay Panel, Transmission Line, FL/BU (20") Qty. 3

- Control Panel, 138 kV Circuit Breaker (20”) Qty. 3
- Take-off structure, 138 kV Qty. 3
- Bus Support Structure, 3 phase, 138 kV, Steel Qty. 8
- 138 kV 4” Sch40 Aluminum Bus Lot

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

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.

New protection relays are required for the new line terminals. Frontline and Backup line protection will be required. A 20” relay panel will be required for each transmission line (2 total).

A breaker control relay on a 20” breaker control panel will be required for the control and operation of each new 138 kV circuit breaker (3 total).

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 138 kV substation.

Metering

Three phase 138 kV revenue metering points will need to be established. DPL 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 DPL’s metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL 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. DPL will provide both the Primary and the Backup meters. DPL’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. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The IC 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 DPL requires directly to PJM. The IC will grant permission for PJM to send DPL 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 DPL 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 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 DPL'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.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

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

Special Operating Requirements

1. DPL 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 DPL.

2. DPL 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 DPL.

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)

None

Multiple Facility Contingency

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

ID	FROM	FROM	FROM	TO	TO BUS	TO	CKT	CONT NAME	Type	Rating	PRE	POST	AC|DC	MW

	BUS#	BUS	BUS AREA	BUS#		BUS AREA	ID			MVA	PROJECT LOADING %	PROJECT LOADING %		IMPACT
349953	231124	GLASGOW	DP&L	231130	CECIL138	DP&L	1	PECO_P4_PEACH215/* $ CHESCO $ PECO_P4_PEACH215 $ STBK	breaker	378.0	98.69	100.93	DC	8.46
349954	231124	GLASGOW	DP&L	231130	CECIL138	DP&L	1	PECO_P4_PEACH205/* $ CHESCO $ PECO_P4_PEACH205 $ STBK	breaker	378.0	96.57	98.81	DC	8.46

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
349757	231000	CLAY_230	DP&L	213750	LINWOOD	PECO	1	PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	breaker	804.0	128.82	129.37	DC	9.66
641025	231000	CLAY_230	DP&L	213750	LINWOOD	PECO	1	PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	breaker	804.0	128.82	129.37	DC	9.66
349777	231001	EDGEMR 5	DP&L	231000	CLAY_230	DP&L	1	PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	breaker	804.0	124.77	125.23	DC	8.07
351305	231205	DARLEY	DP&L	231211	NAAMANS	DP&L	1	DPL_P7_1_DBL_5NC	tower	136.0	100.2	101.17	DC	2.9
351260	231215	SILVERSD	DP&L	231205	DARLEY	DP&L	1	DPL_P7_1_DBL_5NC	tower	175.0	109.57	110.33	DC	2.91

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
351260	5	**SILVERSD 69.0 kV - DARLEY 69.0 kV Ckt 1**	**DP&L** Description : To mitigate the (DP&L) Darley-Silverside 69 kV line (from bus 231205 to bus 231215 ckt 1) overload, it will require increasing the emergency rating of the Darley to Silverside 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. It will also require substation reinforcements at Darley & Silverside Substation. Time Estimate : 24-48 Months Cost : $3,300,000	$3,300,000

ID	Index	Facility	Upgrade Description	Cost
349953,349954	1	**GLASGOW 138.0 kV - CECIL138 138.0 kV Ckt 1**	**DP&L** Description : To mitigate the (DPL) Glasgow – Cecil 138 kV line (from bus 231124 to bus 231130 ckt 1) overload, it will require increasing the emergency rating of the Glasgow to Cecil 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 Glasgow. Time Estimate : 36-60 Months Cost : $5,000,000	$5,000,000
641025,349757	2	**CLAY_230 230.0 kV - LINWOOD 230.0 kV Ckt 1**	**DP&L** Description : To mitigate the (DP&L - PECO) CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) overload will require terminal upgrades at both the Claymont and Linwood Substations. Time Estimate : 12.0 Months Cost : $800,000 **PECO** Description : Replace Linwood CB 225 with a double breaker to eliminate the contingency. Time Estimate : 36.0 Months Cost : $1,400,000	$2,200,000
351305	4	**DARLEY 69.0 kV - NAAMANS 69.0 kV Ckt 1**	**DP&L** Description : To mitigate the (DP&L) Darley-Naamans Road 69 kV line (from bus 231205 to bus 231211 ckt 1) overload, it will require increasing the emergency rating of the Darley to Naamans Road 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. It will also require substation reinforcements at Naamans Road Substation. Time Estimate : 24-48 Months Cost : $1,500,000	$1,500,000
349777	3	**EDGEMR 5 230.0 kV - CLAY_230 230.0 kV Ckt 1**	**DP&L** Description : To mitigate the (DP&L - DP&L) EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) overload will require terminal upgrades at both the Edgemore and Claymont Substations. Time Estimate : 12.0 Months Cost : $800,000	$800,000
			TOTAL COST	**$12,800,000**

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
350813	231000	CLAY_230	DP&L	213750	LINWOOD	PECO	1	PECO_P1-2_220-85/* $ DELCO $ 220-85 $ LC	operation	804.0	119.65	120.21	DC	9.69
641926	231000	CLAY_230	DP&L	213750	LINWOOD	PECO	1	PECO_P1-2_220-85/* $ DELCO $ 220-85 $ LC	operation	804.0	119.65	120.21	DC	9.69
350817	231001	EDGEMR 5	DP&L	213750	LINWOOD	PECO	1	PECO_P1-2_220-84	operation	804.0	117.98	118.51	DC	9.27
350825	231001	EDGEMR 5	DP&L	231000	CLAY_230	DP&L	1	PECO_P1-2_220-85/* $ DELCO $ 220-85 $ LC	operation	804.0	117.21	117.67	DC	8.1
641946	231001	EDGEMR 5	DP&L	213750	LINWOOD	PECO	1	PECO_P1-2_220-84	operation	804.0	117.98	118.51	DC	9.27
350985	231124	GLASGOW	DP&L	231130	CECIL138	DP&L	1	PECO_P1-2_5014/* $ CHESCO $ PECO_P1-2_5014 $ L	operation	378.0	96.54	98.78	DC	8.46

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AE1-107 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AE1-107 project. PJM shall work with DPL to identify these retirement costs and any additional expenses.

DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AE1-107 project.

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
349953	231124	GLASGOW	DP&L	231130	CECIL138	DP&L	1	PECO_P4_PEACH215/* $ CHESCO $ PECO_P4_PEACH215 $ STBK	breaker	378.0	98.69	100.93	DC	8.46

Bus #	Bus	MW Impact
231131	BLOOM ENRGY	0.39
231708	CHRIST3	1.11
231902	DC CT7	1.04
231906	DC3 NUG	1.21
231907	DC10	0.3
231915	DC CT6	0.93
901004	W1-003 E	0.43
901014	W1-004 E	0.43
901024	W1-005 E	0.43
901034	W1-006 E	0.43
904210	V4-022 C	0.18
904212	V4-022 E	0.29
907052	X1-032 E	0.38
909411	X2-083	0.05
910572	X3-008 E	1.23
910821	X3-066 C	0.04
910822	X3-066 E	0.46
913361	Y1-079 C	0.07
913362	Y1-079 E	0.71
913412	Y1-080 E	0.2
915542	Y3-058 E	0.89
917082	Z2-012 E	1.17

Bus #	Bus	MW Impact
917432	Z2-076 E	0.19
917442	Z2-077 E	0.19
917581	Z2-097 C	0.07
917582	Z2-097 E	0.19
919831	AA2-069	39.1
923921	AB2-032 C	1.75
923922	AB2-032 E	0.82
923951	AB2-036 C	3.97
923952	AB2-036 E	6.49
923961	AB2-037 C	7.46
923962	AB2-037 E	12.19
924191	AB2-063 C	0.94
924192	AB2-063 E	1.53
924362	AB2-084 E	0.59
924681	AB2-120 C	3.59
924682	AB2-120 E	5.85
924781	AB2-130 C O1	3.06
924782	AB2-130 E O1	5.0
924801	AB2-133 C O1	3.21
924802	AB2-133 E O1	4.07
924821	AB2-135 C	3.69
924822	AB2-135 E	4.2
924831	AB2-136 C	2.44
924832	AB2-136 E	2.58
924971	AB2-153 C	0.98
924972	AB2-153 E	1.59
925092	AB2-166 E	0.33
925111	AB2-168 C	0.85
925112	AB2-168 E	1.17
925151	AB2-172 C	1.89
925152	AB2-172 E	3.08
925251	AB2-179 C	6.18
925252	AB2-179 E	2.04
925261	AB2-180 C	1.33
925262	AB2-180 E	0.57
925271	AB2-185 C	1.61
925272	AB2-185 E	0.69
925731	AC1-049 C	0.14
925732	AC1-049 E	0.23
926131	AC1-091 C	0.65
926132	AC1-091 E	1.07
926141	AC1-092 C	0.65
926142	AC1-092 E	1.07
926151	AC1-093 C	0.62
926152	AC1-093 E	1.02
926161	AC1-094 C	0.52
926162	AC1-094 E	0.86
926171	AC1-095 C	0.33
926172	AC1-095 E	0.53
926911	AC1-177	0.38
927031	AC1-190 C	3.47
927032	AC1-190 E	1.49

Bus #	Bus	MW Impact
927191	AC1-213 C	0.3
927192	AC1-213 E	0.2
927321	AC1-229 C	0.35
927322	AC1-229 E	0.57
930202	AB1-056 E O1	17.04
930881	AB1-137 C	0.39
930882	AB1-137 E	0.17
930921	AB1-141 C	1.73
930922	AB1-141 E	0.81
930931	AB1-142 C	1.73
930932	AB1-142 E	0.81
931111	AB1-162 C	0.78
931112	AB1-162 E	1.27
931261	AB1-176 C	0.42
931262	AB1-176 E	0.69
932082	AC2-018 E1	1.93
932092	AC2-018 E2	1.93
932161	AC2-023 C	2.53
932162	AC2-023 E	1.85
933631	AC2-185 C	1.32
933632	AC2-185 E	2.16
933641	AC2-186 C	1.82
933642	AC2-186 E	2.97
935121	AD1-145	0.91
936351	AD2-045 C O1	1.49
936352	AD2-045 E O1	0.96
936451	AD2-059 C	0.03
936452	AD2-059 E	0.1
936611	AD2-076 C O1	2.33
936612	AD2-076 E O1	3.8
936691	AD2-088 C O1	1.71
936692	AD2-088 E O1	1.14
937281	AD2-167	3.87
938251	AE1-038 C O1	0.73
938252	AE1-038 E O1	1.01
938651	AE1-087 C	0.84
938652	AE1-087 E	0.21
938811	AE1-107 C	4.94
938812	AE1-107 E	3.52
938891	AE1-117 C O1	4.47
938892	AE1-117 E O1	11.93
938901	AE1-118 C O1	4.47
938902	AE1-118 E O1	11.93
939151	AE1-145 C1	1.13
939152	AE1-145 C2	0.76
939153	AE1-145 E	0.02
939361	AE1-167 C O1	0.57
939362	AE1-167 E O1	0.47
939621	AE1-192 C O1	4.44
939622	AE1-192 E O1	2.17
BAYOU	BAYOU	0.75
BIG_CAJUN1	BIG_CAJUN1	1.16

Bus #	Bus	MW Impact
BIG_CAJUN2	BIG_CAJUN2	2.34
BLUEG	BLUEG	3.49
CALDERWOOD	CALDERWOOD	0.4
CANNELTON	CANNELTON	0.21
CATAWBA	CATAWBA	0.26
CBM-N	CBM-N	0.6
CHEOAH	CHEOAH	0.36
CHILHOWEE	CHILHOWEE	0.13
CHOCTAW	CHOCTAW	0.78
COFFEEN	COFFEEN	0.37
COTTONWOOD	COTTONWOOD	2.99
DEARBORN	DEARBORN	0.58
DUCKCREEK	DUCKCREEK	0.8
EDWARDS	EDWARDS	0.36
ELMERSMITH	ELMERSMITH	0.37
FARMERCITY	FARMERCITY	0.25
G-007A	G-007A	4.04
GIBSON	GIBSON	0.14
HAMLET	HAMLET	0.89
NEWTON	NEWTON	0.96
NYISO	NYISO	2.59
O-066A	O-066A	1.5
PRAIRIE	PRAIRIE	1.82
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.15
TATANKA	TATANKA	0.44
TILTON	TILTON	0.44
TRIMBLE	TRIMBLE	0.39
TVA	TVA	1.26
UNIONPOWER	UNIONPOWER	0.56
VFT	VFT	9.2

Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
641025	231000	CLAY_230	DP&L	213750	LINWOOD	PECO	1	PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	breaker	804.0	128.82	129.37	DC	9.66

Bus #	Bus	MW Impact
231505	HR4	14.07
231708	CHRIST3	3.58
231900	EM5	34.23
231901	EM4	9.56
231908	HR1	6.87
231909	HR2	7.0
231910	HR3	6.87
231916	EM3	4.81
231917	EM10	0.8

Bus #	Bus	MW Impact
901004	W1-003 E	0.68
901014	W1-004 E	0.68
901024	W1-005 E	0.68
901034	W1-006 E	0.68
904210	V4-022 C	0.29
904212	V4-022 E	0.47
907052	X1-032 E	0.6
910572	X3-008 E	1.94
910822	X3-066 E	0.62
913362	Y1-079 E	1.02
913412	Y1-080 E	0.32
915542	Y3-058 E	1.41
917082	Z2-012 E	1.87
917432	Z2-076 E	0.3
917442	Z2-077 E	0.3
917582	Z2-097 E	0.24
919831	AA2-069	60.64
923921	AB2-032 C	2.27
923922	AB2-032 E	1.07
923951	AB2-036 C	5.75
923952	AB2-036 E	9.41
923961	AB2-037 C	12.65
923962	AB2-037 E	20.66
924191	AB2-063 C	1.26
924192	AB2-063 E	2.05
924362	AB2-084 E	0.94
924681	AB2-120 C	5.72
924682	AB2-120 E	9.33
924781	AB2-130 C O1	4.84
924782	AB2-130 E O1	7.9
924801	AB2-133 C O1	4.09
924802	AB2-133 E O1	5.19
924821	AB2-135 C	4.83
924822	AB2-135 E	5.51
924831	AB2-136 C	3.85
924832	AB2-136 E	4.08
924971	AB2-153 C	1.27
924972	AB2-153 E	2.07
925092	AB2-166 E	0.53
925111	AB2-168 C	0.71
925112	AB2-168 E	0.97
925151	AB2-172 C	2.97
925152	AB2-172 E	4.84
925251	AB2-179 C	6.63
925252	AB2-179 E	2.19
925261	AB2-180 C	2.12
925262	AB2-180 E	0.91
925271	AB2-185 C	2.3
925272	AB2-185 E	0.99
925731	AC1-049 C	0.22
925732	AC1-049 E	0.36
926131	AC1-091 C	0.99

Bus #	Bus	MW Impact
926132	AC1-091 E	1.63
926141	AC1-092 C	0.99
926142	AC1-092 E	1.63
926151	AC1-093 C	0.94
926152	AC1-093 E	1.55
926161	AC1-094 C	0.79
926162	AC1-094 E	1.31
926171	AC1-095 C	0.5
926172	AC1-095 E	0.81
926911	AC1-177	0.61
927031	AC1-190 C	5.46
927032	AC1-190 E	2.34
927191	AC1-213 C	0.48
927192	AC1-213 E	0.32
927321	AC1-229 C	0.56
927322	AC1-229 E	0.9
930202	AB1-056 E O1	27.0
930881	AB1-137 C	0.62
930882	AB1-137 E	0.27
930921	AB1-141 C	2.26
930922	AB1-141 E	1.05
930931	AB1-142 C	2.26
930932	AB1-142 E	1.05
931111	AB1-162 C	1.05
931112	AB1-162 E	1.71
931261	AB1-176 C	0.56
931262	AB1-176 E	0.93
932161	AC2-023 C	4.03
932162	AC2-023 E	2.94
933631	AC2-185 C	2.01
933632	AC2-185 E	3.28
933641	AC2-186 C	2.77
933642	AC2-186 E	4.52
935121	AD1-145	1.43
936351	AD2-045 C O1	2.02
936352	AD2-045 E O1	1.29
936451	AD2-059 C	0.06
936452	AD2-059 E	0.18
936611	AD2-076 C O1	3.1
936612	AD2-076 E O1	5.06
936691	AD2-088 C O1	2.7
936692	AD2-088 E O1	1.8
938251	AE1-038 C O1	1.13
938252	AE1-038 E O1	1.56
938651	AE1-087 C	1.32
938652	AE1-087 E	0.33
938811	AE1-107 C	5.64
938812	AE1-107 E	4.02
938891	AE1-117 C O1	7.09
938892	AE1-117 E O1	18.9
938901	AE1-118 C O1	7.09
938902	AE1-118 E O1	18.9

Bus #	Bus	MW Impact
939151	AE1-145 C1	1.81
939152	AE1-145 C2	1.2
939153	AE1-145 E	0.03
939361	AE1-167 C O1	0.9
939362	AE1-167 E O1	0.75
939621	AE1-192 C O1	7.08
939622	AE1-192 E O1	3.46
BAYOU	BAYOU	0.04
BIG_CAJUN1	BIG_CAJUN1	0.06
BIG_CAJUN2	BIG_CAJUN2	0.13
BLUEG	BLUEG	0.33
CALDERWOOD	CALDERWOOD	0.02
CANNELTON	CANNELTON	0.02
CARR	CARR	0.61
CBM-S2	CBM-S2	0.01
CHEOAH	CHEOAH	0.01
CHILHOWEE	CHILHOWEE	0.01
CHOCTAW	CHOCTAW	0.04
COFFEEN	COFFEEN	0.03
COTTONWOOD	COTTONWOOD	0.17
CPLE	CPLE	0.02
DEARBORN	DEARBORN	0.09
DUCKCREEK	DUCKCREEK	0.08
EDWARDS	EDWARDS	0.04
ELMERSMITH	ELMERSMITH	0.03
FARMERCITY	FARMERCITY	0.02
G-007	G-007	2.2
GIBSON	GIBSON	0.01
NEWTON	NEWTON	0.09
O-066	O-066	7.53
PRAIRIE	PRAIRIE	0.15
RENSSELAER	RENSSELAER	0.48
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.04
TILTON	TILTON	0.04
TRIMBLE	TRIMBLE	0.04
TVA	TVA	0.07
UNIONPOWER	UNIONPOWER	0.03

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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
349777	231001	EDGEMR 5	DP&L	231000	CLAY_230	DP&L	1	PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	breaker	804.0	124.77	125.23	DC	8.07

Bus #	Bus	MW Impact
231505	HR4	14.05

Bus #	Bus	MW Impact
231708	CHRIST3	2.72
231900	EM5	34.17
231901	EM4	7.2
231908	HR1	5.18
231910	HR3	5.18
231919	CHRIST1	0.87
231920	CHRIST2	0.87
901004	W1-003 E	0.61
901014	W1-004 E	0.61
901024	W1-005 E	0.61
901034	W1-006 E	0.61
904210	V4-022 C	0.26
904212	V4-022 E	0.42
907052	X1-032 E	0.54
909411	X2-083	0.09
910572	X3-008 E	1.72
910822	X3-066 E	0.54
913362	Y1-079 E	0.9
913412	Y1-080 E	0.29
915542	Y3-058 E	1.26
917082	Z2-012 E	1.67
917432	Z2-076 E	0.27
917442	Z2-077 E	0.27
917582	Z2-097 E	0.21
919831	AA2-069	54.01
923921	AB2-032 C	1.98
923922	AB2-032 E	0.93
923951	AB2-036 C	5.08
923952	AB2-036 E	8.31
923961	AB2-037 C	11.33
923962	AB2-037 E	18.51
924191	AB2-063 C	1.1
924192	AB2-063 E	1.8
924362	AB2-084 E	0.84
924681	AB2-120 C	5.1
924682	AB2-120 E	8.32
924781	AB2-130 C O1	4.32
924782	AB2-130 E O1	7.04
924801	AB2-133 C O1	3.56
924802	AB2-133 E O1	4.51
924821	AB2-135 C	4.21
924822	AB2-135 E	4.81
924831	AB2-136 C	3.43
924832	AB2-136 E	3.63
924971	AB2-153 C	1.11
924972	AB2-153 E	1.81
925092	AB2-166 E	0.47
925111	AB2-168 C	0.59
925112	AB2-168 E	0.8
925151	AB2-172 C	2.64
925152	AB2-172 E	4.31
925251	AB2-179 C	5.63

Bus #	Bus	MW Impact
925252	AB2-179 E	1.86
925261	AB2-180 C	1.89
925262	AB2-180 E	0.81
925271	AB2-185 C	2.03
925272	AB2-185 E	0.87
925731	AC1-049 C	0.2
925732	AC1-049 E	0.32
926131	AC1-091 C	0.88
926132	AC1-091 E	1.45
926141	AC1-092 C	0.88
926142	AC1-092 E	1.45
926151	AC1-093 C	0.83
926152	AC1-093 E	1.37
926161	AC1-094 C	0.7
926162	AC1-094 E	1.16
926171	AC1-095 C	0.45
926172	AC1-095 E	0.72
926911	AC1-177	0.54
927031	AC1-190 C	4.86
927032	AC1-190 E	2.08
927191	AC1-213 C	0.43
927192	AC1-213 E	0.28
927321	AC1-229 C	0.5
927322	AC1-229 E	0.8
930202	AB1-056 E O1	24.07
930881	AB1-137 C	0.55
930882	AB1-137 E	0.24
930921	AB1-141 C	1.97
930922	AB1-141 E	0.92
930931	AB1-142 C	1.97
930932	AB1-142 E	0.92
931111	AB1-162 C	0.92
931112	AB1-162 E	1.5
931261	AB1-176 C	0.49
931262	AB1-176 E	0.81
932161	AC2-023 C	3.6
932162	AC2-023 E	2.62
933631	AC2-185 C	1.79
933632	AC2-185 E	2.91
933641	AC2-186 C	2.46
933642	AC2-186 E	4.01
935121	AD1-145	1.27
936351	AD2-045 C O1	1.77
936352	AD2-045 E O1	1.13
936451	AD2-059 C	0.05
936452	AD2-059 E	0.15
936611	AD2-076 C O1	2.71
936612	AD2-076 E O1	4.42
936691	AD2-088 C O1	2.41
936692	AD2-088 E O1	1.6
938251	AE1-038 C O1	1.01
938252	AE1-038 E O1	1.39

Bus #	Bus	MW Impact
938651	AE1-087 C	1.18
938652	AE1-087 E	0.29
938811	AE1-107 C	4.71
938812	AE1-107 E	3.36
938891	AE1-117 C O1	6.32
938892	AE1-117 E O1	16.85
938901	AE1-118 C O1	6.32
938902	AE1-118 E O1	16.85
939151	AE1-145 C1	1.61
939152	AE1-145 C2	1.07
939153	AE1-145 E	0.03
939361	AE1-167 C O1	0.81
939362	AE1-167 E O1	0.67
939621	AE1-192 C O1	6.31
939622	AE1-192 E O1	3.09
BAYOU	BAYOU	0.03
BIG_CAJUN1	BIG_CAJUN1	0.04
BIG_CAJUN2	BIG_CAJUN2	0.07
BLUEG	BLUEG	0.23
CALDERWOOD	CALDERWOOD	0.01
CANNELTON	CANNELTON	0.01
CARR	CARR	0.54
CBM-S2	CBM-S2	0.03
CHEOAH	CHEOAH	0.01
CHILHOWEE	CHILHOWEE	0.0
CHOCTAW	CHOCTAW	0.02
COFFEEN	COFFEEN	0.02
COTTONWOOD	COTTONWOOD	0.1
CPLE	CPLE	0.02
DEARBORN	DEARBORN	0.07
DUCKCREEK	DUCKCREEK	0.06
EDWARDS	EDWARDS	0.03
ELMERSMITH	ELMERSMITH	0.02
FARMERCITY	FARMERCITY	0.01
G-007	G-007	1.95
GIBSON	GIBSON	0.01
NEWTON	NEWTON	0.06
O-066	O-066	6.68
PRAIRIE	PRAIRIE	0.1
RENSSELAER	RENSSELAER	0.43
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.03
TILTON	TILTON	0.03
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.04
UNIONPOWER	UNIONPOWER	0.01

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ID	FROM BUS#	FROM BUS	FROM BUS	TO BUS#	TO BUS	TO BUS	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT	POST PROJECT	AC|DC	MW IMPACT

			AREA			AREA					LOADING %	LOADING %		
351305	231205	DARLEY	DP&L	231211	NAAMANS	DP&L	1	DPL_P7_1_DBL_5NC	tower	136.0	100.2	101.17	DC	2.9

Bus #	Bus	MW Impact
231708	CHRIST3	1.29
231901	EM4	3.53
231908	HR1	2.53
231909	HR2	3.69
231910	HR3	2.53
231916	EM3	2.54
231917	EM10	0.42
231918	WEST 1	0.37
231919	CHRIST1	0.41
925111	AB2-168 C	0.22
925112	AB2-168 E	0.3
925251	AB2-179 C	1.92
925252	AB2-179 E	0.63
936451	AD2-059 C	0.02
936452	AD2-059 E	0.05
938811	AE1-107 C	1.69
938812	AE1-107 E	1.21
BAYOU	BAYOU	0.01
BIG_CAJUN1	BIG_CAJUN1	0.01
BIG_CAJUN2	BIG_CAJUN2	0.02
BLUEG	BLUEG	0.06
CALDERWOOD	CALDERWOOD	0.0
CANNELTON	CANNELTON	0.0
CARR	CARR	0.15
CBM-S2	CBM-S2	0.01
CHEOAH	CHEOAH	0.0
CHILHOWEE	CHILHOWEE	0.0
CHOCTAW	CHOCTAW	0.01
COFFEEN	COFFEEN	0.01
COTTONWOOD	COTTONWOOD	0.03
CPLE	CPLE	0.01
DEARBORN	DEARBORN	0.02
DUCKCREEK	DUCKCREEK	0.01
EDWARDS	EDWARDS	0.01
ELMERSMITH	ELMERSMITH	0.01
FARMERCITY	FARMERCITY	0.0
G-007	G-007	0.55
GIBSON	GIBSON	0.0
NEWTON	NEWTON	0.02
O-066	O-066	1.89
PRAIRIE	PRAIRIE	0.03
RENSSELAER	RENSSELAER	0.12
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.0
TATANKA	TATANKA	0.01
TILTON	TILTON	0.01
TRIMBLE	TRIMBLE	0.01
TVA	TVA	0.01
UNIONPOWER	UNIONPOWER	0.0

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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
351260	231215	SILVERSD	DP&L	231205	DARLEY	DP&L	1	DPL_P7_1_DBL_5NC	tower	175.0	109.57	110.33	DC	2.91

Bus #	Bus	MW Impact
231708	CHRIST3	1.3
231901	EM4	3.54
231908	HR1	2.54
231909	HR2	3.7
231910	HR3	2.54
231916	EM3	2.55
231917	EM10	0.42
231918	WEST 1	0.38
231919	CHRIST1	0.42
925111	AB2-168 C	0.22
925112	AB2-168 E	0.3
925251	AB2-179 C	1.93
925252	AB2-179 E	0.64
936451	AD2-059 C	0.02
936452	AD2-059 E	0.05
938811	AE1-107 C	1.7
938812	AE1-107 E	1.21
BAYOU	BAYOU	0.01
BIG_CAJUN1	BIG_CAJUN1	0.01
BIG_CAJUN2	BIG_CAJUN2	0.02
BLUEG	BLUEG	0.06
CALDERWOOD	CALDERWOOD	0.0
CANNELTON	CANNELTON	0.0
CARR	CARR	0.15
CBM-S2	CBM-S2	0.01
CHEOAH	CHEOAH	0.0
CHILHOWEE	CHILHOWEE	0.0
CHOCTAW	CHOCTAW	0.01
COFFEEN	COFFEEN	0.01
COTTONWOOD	COTTONWOOD	0.03
CPLE	CPLE	0.01
DEARBORN	DEARBORN	0.02
DUCKCREEK	DUCKCREEK	0.01
EDWARDS	EDWARDS	0.01
ELMERSMITH	ELMERSMITH	0.01
FARMERCITY	FARMERCITY	0.0
G-007	G-007	0.55
GIBSON	GIBSON	0.0
NEWTON	NEWTON	0.02
O-066	O-066	1.9
PRAIRIE	PRAIRIE	0.03
RENSSELAER	RENSSELAER	0.12
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.0

Bus #	Bus	MW Impact
TATANKA	TATANKA	0.01
TILTON	TILTON	0.01
TRIMBLE	TRIMBLE	0.01
TVA	TVA	0.01
UNIONPOWER	UNIONPOWER	0.0

Contingency Name	Contingency Definition
PECO_P1-2_220-84	CONTINGENCY 'PECO_P1-2_220-84' /* $ DELCO $ 220-84 $ LB TRIP BRANCH FROM BUS 213750 TO BUS 231000 CKT 1 /* LINWOOD 230.00 CLAY_230 230.00 $ DELCO $ 220-84 $ L END
DPL_P7_1_DBL_5NC	CONTINGENCY 'DPL_P7_1_DBL_5NC' /* EDGE MOOR-CLAYMONT 230;EDGE MOOR-LINWOOD(PECO) 230 OPEN LINE FROM BUS 231001 TO BUS 231000 CKT 1 OPEN LINE FROM BUS 231001 TO BUS 213750 CKT 1 END
PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK	CONTINGENCY 'PECO_P4_LINWO225/* $ DELCO $ PECO_P4_LINWO225 $ STBK' TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00 EDGEMR5 230.00 $ DELCO $ PECO_P4_LINWO225 $ STBK DISCONNECT BUS 213892 /* PHLISL87 230.00 $ DELCO $ PECO_P4_LINWO225 $ STBK DISCONNECT BUS 213888 /* PHLISCT1 18.00 $ DELCO $ PECO_P4_LINWO225 $ STBK DISCONNECT BUS 213889 /* PHLISCT2 18.00 $ DELCO $ PECO_P4_LINWO225 $ STBK END
PECO_P4_PEACH215/* $ CHESCO $ PECO_P4_PEACH215 $ STBK	CONTINGENCY 'PECO_P4_PEACH215/* $ CHESCO $ PECO_P4_PEACH215 $ STBK' TRIP BRANCH FROM BUS 200065 TO BUS 200051 CKT 1 /* PCHBTM2S 500.00 ROCKSPGS 500.00 $ CHESCO $ PECO_P4_PEACH215 $ STBK REMOVE MACHINE 1 FROM BUS 200034 /* PCHBTM 2 22.00 $ CHESCO $ PECO_P4_PEACH215 $ STBK END
PECO_P1-2_220-85/* $ DELCO $ 220-85 $ LC	CONTINGENCY 'PECO_P1-2_220-85/* $ DELCO $ 220-85 $ LC' TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00 EDGEMR5 230.00 $ DELCO $ 220-85 $ L END
PECO_P4_PEACH205/* $ CHESCO $ PECO_P4_PEACH205 $ STBK	CONTINGENCY 'PECO_P4_PEACH205/* $ CHESCO $ PECO_P4_PEACH205 $ STBK' TRIP BRANCH FROM BUS 200065 TO BUS 200066 CKT 1 /* PCHBTM2S 500.00 PCHBTM1N 500.00 $ CHESCO $ PECO_P4_PEACH205 $ STBK TRIP BRANCH FROM BUS 200064 TO BUS 200065 CKT Z1 /* PCHBTM1S 500.00 PCHBTM2S 500.00 $ CHESCO $ PECO_P4_PEACH205 $ STBK TRIP BRANCH FROM BUS 200013 TO BUS 200066 CKT Z1 /* PCHBTM2N 500.00 PCHBTM1N 500.00 $ CHESCO $ PECO_P4_PEACH205 $ STBK TRIP BRANCH FROM BUS 200065 TO BUS 200051 CKT 1 /* PCHBTM2S 500.00 ROCKSPGS 500.00 $ CHESCO $ PECO_P4_PEACH205 $ STBK END

PECO_P1-2_5014/* $ CHESCO $ PECO_P1-2_5014 $ L	CONTINGENCY 'PECO_P1-2_5014/* $ CHESCO $ PECO_P1-2_5014 $ L' TRIP BRANCH FROM BUS 200065 TO BUS 200051 CKT 1 /* PCHBTM2S 500.00 ROCKSPGS 500.00 $ CHESCO $ PECO_P1-2_5014 $ L END