PJM Generator Interconnection

X3-102 Burches Hill - Possum Pt 500 kV

937MW Capacity / 971.2 MW Energy

Feasibility Study Report

May 2012
DMS #691244v1

Introduction

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

Preface

The intent of this Feasibility Study is to determine a plan, with preliminary cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by IC. As a requirement for interconnection, IC may be responsible for the cost of constructing Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM and the underlying system. All facilities required for interconnection of a generation interconnection project must be designed to meet ITO technical specifications.

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. IC is responsible for its right of way, real estate, and construction permit issues.

General

Queue project X3-102 was studied as a 971.2 MW (937.0 MW of which was Capacity) injection into the ITO system. Project X3-102 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Primary Option

The following contingencies resulted in overloads for the primary option:

Option 1 Impactful Contingencies	
Contingency Name	**File Description**
10PEPCO_S17_X2-030	CONTINGENCY '10PEPCO_S17_X2-030' DISCONNECT BRANCH FROM BUS 223988 TO BUS 223990 CKT 1 / MORGNTW230 – TALB068 DISCONNECT BRANCH FROM BUS 223990 TO BUS 223982 CKT 1 / TALB068 – OAKGV230 DISCONNECT BRANCH FROM BUS 223992 TO BUS 224078 CKT 1 / HAWK 076 230 - HAWK 69 DISCONNECT BRANCH FROM BUS 223990 TO BUS 290891 CKT 1 / TALB068 – S17TAP81230 DISCONNECT BRANCH FROM BUS 223988 TO BUS 909240 CKT 1 / MORGT230 – HAWK076 DISCONNECT BRANCH FROM BUS 909240 TO BUS 223992 CKT 1 END
12PEPCO_S17_X2-030	CONTINGENCY '12PEPCO_S17_X2-030' DISCONNECT BRANCH FROM BUS 223988 TO BUS 223991 CKT 1 / MORGNTW230 – TALB082 DISCONNECT BRANCH FROM BUS 223991 TO BUS 223982 CKT 1 / TALB068 – OAKGV230 DISCONNECT BRANCH FROM BUS 223993 TO BUS 224078 CKT 1 / HAWK077 – HAWK 69 DISCONNECT BRANCH FROM BUS 223991 TO BUS 290892 CKT 1 / TALB082 – S17TAP82230 DISCONNECT BRANCH FROM BUS 223988 TO BUS 909250 CKT 1 /MORGT230 – HAWK 077 DISCONNECT BRANCH FROM BUS 909250 TO BUS 223993 CKT 1 DISCONNECT BRANCH FROM BUS 223993 TO BUS 224124 CKT 1 / HAWK 077 – TALB 087 DISCONNECT BRANCH FROM BUS 224124 TO BUS 223982 CKT 1 / TALB 087 – OAKGV 230 END
250&258	CONTINGENCY '250&258' /* LN 250 & 258 OPEN BRANCH FROM BUS 314003 TO BUS 314041 CKT 1 /* 250 ARLINGTON - GLEBE OPEN BRANCH FROM BUS 314003 TO BUS 314041 CKT 2 /* 258 ARLINGTON - GLEBE END
265&2008	CONTINGENCY '265&2008' /* LN 265 & 2008 OPEN BRANCH FROM BUS 314022 TO BUS 314113 CKT 1 /* 265 CLIFTON - JOHNSON DP OPEN BRANCH FROM BUS 314113 TO BUS 314193 CKT 1 /* 265 JOHNSON DP - WALNEY OPEN BRANCH FROM BUS 314193 TO BUS 314084 CKT 1 /* 265 WALNEY - SULLY OPEN BRANCH FROM BUS 314061 TO BUS 314109 CKT 1 /* 2008 LOUDOUN - CUB RUN DP OPEN BRANCH FROM BUS 314109 TO BUS 314092 CKT 1 /* 2008 CUB RUN DP - WALNEY OPEN BRANCH FROM BUS 314092 TO BUS 314060 CKT 1 /* 2008 WALNEY TO SOUTH DULLES OPEN BRANCH FROM BUS 314060 TO BUS 314027 CKT 1 /* 2008 SOUTH DULLES - DULLES END
5PEPCO	CONTINGENCY '5PEPCO' /* CHALK230 TO BOWIE044 DISCONNECT BRANCH FROM BUS 223983 TO BUS 224600 CKT 1 /* OAKGV230 TO AQUASCO1 DISCONNECT BRANCH FROM BUS 224600 TO BUS 224060 CKT 1 /* AQUASCO1 TO BOWIE044. FEB. 17, 2009. DISCONNECT BRANCH FROM BUS 224060 TO BUS 223979 CKT 1 DISCONNECT BRANCH FROM BUS 223982 TO BUS 223977 CKT 1 DISCONNECT BRANCH FROM BUS 223977 TO BUS 223962 CKT 1 END
7PEPCO_A	CONTINGENCY '7PEPCO_A' /* BOWIE045 TO OAKGV23 DISCONNECT BRANCH FROM BUS 223978 TO BUS 223961 CKT 1 /* OAKGV05 TO CHALK230 DISCONNECT BRANCH FROM BUS 223982 TO BUS 223978 CKT 1 DISCONNECT BRANCH FROM BUS 224061 TO BUS 223980 CKT 1 DISCONNECT BRANCH FROM BUS 292454 TO BUS 224061 CKT 1 /BUS 223983 -> 292454 END

Option 1 Impactful Contingencies	
Contingency Name	**File Description**
8OX _8POSSUM _043	CONTINGENCY '8OX _8POSSUM _043' DISCONNECT BRANCH FROM BUS 314919 TO BUS 314922 CKT 1 /* 500/500KV, AREA 345/345. END

BG_CKT2344	CONTINGENCY 'BG_CKT2344' /* BRANDON TO RIVERSIDE CKT #2344
	  DISCONNECT BUS 220989 /*CKT 2344 BRANDON – HAWKINS-SOLLERS
	  DISCONNECT BUS 220990 /*CKT 2344 HAWKINS-SOLLERS-RIVERSIDE
	  DISCONNECT BUS 220977 /* RIVERSIDE 230-1 H/S AND 2339 TO NORTHEAST
	  DISCONNECT BUS 221230 /*RIVERSIDE 230-1 & L/S BUS CONNECTION
	END

HIRDG_BURTVL	CONTINGENCY 'HIRDG_BURTVL' /* HIGH RIDGE TO BURTONSVILLE CKTS #2314 & #2334
	  DISCONNECT BUS 220983 /* CKT #2314 HIGH RIDGE – BURTONSVILLE & SANDY SPRINGS 230-2
	  DISCONNECT BUS 220984 /* CKT #2334 HIGH RIDGE – BURTONSVILLE & SANDY SPRINGS 230-1
	END

PJM17	CONTINGENCY 'PJM17' DISCONNECT BRANCH FROM BUS 200004 TO BUS 200013 CKT 1 /* CNASTONE PEACHBTM 500 500 END
PJM76	CONTINGENCY 'PJM76' REMOVE MACHINE 1 FROM BUS 200034 /* PB2 END
PJM77	CONTINGENCY 'PJM77' REMOVE MACHINE 1 FROM BUS 200035 /* PB3 END
PP1EB	CONTINGENCY 'PP1EB' / NO PATH OPEN BRANCH FROM BUS 200101 TO BUS 235632 CKT 1 / 200003 BRIGHTON 500 200004 CNASTONE 500 1 END
PP31	CONTINGENCY 'PP31' OPEN BRANCH FROM BUS 223961 TO BUS 223978 CKT 1 / 223961 BURT2314 230 223978 BOWIE045 230 1 END
PP36	CONTINGENCY 'PP36' OPEN BRANCH FROM BUS 223962 TO BUS 223977 CKT 1 / 223962 BURT2334 230 223977 BOWIE042 230 1 END

PP47	CONTINGENCY 'PP47'
	  OPEN BRANCH FROM BUS 223982 TO BUS 223990 CKT 1 / 223982 OAKGV230 230 223990 TALB 068 230 1
	  OPEN BRANCH FROM BUS 290891 TO BUS 223990 CKT 1 / 290891 S17 230 223990 TALB 068 230 1 / S17.
	END

WCHPL_BRNDN	CONTINGENCY 'WCHPL_BRNDN' /* WAUGH CHAPEL TO BRANDON SHORES CKTS #2342 & #2343
	  DISCONNECT BRANCH FROM BUS 220955 TO BUS 220960 CKT 42 /* CKT #2342 W. CHAPEL TO BRANDON SHORES
	  DISCONNECT BRANCH FROM BUS 220955 TO BUS 220960 CKT 43 /* CKT #2343 W. CHAPEL TO BRANDON SHORES
	END

WELTONSP_KEMPTOWN	CONTINGENCY 'WELTONSP_KEMPTOWN' DISCONNECT BRANCH FROM BUS 235634 TO BUS 235636 CKT 1 END

Network Impacts:

Generator Deliverability

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

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
001	N-1	8OX_8POSSUM_043	DVP	Possum Point 500 kV-Possum Point 230 kV 500/230 kV transformer	314922	314074	1	DC	86.66	103.99	ER	969	168.09

Multiple Facility Contingency

(Double Circuit Tower Line Contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)

None identified.

Contribution to Previously Identified Overloads

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have % allocation of cost responsibility which will be calculated and reported for the Impact Study.)

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
002	N-1	PP1EB	BG&E	High Ridge 2316-Howard 2332 230 kV line	220941	220954	1	DC	132.09	133.11	ER	941	60
003	N-1	PP1EB	BG&E	Howard 2332-Granite 2326 & 2332 230 kV line	220954	220973	1	DC	112.65	113.73	ER	728	48.75
004	N-1	PJM17	PECO	Nottingham Reactor-Nottingham 230 kV line	213846	213844	1	DC	133.35	134.38	ER	627	40.19
005	N-1	PP1EB	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	147.45	149.03	ER	138	13.51
006	N-1	PP1EB	METED	Germantown-Germantown Reactor 138 kV line	204530	204531	1	DC	112.98	114.21	ER	104	7.9
007	DCTL	12PEPCO_S17_X2-030	PEPCO	Talbert 068-Oak Groove 230 kV line	223990	223982	1	DC	123.04	124.1	ER	691	45.27
008	Non	Non	PJM	EMORY GR500-Conastone 500 kV line	200101	200004	1	DC	103.87	104.92	NR	2338	152.05
009	N-1	PJM17	BG&E/PL	Conastone-Otter Creek Switchyard 230 kV line	220963	208048	1	DC	174.79	176.14	ER	531	45.12

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
010	N-1	PP1EB	BG&E	Sandy Spring 2314-High Ridge 2316 230 kV line	220983	220941	1	DC	117.31	118.14	ER	941	48.79
011	DCTL	WCHPL_BRNDN	BG&E	Pumphrey-Pumphrey 230/115 kV transformer	220974	221037	1	DC	105.13	106.06	ER	485	27.77
012	DCTL	7PEPCO_A	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	129.86	130.91	ER	730	47.96
013	N-1	PP31	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	117.57	118.51	ER	730	42.53
014	Non	Non	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	114.16	115.08	NR	608	34.6
015	DCTL	7PEPCO_A	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	143.92	145.4	ER	150	13.75
016	N-1	PP31	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	119.21	120.51	ER	150	12.1
017	Non	Non	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	103.56	104.73	NR	130	9.43
018	DCTL	10PEPCO_S17_X2-030	PEPCO	Talbert 082-Oak Groove 230 kV line	223991	223982	1	DC	112.75	113.94	ER	680	50.4
019	N-1	PP47	PEPCO	Talbert 082-Oak Groove 230 kV line	223991	223982	1	DC	105.82	112.9	ER	680	48.15
020	N-1	PJM17	BG&E/PL	Graceton-Safe Harbor Units 3-4 Tap 230 kV line	220964	208071	1	DC	135.7	136.98	ER	485	38.82
021	N-1	PJM17	BG&E/PECO	Graceton-Cooper 230 kV line	220964	214089	1	DC	184.41	185.75	ER	485	40.19
022	N-1	PP1EB	BG&E	Columbia-Howard 2312 230 kV line	221010	220953	1	DC	106.35	107.25	ER	941	52.9
023	DCTL	HIRDG_BURTVL	PEPCO/BG&E	Bowie 043-Bowiebc1 2341 230 kV line	223980	220956	1	DC	103.85	104.73	ER	721	39.45
024	N-1	PP1EB	BG&E	Howard 2312-Granite 2311 & 2312 230 kV line	220953	220972	1	DC	131.9	133.07	ER	728	52.9
025	DCTL	250&258	DVP	Ballston 239 kV-Clarendon 230 kV 3 230 kV line	314820	314120	1	DC	121.58	122.4	ER	240	12.08
026	DCTL	7PEPCO_A	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	129.26	130.2	ER	118	6.88
027	N-1	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	119.82	120.65	ER	118	6.05
028	DCTL	265&2008	DVP	Idylwood 230 kV 2-Clark 230 kV 230 kV line	314100	314021	1	DC	118.49	119.34	ER	478	25.01
029	N-1	PP1EB	METED	Germantown Reactor-Germantown 138/115 kV transformer	204531	204529	1	DC	112.98	114.21	ER	104	7.9
030	N-1	PJM17	PECO	Cooper-Peach Bottom 230 kV line	214089	213869	1	DC	181.93	183.27	ER	485	40.19
031	DCTL	7PEPCO_A	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	182.89	184.67	ER	125	13.75
032	N-1	PP31	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	154.06	155.62	ER	125	12.1

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
033	N-1	PP1EB	BG&E	Sandy Spring 2334-High Ridge 2316 230 kV line	220984	220941	1	DC	119.27	120.09	ER	941	48.06
034	DCTL	5PEPCO	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	130.97	132.03	ER	730	48.15
035	N-1	PP36	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	117.96	118.9	ER	730	42.45
036	Non	Non	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	114.71	115.63	NR	608	34.47
037	N-1	PJM17	PECO	Peach Bottom-Nottingham Reactor 230 kV line	213869	213846	1	DC	133.41	134.45	ER	627	40.19
038	N-1	PJM17	PL	Safe Harbor Units 3-4 Tap-Manor Substation 230 kV line	208071	208019	1	DC	141.01	142.06	ER	579	37.87
039	DCTL	5PEPCO	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	131.1	132.15	ER	730	48.15
040	N-1	PP36	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	118.08	119.02	ER	730	42.45
041	Non	Non	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	114.86	115.77	NR	608	34.47
042	N-1	BG_CKT2344	BG&E	Riverside 2317-Northeast 2315 & 2317 230 kV line	220966	220979	1	DC	110.47	111.38	ER	632	35.42
043	DCTL	7PEPCO_A	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	129.26	130.2	ER	118	6.88
044	N-1	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	119.82	120.65	ER	118	6.05
045	N-1	PP1EB	BG&E	Granite 2311 & 2312-North West 2311 & 2310 230 kV line	220972	220962	1	DC	108.34	109.64	ER	621	49.99
046	DCTL	7PEPCO_A	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	130.11	131.15	ER	730	47.96
047	N-1	PP31	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	117.82	118.76	ER	730	42.53
048	Non	Non	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	114.46	115.38	NR	608	34.6
049	DCTL	HIRDG_BURTVL	PEPCO/BG&E	Bowie 044-Bowiebc0 2340 230 kV line	223979	220959	1	DC	106.41	107.31	ER	720	40.07
050	N-1	PJM77	PJM	Conastone-Peach Bottom 500 kV line	200004	200013	1	DC	150.61	151.34	ER	2815	161.65
051	DCTL	WCHPL_BRNDN	BG&E	Howard 2332-Pumphrey 230 kV line	220954	220974	1	DC	105.32	106.25	ER	485	27.77
052	N-1	PP1EB	BG&E	High Ridge 2316-Columbia 230 kV line	220941	221010	1	DC	121.15	122.05	ER	941	52.59
053	N-1	PJM77	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	144.8	145.39	ER	2901	136.11
054	Non	Non	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	162.43	163.14	NR	2338	136.11

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
055	N-1	WELTONSP_ KEMPTOWN	DVP	Loudoun 500 kV-Brambleton 500 kV 500 kV line	314913	314933	1	DC	102.16	102.79	ER	2323	96.92

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
056	Op	PP1EB	BG&E	High Ridge 2316-Howard 2332 230 kV line	220941	220954	1	DC	122.32	122.89	ER	941	62.39
057	Op	PP1EB	BG&E	Howard 2332-Granite 2326 & 2332 230 kV line	220954	220973	1	DC	100.9	102.02	ER	728	50.69
058	Op	PJM17	PECO	Nottingham Reactor-Nottingham 230 kV line	213846	213844	1	DC	120.13	121.17	ER	627	41.79
059	Op	PP1EB	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	164.82	165.47	ER	138	14.04
060	Non	Non	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	122.59	123.89	NR	124	9.99
061	Op	PP1EB	METED	Germantown-Germantown Reactor 138 kV line	204530	204531	1	DC	140.68	141.96	ER	104	8.22
062	Non	Non	PJM	EMORY GR500-Conastone 500 kV line	200101	200004	1	DC	102.49	103.39	NR	2338	158.1
063	Op	PJM17	BG&E/PL	Conastone-Otter Creek Switchyard 230 kV line	220963	208048	1	DC	156.27	157.7	ER	531	46.92
064	Op	PP1EB	BG&E	Sandy Spring 2314-High Ridge 2316 230 kV line	220983	220941	1	DC	118.5	119.37	ER	941	50.73
065	Op	PP31	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	117.34	118.31	ER	730	44.22
066	Non	Non	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	113.94	114.88	NR	608	35.97
067	Op	PP31	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	118.05	119.4	ER	150	12.59

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
068	Non	Non	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	102.44	103.66	NR	130	9.81
069	Op	PP47	PEPCO	Talbert 082-Oak Groove 230 kV line	223991	223982	1	DC	109.48	110.67	ER	680	50.07
070	Op	PJM17	BG&E/PL	Graceton-Safe Harbor Units 3-4 Tap 230 kV line	220964	208071	1	DC	131.51	132.47	ER	485	40.36
071	Non	Non	BG&E/PL	Graceton-Safe Harbor Units 3-4 Tap 230 kV line	220964	208071	1	DC	107.64	108.63	NR	379	23.25
072	Op	PJM17	BG&E/PECO	Graceton-Cooper 230 kV line	220964	214089	1	DC	147.13	147.83	ER	485	41.79
073	Op	PP1EB	BG&E	Howard 2312-Granite 2311 & 2312 230 kV line	220953	220972	1	DC	113.31	113.96	ER	728	55.01
074	Op	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	120.16	121.02	ER	118	6.29
075	Op	8OX_8POSSUM_043	DVP	Possum Point 500 kV-Possum Point 230 kV 500/230 kV transformer	314922	314074	1	DC	88.63	106.65	ER	969	174.79
076	Op	PP1EB	METED	Germantown Reactor-Germantown 138/115 kV transformer	204531	204529	1	DC	140.68	141.96	ER	104	8.22
077	Op	PJM17	PECO	Cooper-Peach Bottom 230 kV line	214089	213869	1	DC	145.1	145.8	ER	485	41.79
078	Op	PP31	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	157.91	159.54	ER	125	12.59
079	Op	PP1EB	BG&E	Sandy Spring 2334-High Ridge 2316 230 kV line	220984	220941	1	DC	120.41	121.27	ER	941	49.98
080	Op	PP36	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	117.73	118.7	ER	730	44.14
081	Non	Non	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	114.49	115.43	NR	608	35.85
082	Op	PJM17	PECO	Peach Bottom-Nottingham Reactor 230 kV line	213869	213846	1	DC	120.2	121.24	ER	627	41.79
083	Op	PJM17	PL	Safe Harbor Units 3-4 Tap-Manor Substation 230 kV line	208071	208019	1	DC	137.23	138.04	ER	579	39.38
084	Op	PP36	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	117.85	118.81	ER	730	44.14
085	Non	Non	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	114.64	115.58	NR	608	35.85
086	Op	BG_CKT2344	BG&E	Riverside 2317-Northeast 2315 & 2317 230 kV line	220966	220979	1	DC	114.65	115.59	ER	632	36.83
087	Op	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	120.16	121.02	ER	118	6.29
088	Op	PP31	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	117.59	118.56	ER	730	44.22
089	Non	Non	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	114.24	115.18	NR	608	35.97

X3-102 Opt. 1 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
090	Op	PP1EB	AP/PENELEC	Greene-Roxbury 138 kV line	235188	200532	1	DC	119.81	121.01	ER	189	14.04
091	Op	PJM76	PJM	Conastone-Peach Bottom 500 kV line	200004	200013	1	DC	133.49	134.24	ER	2815	168.09
092	Op	PP1EB	BG&E	High Ridge 2316-Columbia 230 kV line	220941	221010	1	DC	110.93	111.87	ER	941	54.69
093	Op	PJM77	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	132.54	133.09	ER	2901	141.53
094	Non	Non	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	147.2	147.88	NR	2338	141.53
095	Op	WELTONSP_KEMPTOWN	DVP	Loudoun 500 kV-Brambleton 500 kV 500 kV line	314913	314933	1	DC	105.81	106.5	ER	2323	100.78
096	Op	PJM17	PL	Millwood Transformer #1-South Akron Transformer 3 230 kV line	208030	208079	1	DC	110.25	111.07	ER	588	29.82

Short Circuit

(Report Overdutied breakers here)

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With x3-102_DOM_opt1	Duty Percent Without x3-102_DOM_opt1	Duty Percent Difference	Note
314922	POSSUM POINT 500.kV	H1T560	S	105.00%	99.10%	5.90%	New Over-duty
314922	POSSUM POINT 500.kV	H1T568	S	105.00%	98.20%	6.80%	New Over-duty
314922	POSSUM POINT 500.kV	568T571	S	101.30%	94.60%	6.70%	New Over-duty
14900	BRISTERS 500.kV	H1T539	S	100.80%	100.00%	0.80%	New Over-duty
14900	BRISTERS 500.kV	H1T545	S	100.80%	100.00%	0.80%	New Over-duty
314922	POSSUM POINT 500.kV	560T571	S	100.60%	99.10%	1.50%	New Over-duty
314061	LOUDOUN 230.kV	L152	S	100.40%	100.00%	0.40%	New Over-duty
314061	LOUDOUN 230.kV	L252	S	100.40%	100.00%	0.40%	New Over-duty
314918	NORTH ANNA 500.kV	G102-1	S	100.30%	99.80%	0.50%	New Over-duty
314918	NORTH ANNA 500.kV	G202	S	100.30%	99.80%	0.50%	New Over-duty
314918	NORTH ANNA 500.kV	H602	S	100.30%	99.80%	0.50%	New Over-duty
314918	NORTH ANNA 500.kV	WT576	S	100.30%	99.80%	0.50%	New Over-duty
314918	NORTH ANNA 500.kV	XT573	S	100.30%	99.80%	0.50%	New Over-duty
5955	W.CHAPEL 230.kV	230-1	T	100.00%	99.70%	0.30%	New Over-duty
5955	W.CHAPEL 230.kV	230-1/2342 T	T	100.00%	99.70%	0.30%	New Over-duty
5955	W.CHAPEL 230.kV	230-2	T	100.00%	99.70%	0.30%	New Over-duty
5955	W.CHAPEL 230.kV	230-2/2338 T	T	100.00%	99.70%	0.30%	New Over-duty
5955	W.CHAPEL 230.kV	230-3	T	100.00%	99.70%	0.30%	New Over-duty
5955	W.CHAPEL 230.kV	230-3/2343 T	T	100.00%	99.70%	0.30%	New Over-duty
314922	POSSUM POINT 500.kV	H1T560	S	116.40%	109.70%	6.70%	Over 100%, > 3% contribution
314922	POSSUM POINT 500.kV	H1T568	S	116.40%	109.70%	6.70%	Over 100%, > 3% contribution
314922	POSSUM POINT 500.kV	568T571	S	106.70%	100.00%	6.70%	New Overduty

The estimated cost to replace 2 overdutied 500 kV breakers H1T539 and H1T545 at Bristers substation with 50 kA breakers will be $650,000 per breaker and will take 14 months including equipment order time.

The estimated cost to replace 2 overdutied 230 kV breakers L152 and L252 at Loudoun substation with 63 kA breakers will be $205,000 per breaker and will take 12 months including equipment order time.

The estimated cost to replace 4 overdutied 500 kV breakers 560T571, 568T571, H1T560 and H1T568 at Possum Point substation with 50 kA breakers will be $650,000 per breaker and will take 16 months including equipment order time.

The estimated cost to replace 5 overdutied 500 kV breakers G102-1, G202, H602, WT576 and XT573 at North Anna substation with 63 kA breakers will be $685,000 per breaker and will take 17 months including equipment order time.

The estimated cost to replace one overdutied 500 kV breaker 568T571 at Possum Point substation with 50 kA breakers will be $650,000 per breaker and will take 14 months including equipment order time.

Secondary Option

The following contingencies resulted in overloads for the secondary option:

Option 2 Impactful Contingencies	
Contingency Name	**File Description**
10PEPCO_S17_X2-030	CONTINGENCY '10PEPCO_S17_X2-030' DISCONNECT BRANCH FROM BUS 223988 TO BUS 223990 CKT 1 / MORGNTW230 – TALB068 DISCONNECT BRANCH FROM BUS 223990 TO BUS 223982 CKT 1 / TALB068 – OAKGV230 DISCONNECT BRANCH FROM BUS 223992 TO BUS 224078 CKT 1 / HAWK 076 230 - HAWK 69 DISCONNECT BRANCH FROM BUS 223990 TO BUS 290891 CKT 1 / TALB068 – S17TAP81230 DISCONNECT BRANCH FROM BUS 223988 TO BUS 909240 CKT 1 / MORGT230 – HAWK076 DISCONNECT BRANCH FROM BUS 909240 TO BUS 223992 CKT 1 END
5PEPCO	CONTINGENCY '5PEPCO' /* CHALK230 TO BOWIE044 DISCONNECT BRANCH FROM BUS 223983 TO BUS 224600 CKT 1 /* OAKGV230 TO AQUASCO1 DISCONNECT BRANCH FROM BUS 224600 TO BUS 224060 CKT 1 /* AQUASCO1 TO BOWIE044. FEB. 17, 2009. DISCONNECT BRANCH FROM BUS 224060 TO BUS 223979 CKT 1 DISCONNECT BRANCH FROM BUS 223982 TO BUS 223977 CKT 1 DISCONNECT BRANCH FROM BUS 223977 TO BUS 223962 CKT 1 END
7PEPCO_A	CONTINGENCY '7PEPCO_A' /* BOWIE045 TO OAKGV23 DISCONNECT BRANCH FROM BUS 223978 TO BUS 223961 CKT 1 /* OAKGV05 TO CHALK230 DISCONNECT BRANCH FROM BUS 223982 TO BUS 223978 CKT 1 DISCONNECT BRANCH FROM BUS 224061 TO BUS 223980 CKT 1 DISCONNECT BRANCH FROM BUS 292454 TO BUS 224061 CKT 1 /BUS 223983 -> 292454 END
BG_CKT2344	CONTINGENCY 'BG_CKT2344' /* BRANDON TO RIVERSIDE CKT #2344 DISCONNECT BUS 220989 /*CKT 2344 BRANDON – HAWKINS-SOLLERS DISCONNECT BUS 220990 /*CKT 2344 HAWKINS-SOLLERS-RIVERSIDE DISCONNECT BUS 220977 /* RIVERSIDE 230-1 H/S AND 2339 TO NORTHEAST DISCONNECT BUS 221230 /*RIVERSIDE 230-1 & L/S BUS CONNECTION END

Option 2 Impactful Contingencies	
Contingency Name	**File Description**
BG_RIV230-2	CONTINGENCY 'BG_RIV230-2' /* RIVERSIDE 230-2 TRANSFORMER & CKT 2345 DISCONNECT BRANCH FROM BUS 220966 TO BUS 220988 CKT 1 /* CKT #2345 RIVERSIDE TO SOLLERS PT DISCONNECT BRANCH FROM BUS 220966 TO BUS 221231 CKT 1 /* RIVERSIDE 230-2 TRANSFORMER DISCONNECT BRANCH FROM BUS 221231 TO BUS 221147 CKT 1 /* RIVERSIDE 230-2 L/S BUS CONNECTION END
HIRDG_BURTVL	CONTINGENCY 'HIRDG_BURTVL' /* HIGH RIDGE TO BURTONSVILLE CKTS #2314 & #2334 DISCONNECT BUS 220983 /* CKT #2314 HIGH RIDGE – BURTONSVILLE & SANDY SPRINGS 230-2 DISCONNECT BUS 220984 /* CKT #2334 HIGH RIDGE – BURTONSVILLE & SANDY SPRINGS 230-1 END
PJM17_X3-068A	CONTINGENCY 'PJM17_X3-068A' DISCONNECT BRANCH FROM BUS 200004 TO BUS 911010 CKT 1 /* CNASTONE PEACHBTM 500 500 END
PJM17_X3-068B	CONTINGENCY 'PJM17_X3-068B' DISCONNECT BRANCH FROM BUS 911010 TO BUS 200013 CKT 1 /* CNASTONE PEACHBTM 500 500 END
PJM40	CONTINGENCY 'PJM40' DISCONNECT BRANCH FROM BUS 200013 TO BUS 200024 CKT 1 /* PEACHBTM LIMERICK 500 500 END
PJM67	CONTINGENCY 'PJM67' DISCONNECT BRANCH FROM BUS 200026 TO BUS 200004 CKT 1 /* HUNTERTN CNASTONE 500 500 END
PJM76	CONTINGENCY 'PJM76' REMOVE MACHINE 1 FROM BUS 200034 /* PB2 END
PJM77	CONTINGENCY 'PJM77' REMOVE MACHINE 1 FROM BUS 200035 /* PB3 END
PP1EB	CONTINGENCY 'PP1EB' / NO PATH OPEN BRANCH FROM BUS 200101 TO BUS 235632 CKT 1 / 200003 BRIGHTON 500 200004 CNASTONE 500 1 END
PP27	CONTINGENCY 'PP27' OPEN BRANCH FROM BUS 220983 TO BUS 223961 CKT 1 / 220983 SANDY14T 230 223961 BURT2314 230 1 END
PP28	CONTINGENCY 'PP28' OPEN BRANCH FROM BUS 220984 TO BUS 223962 CKT 1 / 220984 SANDY34T 230 223962 BURT2334 230 1 END
PP31	CONTINGENCY 'PP31' OPEN BRANCH FROM BUS 223961 TO BUS 223978 CKT 1 / 223961 BURT2314 230 223978 BOWIE045 230 1 END
PP36	CONTINGENCY 'PP36' OPEN BRANCH FROM BUS 223962 TO BUS 223977 CKT 1 / 223962 BURT2334 230 223977 BOWIE042 230 1 END
PP47	CONTINGENCY 'PP47' OPEN BRANCH FROM BUS 223982 TO BUS 223990 CKT 1 / 223982 OAKGV230 230 223990 TALB 068 230 1 OPEN BRANCH FROM BUS 290891 TO BUS 223990 CKT 1 / 290891 S17 230 223990 TALB 068 230 1 / S17. END
PP53_X3-102B	

Option 2 Impactful Contingencies	
Contingency Name	**File Description**
PP54_V3-017A	CONTINGENCY 'PP54_V3-017A' OPEN BRANCH FROM BUS 223982 TO BUS 224125 CKT 1 / 223982 OAKGV230 230 224125 TALB 066 230 1 OPEN BRANCH FROM BUS 223992 TO BUS 894610 CKT 1 / 223992 HAWK 076 230 224125 TALB 066 230 1 OPEN BRANCH FROM BUS 223992 TO BUS 224078 CKT 1 / 223992 HAWK 076 230 224078 HAWK 69 69.0 1 END
PP57	CONTINGENCY 'PP57' OPEN BRANCH FROM BUS 223986 TO BUS 223988 CKT 1 / 223986 SMRYCE72 230 223988 MORGT230 230 1 OPEN BRANCH FROM BUS 223986 TO BUS 224062 CKT 1 / 223986 SMRYCE72 230 224062 HEW2320W 230 1 DISCONNECT BUS 224062 END
PP58	CONTINGENCY 'PP58' OPEN BRANCH FROM BUS 223987 TO BUS 223988 CKT 1 / 223987 SMRYCE74 230 223988 MORGT230 230 1 OPEN BRANCH FROM BUS 223987 TO BUS 224063 CKT 1 / 223987 SMRYCE74 230 224063 HEW2320E 230 1 DISCONNECT BUS 224063 END
PP60_X2-030A	
PP85	CONTINGENCY 'PP85' OPEN BRANCH FROM BUS 224102 TO BUS 224104 CKT 1 / 224102 BENN T7 115 224104 TUX 504 115 1 END
WCHPL_BRNDN	CONTINGENCY 'WCHPL_BRNDN' /* WAUGH CHAPEL TO BRANDON SHORES CKTS #2342 & #2343 DISCONNECT BRANCH FROM BUS 220955 TO BUS 220960 CKT 42 /* CKT #2342 W. CHAPEL TO BRANDON SHORES DISCONNECT BRANCH FROM BUS 220955 TO BUS 220960 CKT 43 /* CKT #2343 W. CHAPEL TO BRANDON SHORES END

Network Impacts:

Generator Deliverability

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

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
001	N-1	PP53_X3-102B	PEPCO	X3-102 TAP-Hawkins Gate 077 230 kV line	911210	223993	1	DC	0.05	137.3	ER	680	934
002	N-1	PP58	PEPCO	Morgantown Bus-Semco Ryceville 072 230 kV line	223988	223986	1	DC	86.66	105.17	ER	691	127.89
003	N-1	PP53_X3-102B	PEPCO	X2-030 TAP-Morgantown Bus 230 kV line	909250	223988	1	DC	34.91	154.19	ER	691	824.28
004	N-1	PP47	PEPCO	Morgantown Bus-Talbert 082 230 kV line	223988	223991	1	DC	87.6	102.23	ER	692	101.4
005	N-1	PP1EB	PEPCO/BG &E	Burtonsville 2314-Sandy Spring 2314 230 kV line	223961	220983	1	DC	94.91	100.64	ER	1227	70.33
006	N-1	PP60_X2-030A	PEPCO	Talbert 087-Oak Groove 230 kV line	224124	223982	1	DC	60.72	198.08	ER	680	934
007	Non	Non	PEPCO	Talbert 087-Oak Groove 230 kV line	224124	223982	1	DC	71.67	159.86	NR	559	492.95

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
008	N-1	PP57	PEPCO	Morgantown Bus-Semco Ryceville 074 230 kV line	223988	223987	1	DC	86.78	105.32	ER	690	127.89
009	N-1	PP60_X2-030A	PEPCO	X3-102 TAP-Talbert 087 230 kV line	911210	224124	1	DC	60.79	198.15	ER	680	934
010	Non	Non	PEPCO	X3-102 TAP-Talbert 087 230 kV line	911210	224124	1	DC	71.76	159.94	NR	559	492.95
011	N-1	PP53_X3-102B	PEPCO	Hawkins Gate 077-Hawkins Gate 230/69 kV transformer	223993	224078	1	DC	62.62	102.51	ER	275	109.72

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)

None identified.

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.)

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
012	N-1	PP1EB	BG&E	High Ridge 2316-Howard 2332 230 kV line	220941	220954	1	DC	132.13	139.99	ER	941	74.02
013	N-1	PP1EB	BG&E	Howard 2332-Granite 2326 & 2332 230 kV line	220954	220973	1	DC	113.49	121.61	ER	728	59.15
014	N-1	PJM17_X3-068B	PECO	Nottingham Reactor-Nottingham 230 kV line	213846	213844	1	DC	123.6	124.72	ER	627	43.85
015	N-1	PP1EB	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	147.42	148.8	ER	138	11.81
016	N-1	PP1EB	METED	Germantown-Germantown Reactor 138 kV line	204530	204531	1	DC	112.98	114.04	ER	104	6.85
017	Non	Non	PJM	EMORY GR500-Conastone 500 kV line	200101	200004	1	DC	103.87	104.9	NR	2338	147.86
018	N-1	PJM17_X3-068B	BG&E/PL	Conastone-Otter Creek Switchyard 230 kV line	220963	208048	1	DC	184.2	185.68	ER	531	49.12
019	N-1	PP28	BG&E	Sandy Spring 2314-High Ridge 2316 230 kV line	220983	220941	1	DC	116.45	125.23	ER	941	82.65

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
020	DCTL	WCHPL_BRNDN	BG&E	Pumphrey-Pumphrey 230/115 kV transformer	220974	221037	1	DC	105.13	106.34	ER	485	36.37
021	DCTL	7PEPCO_A	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	129.87	151.25	ER	730	156.34
022	N-1	PP31	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	117.56	137.1	ER	730	142.59
023	Non	Non	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	114.15	133.23	NR	608	115.99
024	N-1	PJM17_X3-068B	BG&E/PL	Graceton-Safe Harbor Units 3-4 Tap 230 kV line	220964	208071	1	DC	113.93	115.38	ER	485	44.3
025	N-1	PJM17_X3-068B	BG&E/PECO	Graceton-Cooper 230 kV line	220964	214089	1	DC	171.83	173.29	ER	485	43.85
026	N-1	PP1EB	BG&E	Columbia-Howard 2312 230 kV line	221010	220953	1	DC	106.37	113.22	ER	941	64.64
027	N-1	PP54_V3-017A	PEPCO	V3-017 TAP-Talbert 068 230 kV line	894600	223990	1	DC	155.93	166.8	ER	691	75.11
028	Non	Non	PEPCO	V3-017 TAP-Talbert 068 230 kV line	894600	223990	1	DC	116.25	128.18	NR	608	72.53
029	DCTL	HIRDG_BURTVL	PEPCO/BG&E	Bowie 043-Bowiebc1 2341 230 kV line	223980	220956	1	DC	103.85	106.01	ER	721	96.66
030	N-1	PP1EB	BG&E	Howard 2312-Granite 2311 & 2312 230 kV line	220953	220972	1	DC	131.96	140.82	ER	728	64.64
031	DCTL	7PEPCO_A	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	129.25	132.27	ER	118	22.03
032	N-1	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	119.81	122.55	ER	118	19.98
033	Non	Non	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	114.47	116.83	NR	106	15.49
034	DCTL	7PEPCO_A	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	143.92	148.66	ER	150	44.05
035	N-1	PP31	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	119.2	123.5	ER	150	39.96
036	Non	Non	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	103.55	107.4	NR	130	30.97
037	N-1	PJM76	PJM	Conastone-X3-068 TAP 500 kV line	200004	911010	1	DC	148.77	153.09	ER	2815	168.62
038	N-1	PP1EB	METED	Germantown Reactor-Germantown 138/115 kV transformer	204531	204529	1	DC	112.98	114.04	ER	104	6.85
039	N-1	PJM17_X3-068B	PECO	Cooper-Peach Bottom 230 kV line	214089	213869	1	DC	169.34	170.8	ER	485	43.85
040	DCTL	7PEPCO_A	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	182.88	188.57	ER	125	44.05
041	N-1	PP31	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	154.06	159.22	ER	125	39.96

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
042	N-1	PP27	BG&E	Sandy Spring 2334-High Ridge 2316 230 kV line	220984	220941	1	DC	116.81	125.49	ER	941	81.68
043	DCTL	5PEPCO	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	131	152.51	ER	730	157.33
044	N-1	PP36	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	117.96	137.46	ER	730	142.35
045	Non	Non	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	114.71	133.73	NR	608	115.62
046	N-1	PP85	PEPCO	Benning T4-Tuxedo 503 115 kV line	224103	224105	1	DC	101.53	104.02	ER	180	27.73
047	N-1	PJM17_X3 -068B	PECO	Peach Bottom-Nottingham Reactor 230 kV line	213869	213846	1	DC	123.66	124.79	ER	627	43.85
048	N-1	PJM17_X3 -068B	PL	Safe Harbor Units 3-4 Tap-Manor Substation 230 kV line	208071	208019	1	DC	123.65	124.85	ER	579	43.36
049	N-1	BG_RIV23 0-2	BG&E	Brandon Shores-Hawkins Point 2344 230 kV line	220960	220989	1	DC	106.36	107.17	ER	1153	57.72
050	DCTL	5PEPCO	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	131.11	152.62	ER	730	157.33
051	N-1	PP36	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	118.07	137.57	ER	730	142.35
052	Non	Non	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	114.85	133.87	NR	608	115.62
053	N-1	BG_CKT23 44	BG&E	Riverside 2317-Northeast 2315 & 2317 230 kV line	220966	220979	1	DC	110.46	111.63	ER	632	45.79
054	DCTL	7PEPCO_A	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	129.25	132.27	ER	118	22.03
055	N-1	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	119.81	122.55	ER	118	19.98
056	Non	Non	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	114.47	116.83	NR	106	15.49
057	N-1	PP1EB	BG&E	Granite 2311 & 2312-North West 2311 & 2310 230 kV line	220972	220962	1	DC	108.39	118.14	ER	621	60.59
058	DCTL	7PEPCO_A	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	130.13	151.51	ER	730	156.34
059	N-1	PP31	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	117.82	137.35	ER	730	142.59
060	Non	Non	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	114.46	133.53	NR	608	115.99
061	N-1	BG_RIV23 0-2	BG&E	Sollers Point 2344-Riverside 2339 230 kV line	220990	220977	1	DC	122.98	123.88	ER	1036	57.72

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
062	DCTL	10PEPCO_S17_X2-030	PEPCO	V3-017 TAP-Talbert 066 230 kV line	894610	224125	1	DC	126.42	127.27	ER	680	40.78
063	N-1	PP47	PEPCO	V3-017 TAP-Talbert 066 230 kV line	894610	224125	1	DC	124.74	125.84	ER	680	46.25
064	DCTL	HIRDG_BURTVL	PEPCO/BG&E	Bowie 044-Bowiebc0 2340 230 kV line	223979	220959	1	DC	106.41	108.63	ER	720	99.04
065	N-1	PJM40	PJM	Peach Bottom-U2-74 TAP 500 kV line	200013	293025	1	DC	102.85	105.74	ER	2611	75.32
066	DCTL	WCHPL_BRNDN	BG&E	Howard 2332-Pumphrey 230 kV line	220954	220974	1	DC	105.32	106.53	ER	485	36.37
067	N-1	PP1EB	BG&E	High Ridge 2316-Columbia 230 kV line	220941	221010	1	DC	121.16	127.98	ER	941	64.27
068	DCTL	10PEPCO_S17_X2-030	PEPCO	Talbert 066-Oak Groove 230 kV line	224125	223982	1	DC	194.47	195.63	ER	680	55.68
069	N-1	PP47	PEPCO	Talbert 066-Oak Groove 230 kV line	224125	223982	1	DC	175.15	187.65	ER	680	84.99
070	Non	Non	PEPCO	Talbert 066-Oak Groove 230 kV line	224125	223982	1	DC	148.22	149.53	NR	559	45.45
071	N-1	PJM67	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	143.45	143.84	ER	2901	100.32
072	Non	Non	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	159.5	160.09	NR	2338	111
073	N-1	PJM17_X3-068B	PL	Millwood Transformer #1-South Akron Transformer 3 230 kV line	208030	208079	1	DC	111.1	111.98	ER	588	31.77
074	N-1	PJM76	PJM	X3-068 TAP-Peach Bottom 500 kV line	911010	200013	1	DC	156.18	160.53	ER	2815	168.62

Short Circuit

(Report over-dutied breakers.)

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With x3-102_DOM_opt2	Duty Percent Without x3-102_DOM_opt2	Duty Percent Difference	Note
14900	BRISTERS 500.kV	H1T539	S	100.00%	100.00%	0.00%	Newly over-duty
14900	BRISTERS 500.kV	H1T545	S	100.00%	100.00%	0.00%	Newly over-duty
314061	LOUDOUN 230.kV	L252	S	100.00%	100.00%	0.00%	Newly over-duty
223988	GSF 230 230.kV	WEST OCB	T	132.50%	127.70%	4.80%	Over 100%, > 3% contribution
223982	OAKGV 230 230.kV	ITE OCB	S	121.70%	116.30%	5.40%	Over 100%, > 3% contribution
5955	W.CHAPEL 230.kV	230-1	T	100.00%	99.70%	0.30%	Newly Over-duty
5955	W.CHAPEL 230.kV	230-1/2342 T	T	100.00%	99.70%	0.30%	Newly over-duty
5955	W.CHAPEL 230.kV	230-2	T	100.00%	99.70%	0.30%	Newly over-duty
5955	W.CHAPEL 230.kV	230-2/2338 T	T	100.00%	99.70%	0.30%	Newly over-duty
5955	W.CHAPEL 230.kV	230-3	T	100.00%	99.70%	0.30%	Newly over-duty
5955	W.CHAPEL 230.kV	230-3/2343 T	T	100.00%	99.70%	0.30%	Newly over-duty
314922	POSSUM POINT 500.kV	568T571	S	100.20%	100.00%	0.20%	Newly over-duty

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
075	Op	PP1EB	BG&E	High Ridge 2316-Howard 2332 230 kV line	220941	220954	1	DC	122.47	123.18	ER	941	76.97
076	Op	PP1EB	BG&E	Howard 2332-Granite 2326 & 2332 230 kV line	220954	220973	1	DC	100.95	102.31	ER	728	61.51
077	Op	PJM17_X3-068B	PECO	Nottingham Reactor-Nottingham 230 kV line	213846	213844	1	DC	119.32	120.46	ER	627	45.6

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
078	Op	PP1EB	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	164.65	165.21	ER	138	12.29
079	Non	Non	PENELEC	Roxbury-Roxbury 138/115 kV transformer	200532	200520	1	DC	122.54	123.71	NR	124	8.98
080	Op	PP1EB	METED	Germantown-Germantown Reactor 138 kV line	204530	204531	1	DC	140.68	141.79	ER	104	7.12
081	Op	PP53_X3-102B	PEPCO	X3-102 TAP-Hawkins Gate 077 230 kV line	911210	223993	1	DC	0.05	142.77	ER	680	971.2
082	Non	Non	PJM	EMORY GR500-Conastone 500 kV line	200101	200004	1	DC	102.5	103.36	NR	2338	153.75
083	Op	PJM17_X3-068B	BG&E/PL	Conastone-Otter Creek Switchyard 230 kV line	220963	208048	1	DC	156.93	158.48	ER	531	51.08
084	Op	PP1EB	BG&E	Sandy Spring 2314-High Ridge 2316 230 kV line	220983	220941	1	DC	118.49	119.75	ER	941	73.13
085	Op	PP31	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	117.36	137.64	ER	730	148.27
086	Non	Non	PEPCO	Bowie 042-Burtonsville 2334 230 kV line	223977	223962	1	DC	113.96	133.76	NR	608	120.61
087	Op	PJM17_X3-068B	BG&E/PL	Graceton-Safe Harbor Units 3-4 Tap 230 kV line	220964	208071	1	DC	110.11	110.89	ER	485	46.06
088	Op	PJM17_X3-068B	BG&E/PECO	Graceton-Cooper 230 kV line	220964	214089	1	DC	146.18	146.93	ER	485	45.6
089	Op	PP53_X3-102B	PEPCO	Hawkins Gate 077-X2-030 TAP 230 kV line	223993	909250	1	DC	21.1	102.94	ER	691	857.11
090	Op	PP54_V3-017A	PEPCO	V3-017 TAP-Talbert 068 230 kV line	894600	223990	1	DC	148.62	150.29	ER	691	78.1
091	Non	Non	PEPCO	V3-017 TAP-Talbert 068 230 kV line	894600	223990	1	DC	109.61	111.48	NR	608	75.42
092	Op	PP1EB	BG&E	Howard 2312-Granite 2311 & 2312 230 kV line	220953	220972	1	DC	113.48	114.28	ER	728	67.22
093	Op	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	120.15	122.99	ER	118	20.77
094	Non	Non	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	1	DC	114.76	117.22	NR	106	16.1
095	Op	PP31	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	118.04	122.52	ER	150	41.55
096	Non	Non	PEPCO	Ft Slocum Par-Ft Slocum 69 kV line	224121	224122	1	DC	102.43	106.43	NR	130	32.2
097	Op	PJM77	PJM	Conastone-X3-068 TAP 500 kV line	200004	911010	1	DC	133.16	133.94	ER	2815	175.34
098	Op	PP53_X3-102B	PEPCO	X2-030 TAP-Morgantown Bus 230 kV line	909250	223988	1	DC	34.91	158.95	ER	691	857.11
099	Op	PP1EB	METED	Germantown Reactor-Germantown 138/115 kV transformer	204531	204529	1	DC	140.68	141.79	ER	104	7.12

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
100	Op	PJM17_X3-068B	PECO	Cooper-Peach Bottom 230 kV line	214089	213869	1	DC	144.15	144.89	ER	485	45.6
101	Op	PP31	PEPCO	12Th & Irving-Ft Slocum Par 69 kV line	224119	224121	1	DC	157.91	163.28	ER	125	41.55
102	Op	PP1EB	BG&E	Sandy Spring 2334-High Ridge 2316 230 kV line	220984	220941	1	DC	120.4	121.62	ER	941	70.95
103	Op	PP36	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	117.75	137.99	ER	730	148.02
104	Non	Non	PEPCO	Bowie 045-Burtonsville 2314 230 kV line	223978	223961	1	DC	114.51	134.25	NR	608	120.22
105	Op	PP85	PEPCO	Benning T4-Tuxedo 503 115 kV line	224103	224105	1	DC	101.83	104.42	ER	180	28.84
106	Op	PJM17_X3-068B	PECO	Peach Bottom-Nottingham Reactor 230 kV line	213869	213846	1	DC	119.39	120.53	ER	627	45.6
107	Op	PJM17_X3-068B	PL	Safe Harbor Units 3-4 Tap-Manor Substation 230 kV line	208071	208019	1	DC	129.19	130.45	ER	579	45.08
108	Op	BG_RIV230-2	BG&E	Brandon Shores-Hawkins Point 2344 230 kV line	220960	220989	1	DC	103.65	104.49	ER	1153	60.02
109	Op	PP36	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	117.87	138.11	ER	730	148.02
110	Non	Non	PEPCO	Oak Groove-Bowie 045 230 kV line	223982	223978	1	DC	114.66	134.39	NR	608	120.22
111	Op	BG_CKT2344	BG&E	Riverside 2317-Northeast 2315 & 2317 230 kV line	220966	220979	1	DC	114.63	115.85	ER	632	47.62
112	Op	PP31	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	120.15	122.99	ER	118	20.77
113	Non	Non	PEPCO	Benning East-12Th & Irving 69 kV line	224023	224119	2	DC	114.76	117.22	NR	106	16.1
114	Op	PP31	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	117.61	137.89	ER	730	148.27
115	Non	Non	PEPCO	Oak Groove-Bowie 042 230 kV line	223982	223977	1	DC	114.26	134.06	NR	608	120.61
116	Op	BG_RIV230-2	BG&E	Sollers Point 2344-Riverside 2339 230 kV line	220990	220977	1	DC	119.96	120.9	ER	1036	60.02
117	Op	PP60_X2-030A	PEPCO	Talbert 087-Oak Groove 230 kV line	224124	223982	1	DC	60.72	203.55	ER	680	971.2
118	Non	Non	PEPCO	Talbert 087-Oak Groove 230 kV line	224124	223982	1	DC	63.86	155.52	NR	559	512.58
119	Op	PP47	PEPCO	V3-017 TAP-Talbert 066 230 kV line	894610	224125	1	DC	118.98	120	ER	680	48.09
120	Op	PP1EB	AP/PENELEC	Greene-Roxbury 138 kV line	235188	200532	1	DC	119.78	120.83	ER	189	12.29
121	Op	PJM17_X3-068B	PL	Millwood Transformer #2-Millwood Transformer #1 230 kV line	208031	208030	1	DC	106.74	107.57	ER	588	30.08

X3-102 Opt. 2 ###	Contingency		Affected Area	Facility Description	Bus		Circuit	Analyses Type	Loading		Rating		MW Contribution
	Type	Name			To	From			Before	After	Type	MVA	
122	Op	PP1EB	BG&E	High Ridge 2316-Columbia 230 kV line	220941	221010	1	DC	110.92	112.07	ER	941	66.83
123	Op	PP47	PEPCO	Talbert 066-Oak Groove 230 kV line	224125	223982	1	DC	165.26	167.15	ER	680	88.38
124	Non	Non	PEPCO	Talbert 066-Oak Groove 230 kV line	224125	223982	1	DC	140.81	142.02	NR	559	47.26
125	Op	PP60_X2-030A	PEPCO	X3-102 TAP-Talbert 087 230 kV line	911210	224124	1	DC	60.79	203.62	ER	680	971.2
126	Non	Non	PEPCO	X3-102 TAP-Talbert 087 230 kV line	911210	224124	1	DC	63.95	155.6	NR	559	512.58
127	Op	PJM67	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	131.43	131.85	ER	2901	104.32
128	Non	Non	AP/PJM	Kemptown-EMORY GR500 500 kV line	235632	200101	1	DC	145.03	145.64	NR	2338	115.42
129	Op	PJM17_X3-068A	PL	Millwood Transformer #1-South Akron Transformer 3 230 kV line	208030	208079	1	DC	109	109.9	ER	588	33.04
130	Op	PJM77	PJM	X3-068 TAP-Peach Bottom 500 kV line	911010	200013	1	DC	140.48	141.25	ER	2815	175.34

Primary Option:

Attachment Facilities:

It is assumed that IC will construct all Attachment Facilities.

Direct Connection Network Upgrades:

Turning poles to cut 500 kV Feeder: $2 million

500 kV station with at least five 500 kV breakers: $20 million

Remote end relay and telecom work: $1 million

500kV extension from existing lines to new substation with installation of two heavy duty 90 degree double circuit poles and bringing the lines to the A-frame structures in the new 500-kV substation for approximately 7 miles:
$23,000,000

Right of way estimate (see sketch below):

Rosewick to Burches Hill - Possum Point (500 kV): 200 feet wide x 2 (corridor factor) = $3,600,000

Overall duration is estimated to be two years.

Note: if station is provided by Interconnection Customer through Option to Build, then ITO costs will be $2 million for oversight and commissioning costs.

Non-Direct Connection Network Upgrades:

X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
001	DVP	Dominion would need to install a second 500-230 kV Tx at this location to resolve this overload.	$20,000,000	
002	BG&E	Rebuild line to accommodate double bundle 1272 ACSR. Existing: Circuit 2332-A is 1590 kcm ACSR @ 160 deg. C Assumptions: Length of line is 8.9 miles 2+ year CPCN process required Existing tower removal included	$24,000,000	60
003	BG&E	Replace wire drops and upgrade structures for a new rating of 825 MVA.	$500,000	18
004	PECO	Replace Line 220-08 reactor and by-pass circuit switcher at Nottingham substation to get a minimum summer emergency rating of 741 MVA.	$1,700,000	24
005	PENELEC	Install a standard 115kV Circuit Breaker with 3000A.	$717,300	
006	METED	Based on an initial review, we have determined that the reactor cannot be upgraded. Therefore the apparent mitigation action will be to replace the Germantown 138/ 115 kV transformer and miscellaneous substation components.	$5,028,600	
007	PEPCO	Talbert 069 - Oak Grove needs upgrading. Engineering and Construction times include lead time to acquire the ACCR conductor. All the breakers and switches at the Oak Grove Sub are in the process of being upgraded as a baseline upgrade so there are no breaker replacement cost associated with the feeder upgrades. Relaying and testing will for the upgraded 2 feeders will be 100K per feeder at Oak Grove. Currently there are no breakers at Talbert but as part of the suspended S17 project, breakers were added for that project. These breakers would need to be 3000 Amps if they were installed.	$16,200,000	48
008	PJM	The two breaker bay at Conastone for the Brighton line is over the continuous rating. Upgrade Conastone bay with two 4000A breakers, four 4000A breaker disconnects and a 4000 A line switch for newew rating 3710.	$3,000,000	36

X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
009	BG&E/PL	A PPL project to re-conductor Manor-Conastone with 1590 ACSR is underway. This project will equip the line to handle 653/793 MVA (Summer Normal/Emergency). The BG&E portion of the Conastone to Otter Creek line can be upgraded by Reconducting from Gorsuch Mills to the Pennsylvania State Line (change of ownership to PPL). The existing circuit 2302 conductor is 1590 kcmil 45/7 ACSR from Conastone to Gorsuch Mills and 795 kcm 30/19 ACSR from Gorsuch Mills to the PA State Line. Assumptions: • Reconductor with 1590 kcm ACSR from Gorsuch Mills to PA line to match capability of remainder of line. • Length of this line section is 1.7 miles. • Towers can be reinforced instead of replaced. • Based on previous estimate by R.W.M. for PJM (B48) study on circuit 22008.	$700,000	36
010	BG&E	Rebuild existing line using double bundle 1033 ACSR @ 125 degC (1227 MVA) Assumptions: -Full structure replacement required -Existing structure removal included -Line length of 3.61 miles -2+ year CPCN process required	$10,000,000	60
011	BG&E	Remove the wire drop limitation at Pumphrey to change rating to 525/640.	$200,000	12
012	PEPCO	Upgrading this circuit will require replacing the existing conductor to an ACCR conductor, which will be rated at 3000 amps or 1200 MVA SE.	$8,000,000	24
013	PEPCO	Same as 012.	Already addressed	Already addressed
014	PEPCO	Same as 012.	Already addressed	Already addressed
015	PEPCO	For the overloads identified on the Pepco 69kV (Benning, 12 Street & Irving and Ft Slocum) - Pepco found these violations to not be valid because the 2015 load flow cases dispatched Benning and Buzzard generation, which deactivated in 2012. The dispatch of these units are the reason for these violations in this report. No upgrades required.	TO identified no upgrade required.	TO identified no upgrade required.

X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
016	PEPCO	Same as 015.	Already addressed	Already addressed
017	PEPCO	Same as 015.	Already addressed	Already addressed
018	PEPCO	Same as 007.	Already addressed	Already addressed
019	PEPCO	Same as 007.	Already addressed	Already addressed
020	BG&E/PL	A PPL project to re-conductor Manor-Graceton 230 kV with 1590 ACSR is underway. This project will equip the line to handle 653/793 MVA (Summer Normal/Emergency). Estimated in-service date: November 2013 BGE: Line rated 559/674. There are substation limitations at Graceton that will be removed with project b0497.	Addressed by RTEP Projects	Addressed by RTEP Projects
021	BG&E/PECO	Rebuild Cooper to Graceton 230kV line 1.85 miles to PA border. New rating would be 648/802. Duration includes CPCN.	$7,500,000	54
022	BG&E	Rebuild 3.6 miles of double circuit line with bundled 1033.5 MCM conductor. Rate line to 968/1227 MVA. Duration includes CPCN.	$12,000,000	48
023	PEPCO/BG&E	PEPCO: The Two tie lines at Bowie 043 and 044 are limited on the Pepco end by metering. Substation Engineering estimates the replacement of the metering and associated equipment to be $250K per feeder. This would raise the emergency limit to the conductor rating of 800 MVA. BGE: Pepco equipment limits the line. Removing the limitation then the BGE rating is 799 SN/974 SE.	$500,000	18
024	BG&E	Same as 003.	Already addressed	Already addressed
025	DVP	This is not be violation on DVP system since it is less than 130% DVP criterion.	TO identified no upgrade required.	TO identified no upgrade required.
026	PEPCO	Same as 015.	Already addressed	Already addressed
027	PEPCO	Same as 015.	Already addressed	Already addressed
028	DVP	Same as 025.	Already addressed	Already addressed

X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
029	METED	Same as 006.	Already addressed	Already addressed
030	PECO	Reconductor Line 220-08 from PB Tap to Cooper Substation to get a minimum summer emergency rating of 741 MVA. The line is approximately 1.4 miles long.	$1,000,000	24
031	PEPCO	Same as 015.	Already addressed	Already addressed
032	PEPCO	Same as 015.	Already addressed	Already addressed
033	BG&E	Same as 010.	Already addressed	Already addressed
034	PEPCO	Upgrading this circuit will require replacing the existing conductor to an ACCR conductor, which will be rated at 3000 amps or 1200 MVA SE.	$8,000,000	24
035	PEPCO	Same as 034.	Already addressed	Already addressed
036	PEPCO	Same as 034.	Already addressed	Already addressed
037	PECO	Reconductor Line 220-08 from Nottingham Reactor to PB Tap to get a minimum summer emergency rating of 741 MVA. The line is approximately 14 miles long.	$10,000,000	48
038	PL	Upgrade current 795 kcmil 30/19 (140 degrees C) line section to 1590kcmil 45/7 (125 degrees) .	$56,000	18
039	PEPCO	Upgrading this circuit will require replacing the existing conductor to an ACCR conductor, which will be rated at 3000 amps or 1200 MVA SE.	$12,000,000	24
040	PEPCO	Same as 039.	Already addressed	Already addressed
041	PEPCO	Same as 039.	Already addressed	Already addressed
042	BG&E	No upgrade required, summer emergency rating is 675.	TO identified no upgrade required.	TO identified no upgrade required.
043	PEPCO	Same as 015.	Already addressed	Already addressed
044	PEPCO	Same as 015.	Already addressed	Already addressed

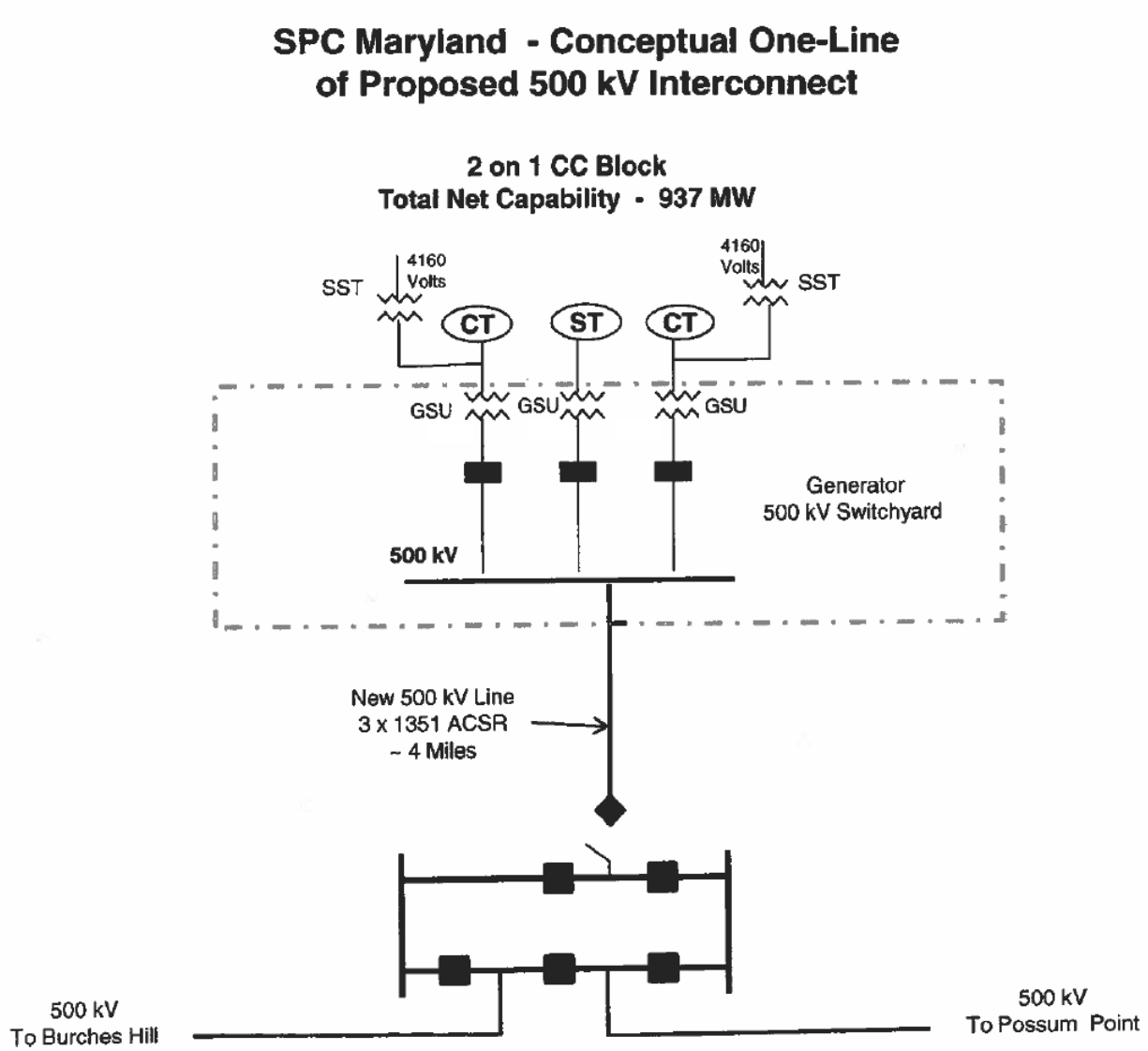
X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
045	BG&E	The overload can be alleviated by reconductoring the line with 2167 ACSR which will increase the rating to 1105 MVA. There will also be substation terminal cost upgrades associated with the reinforcement.	$23,600,000	72
046	PEPCO	Upgrading this circuit will require replacing the existing conductor to an ACCR conductor, which will be rated at 3000 amps or 1200 MVA SE.	$12,000,000	24
047	PEPCO	Same as 046.	Already addressed	Already addressed
048	PEPCO	Same as 046.	Already addressed	Already addressed
049	PEPCO/BG&E	Same as 023.	Already addressed	Already addressed
050	PJM	BGE: • At Conastone construct a new two breaker 4000A bay (breakers D, F) with two 63 kA breakers. Includes line termination structures, allowance for a second line and the relocation of the 500kV cap bank. 36 months to complete - $14M • Construct a new 500kV line from Conastone - Peachbotton rated for a minimum of 2939/3733 SN/SE. Build 9.6 miles 500KV line from Conastone to Pennsylvania line. Purchase 150’ R/W. Total for project $46.8 million 5-7 years. PECO: • Replace existing Peach Bottom-Conastone 500kV Line (5012) terminal equipment at Peach Bottom Substation to match the conductor summer normal and emergency rating of 2920 / 3707 MVA (PECO portion only)- $5 million, 3 years • Build new second Peach Bottom-Conastone 500kV Line on separate towers from existing 5012 Line with a minimum summer emergency rating of 3510 MVA (PECO portion only)- $20 million, 5 years [Right-of-way costs are not included]	$85,800,000	84
051	BG&E	Wire drop limitation on the disconnect (ABSU) at Howard $200,000. Transmission line has sag limitations on multiple spans. Upgrading existing line is not possible and requires total rebuild Howard to Pumphrey. Duration includes CPCN.	$12,200,000	48

X3-102 Opt. 1 ###	ITO	Work Description	Estimated Cost	Approximate Duration
052	BG&E	230kV line is at its full rating requires a total rebuild for full 4.4 miles, CPCN needed and is included in duration. Rebuild with bundle 1590 MCMrate 1604 SE.	$15,000,000	60
053	AP/PJM	Same as 008.	Already addressed	Already addressed
054	AP/PJM	Same as 008.	Already addressed	Already addressed
055	DVP	Same as 025.	Already addressed	Already addressed
Non-Direct Connection Thermal Upgrades Summary			$289,701,900	84

Primary Option Contingency Overload Summary:

Option 1																					
	Overloads Identified (###)																				
Contingency	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
10PEPCO_S17_X2-030	018																				
12PEPCO_S17_X2-030	007																				
250&258	025																				
265&2008	028																				
5PEPCO	034	039																			
7PEPCO_A	012	015	026	031	043	046															
8OX _8POSSUM _043	001	075																			
BG_CKT2344	042	086																			
HIRDG_BURTVL	023	049																			
Non	008	014	017	036	041	048	054	060	062	066	068	071	081	085	089	094					
PJM17	004	009	020	021	030	037	038	058	063	070	072	077	082	083	096						
PJM76	091																				
PJM77	050	053	093																		
PP1EB	002	003	005	006	010	022	024	029	033	045	052	056	057	059	061	064	073	076	079	090	092
PP31	013	016	027	032	044	047	065	067	074	078	087	088									
PP36	035	040	080	084																	
PP47	019	069																			
WCHPL_BRNDN	011	051																			
WELTONSP_KEMPTOWN	055	095																			

Primary Option One-Line:



Secondary Option:

Attachment Facilities:

It is assumed that IC will construct all Attachment Facilities.

Direct Connection Network Facilities:

Turning poles to cut 230 kV Feeders: $4 million

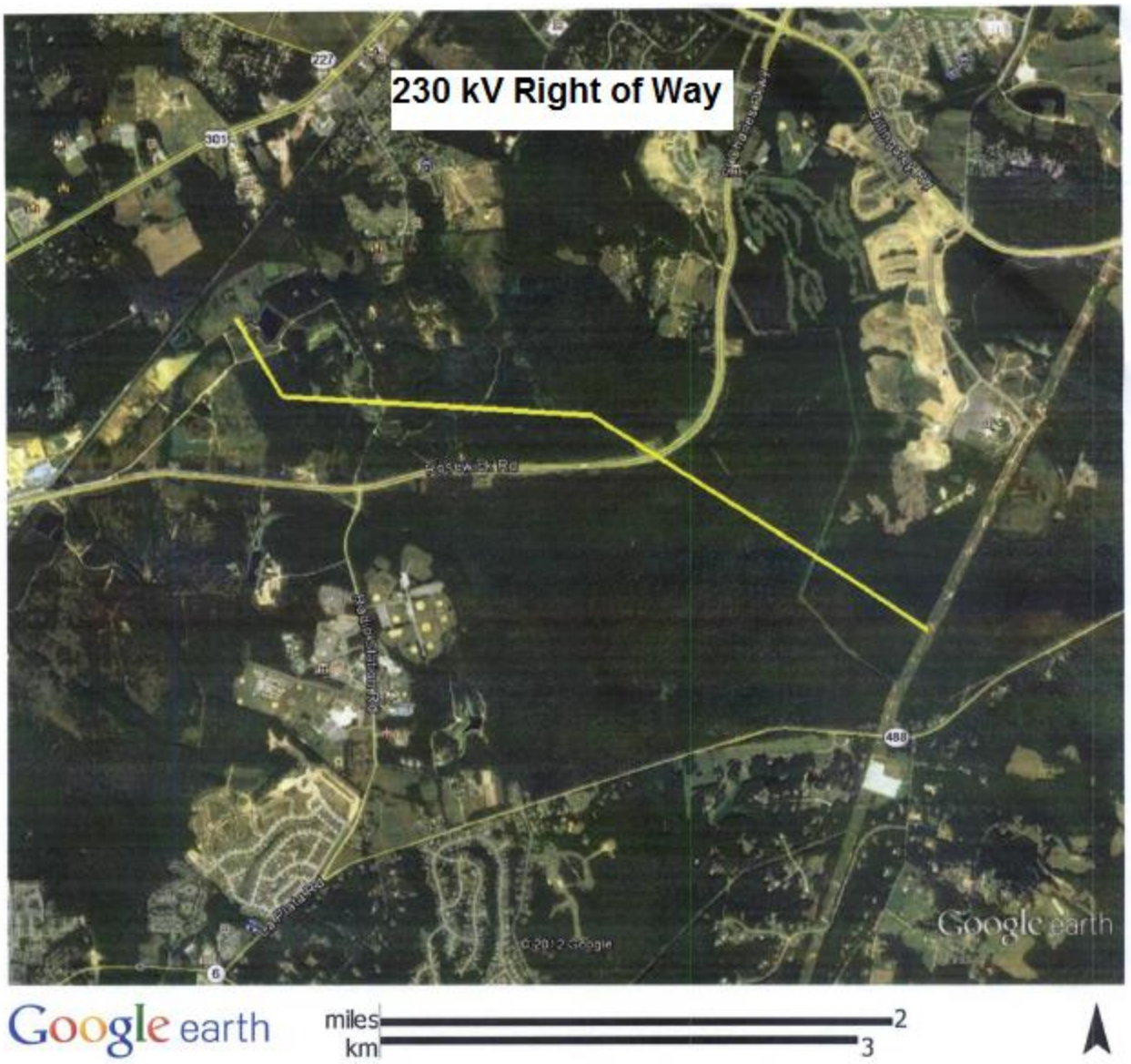
230 kV station with at least seven breakers: $15 million

Remote end relay work & telecom: $1.5 million

230kV extension from existing lines to new substation with installation of two heavy duty 90 degree double circuit poles and bringing the lines to the A-frame structures in the new 230-kV substation approximately 4 miles: $14.5 million

Rosewick to Talbert - Morgantown (230kV): 150 feet wide x 2 (corridor factor) = $2,006,000

Note: if station is provided by Interconnection Customer through Option to Build, then ITO costs will be $2 million for oversight and commissioning costs.



Secondary Option Contingency Overload Summary:

Option 2																											
	Overloads Identified (###)																										
Contingency	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
10PEPCO_S17_X2-030	062	068																									
5PEPCO	043	050																									
7PEPCO_A	021	031	034	040	054	058																					
BG_CKT2344	053	111																									
BG_RIV230-2	049	061	108	116																							
HIRDG_BURTVL	029	064																									
Non	007	010	017	023	028	033	036	045	052	056	060	070	072	079	082	086	091	094	096	104	110	113	115	118	124	126	128
PJM17_X3-068A	129																										
PJM17_X3-068B	014	018	024	025	039	047	048	073	077	083	087	088	100	106	107	121											
PJM40	065																										
PJM67	071	127																									
PJM76	037	074																									
PJM77	097	130																									
PP1EB	005	012	013	015	016	026	030	038	057	067	075	076	078	080	084	092	099	102	120	122							
PP27	042																										
PP28	019																										
PP31	022	032	035	041	055	059	085	093	095	101	112	114															
PP36	044	051	103	109																							
PP47	004	063	069	119	123																						
PP53_X3-102B	001	003	011	081	089	098																					
PP54_V3-017A	027	090																									
PP57	008																										
PP58	002																										
PP60_X2-030A	006	009	117	125																							
PP85	046	105																									
WCHPL_BRNDN	020	066																									

Secondary Option One-line: