Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position Y3-051

Linden 138 kV & 230 kV

September / 2013

General

Interconnection Customer (IC) has requested an increase of 6 MW to the Capacity Interconnection Rights and a 114 MW increase to Maximum Facility Output (MFO) of their generating units.

Direct Connection Cost Estimate

No upgrades to the Attachment Facilities are required to accommodate the additional 114 MW increase in Maximum Facility Output (MFO).

Revenue Metering and SCADA Requirements

Existing unit. Not required.

Network Impacts

The Queue Project #Y3-051 was studied as a 114.0 MW (Capacity 6.0 MW) injection at Linden 138 kV and 230 kV substations in the PSEG area. Project #Y3-051 was evaluated for compliance with reliability criteria for summer peak conditions in 2017. Potential network impacts were as follows:

Table 1 – Y3-051 Contingencies

Contingency Name	Description
36PS	CONTINGENCY '36PS' /* DEANS-WESTFIELD 230KV & SEWAREN(PIERSON AVE) - ROSELAND 230KV DCTL DISCONNECT BRANCH FROM BUS 218306 TO BUS 218356 CKT 1 DISCONNECT BRANCH FROM BUS 218356 TO BUS 218305 CKT 1 DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1 DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1 DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1 MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG T1 T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG T1 KILMER T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG T1 NEWDVR T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG T1 LAFAYET T2 MOVE 100 PERCENT LOAD FROM BUS 218415 TO BUS 218416 /* WESTFIELD T1 T2 MOVE 100 PERCENT LOAD FROM BUS 218380 TO BUS 218381 /* FANWOOD T2 T1 END
ALD_SPRI	CONTINGENCY 'ALD_SPRI' /* ALDENE 230KV-SPRINGFLD RD 138KV TRIP LINE FROM BUS 218345 TO BUS 216911 CKT 1 MOVE 100 PERCENT LOAD FROM BUS 216927 TO BUS 216926 END
BAYW_DRMS	CONTINGENCY 'BAYW_DRMS' /* BAYWAY DOREMUS 138KV TRIP LINE FROM BUS 216905 TO BUS 217056 CKT 1 /* BAYWAY DOREMUS 138 138 MOVE 100 PERCENT LOAD FROM BUS 216930 TO BUS 216932 /* DOREMUS T1 T2 MOVE 100 PERCENT LOAD FROM BUS 216931 TO BUS 216933 /* DOREMUS T3 T4

Table 1 – Y3-051 Contingencies	
Contingency Name	**Description**
	END
PS_GO	CONTINGENCY 'PS_GO' /*DEANS-LINDENG_ WOODBRIDGE TO SEWAREN O DISCONNECT BRANCH FROM BUS 218354 TO BUS 218306 CKT 2 /* PRSN AVG DEANS 230 230 DISCONNECT BRANCH FROM BUS 218354 TO BUS 218300 CKT 1 /* MINUESTG LINDEN 230 230 DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1 /*PRSB AVG NEW DOVER 230 230 DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1 /* NEW DOVER FANWOOD 230 230 DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1 /* FANWOOD ROSELAND 230 230 MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG T1 T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG T1 KILMER T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG T1 NEWDVR T2 MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG T1 LAFAYET T2 MOVE 52 PERCENT LOAD FROM BUS 218396 TO BUS 218397 /* MINUESTR T2 T1 MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218410 /* MINUESTR T2 WARINAN T1 MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218414 /* MINUESTR T2 WDBRDG T1 END
PS61	CONTINGENCY 'PS61' /* WARINANCO BUS BREAKER TO ALDENE DISCONNECT BRANCH FROM BUS 218307 TO BUS 217122 CKT 1 /* ALDENE ALDENE 230 230 DISCONNECT BRANCH FROM BUS 217122 TO BUS 218376 CKT 1 /* ALDENE1 ALDENEAB 230 26 DISCONNECT BRANCH FROM BUS 217122 TO BUS 218316 CKT 1 /* ALDENE1 WARINANC 230 230 DISCONNECT BRANCH FROM BUS 218316 TO BUS 218441 CKT 1 /* WARINANC VFT 230 230 DISCONNECT BRANCH FROM BUS 218316 TO BUS 218410 CKT 1 /* WARINANC T1 DISCONNECT BRANCH FROM BUS 218316 TO BUS 218411 CKT 1 /* WARINANC T2 MOVE 13 MW LOAD FROM BUS 218410 TO BUS 218374 /* WARINANC T1 ALDENE T1 MOVE 5 MW LOAD FROM BUS 218410 TO BUS 218375 /* WARINANC T1 ALDENE T2 MOVE 5 MW LOAD FROM BUS 218410 TO BUS 218413 /* WARINANC T1 WOODBRDG T3 MOVE 8 MW LOAD FROM BUS 218411 TO BUS 216924 /* WARINANC T2 NORTHAV T1 MOVE 5 MW LOAD FROM BUS 218411 TO BUS 216925 /* WARINANC T2 NORTHAV T2 MOVE 8 MW LOAD FROM BUS 218411 TO BUS 218397 /* WARINANC T2 MINUEST T1 END
PS8B	CONTINGENCY 'PS8B' DISCONNECT BRANCH FROM BUS 218441 TO BUS 218316 CKT 1 /* G22 WARINANCO 230 230 MOVE 100 PERCENT LOAD FROM BUS 218410 TO BUS 218411 /* WARINANCO T1 T2 END

Generator Deliverability

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

None

Multiple Facility Contingency

(Double Circuit Tower Line(DCTL), Line with Failed Breaker(LFFB) and Bus Fault(Bus) contingencies for the full energy output.)

None

Contribution to Previously Identified Overloads

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

Table 2 below provides a summary of the impacts caused by Y1-070 on the ATSI transmission system and other TO areas for contribution to previously identified overloads:

Table 2 - Y3-051 Contribution to Previously Identified Overloads

	Contingency			Bus		Loading		Rating		MW	FG
#	Type	Name	Facility Description	From	To	Initial	Final	Type	MVA	Cont.	App.
1	DCTL	PS_GO	SPRINGRD-W.ORANGE 230 kV line	216911	216914	107.32	111	ER	789	29.07	1
2	LFFB	PS61	LINDEN-MINUESTR 230 kV line	218300	218353	106.42	112.11	ER	740	42.11	2
3	DCTL	PS_GO	ALDENE2-SPRINGRD 230 kV line	218345	216911	116.21	119.9	ER	789	29.07	3
4	DCTL	36PS	LINDEN-TOSCO 230 kV line	218300	218343	121	124.38	ER	1081	36.49	4
5	DCTL	36PS	TOSCO-G22_MTX5 230 kV line	218343	218441	122.48	125.74	ER	1120	36.43	5
6	DCTL	36PS	WARINANC-ALDENE1 230 kV line	218316	217122	147.56	151.65	ER	887	36.3	6
7	DCTL	PS_GO	G22_MTX5-WARINANC 230 kV line	218441	218316	161.74	167.42	ER	821	46.61	7

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.

Table 3 - Y3-051 Delivery of Energy Portion of Interconnection Request

	Contingency			Bus		Loading		Rating		MW	FG
#	Type	Name	Facility Description	From	To	Initial	Final	Type	MVA	Cont.	App.
1	N-1	PS8B	NEWDOVRO-FANWOODO 230 kV line	218355	218320	101.56	101.93	ER	870	19.96	
2	N-1	ALD_SPRI	ALDENE-STAN_TER 230 kV line	218307	218430	98.99	102.33	ER	558	18.64	
3	N-1	PS8B	PRSN AVG-NEWDOVRO 230 kV line	218357	218355	105.25	105.62	ER	870	19.96	
4	Non	Non	PVSC-BAYONNE 138 kV line	216992	216908	87.16	96.1	NR	200	17.89	
5	N-1	ALD_SPRI	STAN_TER-MCARTHUR 230 kV line	218430	217170	100.43	103.82	ER	550	18.64	
6	N-1	PS8B	METUCHEN-PRSN AVG 230 kV line	218469	218357	109.36	109.73	ER	870	19.96	
7	N-1	BAYW_DRMS	FEDERLSQ-NEWARK3 138 kV line	217119	217022	100.36	104.96	ER	281	12.93	
8	Non	Non	LINDEN-TOSCO 230 kV line	218300	218343	108.1	111.87	NR	936	35.33	
9	N-1	BAYW_DRMS	BAYWAY2-FEDERLSQ 138 kV line	217134	217119	109.34	113.85	ER	287	12.93	
10	Non	Non	TOSCO-G22_MTX5 230 kV line	218343	218441	115.04	118.81	NR	936	35.27	
11	Non	Non	SPRINGRD-W.ORANGE 230 kV line	216911	216914	127.99	132.46	NR	512	22.9	
12	Non	Non	WARINANC-ALDENE1 230 kV line	218316	217122	139.51	144.33	NR	732	35.27	
13	Non	Non	ALDENE2-SPRINGRD 230 kV line	218345	216911	141.7	146.17	NR	512	22.9	
14	Non	Non	G22_MTX5-WARINANC 230 kV line	218441	218316	158.68	163.97	NR	667	35.27	

Short Circuit

(Summary of impacted circuit breakers)

Not required

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

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

Table 2b - Y3-051 Contribution to Previously Identified Overloads						
	Contingency		Facility Description	Description	Schedule	Cost
#	Type	Name				
1	DCTL	PS_GO	SPRINGRD-W.ORANGE 230 kV line	(PSEG - PSEG) The SPRINGRD-W.ORANGE 230 kV line: Build new Aldene – Springfield Rd 230 kV cable.	48 months.	$75 M
				Build new Springfield Rd – West Orange 230 kV cable.	48 months.	$135 M
2	LFFB	PS61	LINDEN-MINUESTR 230 kV line	(PSEG - PSEG) The LINDEN-MINUESTR 230 kV line: This overload can be alleviated by reconductoring the Linden – Minue St (R2218-1) 230 kV line.	48 months	$22 M
3	DCTL	PS_GO	ALDENE2-SPRINGRD 230 kV line	Same as #1		
4	DCTL	36PS	LINDEN-TOSCO 230 kV line	(PSEG - PSEG) The LINDEN-TOSCO 230 kV line: This overload can be alleviated by reconductoring the Tosco – Linden (B-2254) 230 kV line.	48 months	$6 M
5	DCTL	36PS	TOSCO-G22_MTX5 230 kV line	(PSEG - PSEG) The TOSCO-G22_MTX5 230 kV line: This overload can be alleviated by reconductoring the VFT – Tosco (S-2271) 230 kV line.	48 months	$2 M
6	DCTL	36PS	WARINANC-ALDENE1 230 kV line	(PSEG - PSEG) The WARINANC-ALDENE1 230 kV line: This overload can be alleviated by reconductoring the Aldene – Warinanco (N-2240) 230 kV line.	48 months	$22 M
7	DCTL	PS_GO	G22_MTX5-WARINANC 230 kV line	(PSEG - PSEG) The G22_MTX5-WARINANC 230 kV line: This overload can be alleviated by reconductoring the Warinanco - VFT (U-2273) 230 kV line. Estimated cost:; Estimated time:	48 months	$14 M

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.

Table 4 - Y3-051 Delivery of Energy Portion of Interconnection Request

	Contingency			Bus			Loading		Rating		MW	FG
#	Type	Name	Facility Description	From	To	Cir.	Initial	Final	Type	MVA	Cont.	App.
1	N-1	PS8B	NEWDOVRO-FANWOODO 230 kV line	218355	218320	1	101.59	102.09	ER	870	26.77	
2	N-1	ALD_SPRI	ALDENE-STAN_TER 230 kV line	218307	218430	1	99.04	103.52	ER	558	25	
3	N-1	ALD_SPRI	STAN_TER-MCARTHUR 230 kV line	218430	217170	1	100.48	105.03	ER	550	25	
4	N-1	PS8B	PRSN AVG-NEWDOVRO 230 kV line	218357	218355	1	105.28	105.78	ER	870	26.77	
5	N-1	PS8B	METUCHEN-PRSN AVG 230 kV line	218469	218357	1	109.39	109.88	ER	870	26.77	
6	Non	Non	LINDEN-TOSCO 230 kV line	218300	218343	1	108.1	113.16	NR	936	47.4	
7	Non	Non	TOSCO-G22_MTX5 230 kV line	218343	218441	1	115.04	120.1	NR	936	47.32	
8	Non	Non	SPRINGRD-W.ORANGE 230 kV line	216911	216914	1	128.06	134.06	NR	512	30.71	
9	Non	Non	WARINANC-ALDENE1 230 kV line	218316	217122	1	139.51	145.97	NR	732	47.32	
10	Non	Non	ALDENE2-SPRINGRD 230 kV line	218345	216911	1	141.77	147.77	NR	512	30.71	
11	Non	Non	G22_MTX5-WARINANC 230 kV line	218441	218316	1	158.68	165.78	NR	667	47.32	

Short Circuit – Breaker Costs

Not required

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined

Light Load Reliability Analysis

*(Summary of any reinforcements required to mitigate system reliability issues during light load periods. This light load study was evaluated for compliance with reliability criteria for **Light Load conditions** in 2014.)*

Not required.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

The analysis will be done in the Impact Study

Appendices

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.

Appendix 1

(PSEG - PSEG) The SPRINGRD-W.ORANGE 230 kV line (from bus 216911 to bus 216914 ckt 1) loads from 107.32% to 111.0% (**DC power flow**) of its emergency rating (789 MVA) for the tower line contingency outage of 'PS_GO'. This project contributes approximately 29.07 MW to the thermal violation.

CONTINGENCY 'PS_GO' /*DEANS-LINDENG_
WOODBRIDGE TO SEWAREN O
DISCONNECT BRANCH FROM BUS 218354 TO BUS 218306 CKT 2 /* PRSN AVG
DEANS 230 230
DISCONNECT BRANCH FROM BUS 218354 TO BUS 218300 CKT 1 /*
MINUESTG LINDEN 230 230
DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1 /*PRSB AVG
NEW DOVER 230 230
DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1 /* NEW
DOVER FANWOOD 230 230
DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1 /* FANWOOD
ROSELAND 230 230
MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG
T1 T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG
T1 KILMER T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG
T1 NEWDVR T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG
T1 LAFAYET T2
MOVE 52 PERCENT LOAD FROM BUS 218396 TO BUS 218397 /* MINUESTR
T2 T1
MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218410 /* MINUESTR
T2 WARINAN T1
MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218414 /* MINUESTR
T2 WDBRDG T1
END

Bus Number	Bus Name	Full Contribution
218307	ALDENE	0.02
218376	ALDENEAB	12.74
218326	EDISON 1	27.35
218327	EDISON 2	27.35
218328	EDISON 3	27.35
218423	LINDNCT1	2.39
218424	LINDNCT2	2.39
218425	LINDNCT3	2.39
218426	LINDNST1	4.67
206679	M&M S721	-0.85
94130	O66_NONFIRM	50.33
206638	PEAPACK	-0.33
290745	S-061	0.33

218360	SEWAREN1	26.04
218361	SEWAREN2	28.14
218362	SEWAREN3	25.52
218363	SEWAREN4	28.32
218364	SEWAREN6	25.33
218344	TOSCONUG	1.95
293093	U2-077	237.18
292094	V1-030 C1	0.01
292095	V1-030 E1	0.51
292185	V1-030 E2	0.63
292101	V1-030 E4	0.06
292103	V1-030 E5	0.15
292107	V1-030 E7	0.09
292189	V1-030 EA	0.48
292078	V1-034	0.43
297021	V2-009 E1	0.19
297023	V2-009 E2	0.37
297025	V2-009 E3	0.39
297027	V2-009 E4	0.26
293378	V3-024 E	0.75
292666	V3-058 E	0.26
292668	V3-059 E	0.26
292681	V3-069 E	0.26
900801	W1-001	5.65
902002	W1-121 E	0.29
902251	W2-023	162.48
902652	W2-052E	0.1
903961	W3-077C	-0.33
905642	W4-080 E	2.68
909452	X2-088 E	0.18
909462	X2-089 E	0.37
910612	X3-029 E	-0.72
910712	X3-052 E	-0.43
912221	X4-044 C	4.68
912222	X4-044 E	3.78
913101	Y1-026	59.33
915251	Y3-049 1	0.65
915252	Y3-049 2	0.65
915253	Y3-049 3	0.65
915271	Y3-051 C	2.13
915272	Y3-051 E1	26.95

Appendix 2

(PSEG - PSEG) The LINDEN-MINUESTR 230 kV line (from bus 218300 to bus 218353 ckt 1) loads from 106.42% to 112.11% (**DC power flow**) of its emergency rating (740 MVA) for the line fault with failed breaker contingency outage of 'PS61'. This project contributes approximately 42.11 MW to the thermal violation.

CONTINGENCY 'PS61' /* WARINANCO BUS BREAKER TO ALDENE
DISCONNECT BRANCH FROM BUS 218307 TO BUS 217122 CKT 1 /* ALDENE ALDENE 230 230
DISCONNECT BRANCH FROM BUS 217122 TO BUS 218376 CKT 1 /* ALDENE1 ALDENEAB 230 26
DISCONNECT BRANCH FROM BUS 217122 TO BUS 218316 CKT 1 /* ALDENE1 WARINANC 230 230
DISCONNECT BRANCH FROM BUS 218316 TO BUS 218441 CKT 1 /* WARINANC VFT 230 230
DISCONNECT BRANCH FROM BUS 218316 TO BUS 218410 CKT 1 /* WARINANC T1
DISCONNECT BRANCH FROM BUS 218316 TO BUS 218411 CKT 1 /* WARINANC T2
MOVE 13 MW LOAD FROM BUS 218410 TO BUS 218374 /* WARINANC T1 ALDENE T1
MOVE 5 MW LOAD FROM BUS 218410 TO BUS 218375 /* WARINANC T1 ALDENE T2
MOVE 5 MW LOAD FROM BUS 218410 TO BUS 218413 /* WARINANC T1 WOODBRDG T3
MOVE 8 MW LOAD FROM BUS 218411 TO BUS 216924 /* WARINANC T2 NORTHAV T1
MOVE 5 MW LOAD FROM BUS 218411 TO BUS 216925 /* WARINANC T2 NORTHAV T2
MOVE 8 MW LOAD FROM BUS 218411 TO BUS 218397 /* WARINANC T2 MINUEST T1
END

Bus Number	Bus Name	Full Contribution
218423	LINDNCT1	3.46
218424	LINDNCT2	3.46
218425	LINDNCT3	3.46
218426	LINDNST1	6.76
290745	S-061	0.45
218344	TOSCONUG	2.66
293093	U2-077	315.73
292094	V1-030 C1	0.02
292095	V1-030 E1	0.73
900801	W1-001	7.52
913101	Y1-026	80.7
915271	Y3-051 C	3.08
915272	Y3-051 E1	39.03

Appendix 3

(PSEG - PSEG) The ALDENE2-SPRINGRD 230 kV line (from bus 218345 to bus 216911 ckt 1) loads from 116.21% to 119.9% (**DC power flow**) of its emergency rating (789 MVA) for the tower line contingency outage of 'PS_GO'. This project contributes approximately 29.07 MW to the thermal violation.

```
CONTINGENCY 'PS_GO'                                    /*DEANS-LINDENG_
WOODBRIDGE TO SEWAREN O
  DISCONNECT BRANCH FROM BUS 218354 TO BUS 218306 CKT 2          /* PRSN AVG
DEANS 230 230
  DISCONNECT BRANCH FROM BUS 218354 TO BUS 218300 CKT 1          /*
MINUESTG LINDEN 230 230
  DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1          /*PRSB AVG
NEW DOVER 230 230
  DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1          /* NEW
DOVER FANWOOD 230 230
  DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1          /* FANWOOD
ROSELAND 230 230
  MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402           /* PRSN AVG
T1 T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384           /* PRSN AVG
T1 KILMER T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399           /* PRSN AVG
T1 NEWDVR T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390           /* PRSN AVG
T1 LAFAYET T2
  MOVE 52 PERCENT LOAD FROM BUS 218396 TO BUS 218397           /* MINUESTR
T2 T1
  MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218410           /* MINUESTR
T2 WARINAN T1
  MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218414           /* MINUESTR
T2 WDBRDG T1
  END
```

Bus Number	Bus Name	Full Contribution
218307	ALDENE	0.02
218376	ALDENEAB	12.74
218326	EDISON 1	27.35
218327	EDISON 2	27.35
218328	EDISON 3	27.35
218423	LINDNCT1	2.39
218424	LINDNCT2	2.39
218425	LINDNCT3	2.39
218426	LINDNST1	4.67
206679	M&M S721	-0.85
94130	O66_NONFIRM	50.33
206638	PEAPACK	-0.33
290745	S-061	0.33

218360	SEWAREN1	26.04
218361	SEWAREN2	28.14
218362	SEWAREN3	25.52
218363	SEWAREN4	28.32
218364	SEWAREN6	25.33
218344	TOSCONUG	1.95
293093	U2-077	237.18
292094	V1-030 C1	0.01
292095	V1-030 E1	0.51
292185	V1-030 E2	0.63
292101	V1-030 E4	0.06
292103	V1-030 E5	0.15
292107	V1-030 E7	0.09
292189	V1-030 EA	0.48
292078	V1-034	0.43
297021	V2-009 E1	0.19
297023	V2-009 E2	0.37
297025	V2-009 E3	0.39
297027	V2-009 E4	0.26
293378	V3-024 E	0.75
292666	V3-058 E	0.26
292668	V3-059 E	0.26
292681	V3-069 E	0.26
900801	W1-001	5.65
902002	W1-121 E	0.29
902251	W2-023	162.48
902652	W2-052E	0.1
903961	W3-077C	-0.33
905642	W4-080 E	2.68
909452	X2-088 E	0.18
909462	X2-089 E	0.37
910612	X3-029 E	-0.72
910712	X3-052 E	-0.43
912221	X4-044 C	4.68
912222	X4-044 E	3.78
913101	Y1-026	59.33
915251	Y3-049 1	0.65
915252	Y3-049 2	0.65
915253	Y3-049 3	0.65
915271	Y3-051 C	2.13
915272	Y3-051 E1	26.95

Appendix 4

(PSEG - PSEG) The LINDEN-TOSCO 230 kV line (from bus 218300 to bus 218343 ckt 1) loads from 121.0% to 124.38% (**DC power flow**) of its emergency rating (1081 MVA) for the tower line contingency outage of '36PS'. This project contributes approximately 36.49 MW to the thermal violation.

CONTINGENCY '36PS' /* DEANS-WESTFIELD 230KV & SEWAREN(PIERSON AVE) -ROSELAND 230KV DCTL
DISCONNECT BRANCH FROM BUS 218306 TO BUS 218356 CKT 1
DISCONNECT BRANCH FROM BUS 218356 TO BUS 218305 CKT 1
DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1
DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1
DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1
MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG T1 T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG T1 KILMER T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG T1 NEWDVR T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG T1 LAFAYET T2
MOVE 100 PERCENT LOAD FROM BUS 218415 TO BUS 218416 /* WESTFIELD T1 T2
MOVE 100 PERCENT LOAD FROM BUS 218380 TO BUS 218381 /* FANWOOD T2 T1
END

Bus Number	Bus Name	Full Contribution
218326	EDISON 1	33.25
218327	EDISON 2	33.24
218328	EDISON 3	33.25
206617	EXXON	-0.37
218423	LINDNCT1	2.99
218424	LINDNCT2	2.99
218425	LINDNCT3	2.99
218426	LINDNST1	5.86
206679	M&M S721	-0.91
94130	O66_NONFIRM	54.11
206638	PEAPACK	-0.36
218360	SEWAREN1	32.53
218361	SEWAREN2	35.08
218362	SEWAREN3	31.81
218363	SEWAREN4	35.25
218364	SEWAREN6	31.52
292094	V1-030 C1	0.02
292095	V1-030 E1	0.63
292185	V1-030 E2	0.76

292101	V1-030 E4	0.08
292103	V1-030 E5	0.18
292107	V1-030 E7	0.11
292189	V1-030 EA	0.52
292078	V1-034	0.46
297021	V2-009 E1	0.22
297023	V2-009 E2	0.45
297025	V2-009 E3	0.46
297027	V2-009 E4	0.31
293378	V3-024 E	0.9
292666	V3-058 E	0.31
292668	V3-059 E	0.31
292681	V3-069 E	0.33
902002	W1-121 E	0.34
902251	W2-023	203.22
902652	W2-052E	0.13
903961	W3-077C	-0.35
905642	W4-080 E	3.34
909452	X2-088 E	0.21
909462	X2-089 E	0.46
910562	X3-007 E	0.11
910612	X3-029 E	-0.77
910712	X3-052 E	-0.46
915251	Y3-049 1	0.79
915252	Y3-049 2	0.79
915253	Y3-049 3	0.79
915271	Y3-051 C	2.67
915272	Y3-051 E1	33.82

Appendix 5

(PSEG - PSEG) The TOSCO-G22_MTX5 230 kV line (from bus 218343 to bus 218441 ckt 1) loads from 122.48% to 125.74% (**DC power flow**) of its emergency rating (1120 MVA) for the tower line contingency outage of '36PS'. This project contributes approximately 36.43 MW to the thermal violation.

CONTINGENCY '36PS' /* DEANS-WESTFIELD 230KV & SEWAREN(PIERSON AVE) -ROSELAND 230KV DCTL
DISCONNECT BRANCH FROM BUS 218306 TO BUS 218356 CKT 1
DISCONNECT BRANCH FROM BUS 218356 TO BUS 218305 CKT 1
DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1
DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1
DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1
MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG T1 T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG T1 KILMER T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG T1 NEWDVR T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG T1 LAFAYET T2
MOVE 100 PERCENT LOAD FROM BUS 218415 TO BUS 218416 /* WESTFIELD T1 T2
MOVE 100 PERCENT LOAD FROM BUS 218380 TO BUS 218381 /* FANWOOD T2 T1
END

Bus Number	Bus Name	Full Contribution
218326	EDISON 1	33.13
218327	EDISON 2	33.12
218328	EDISON 3	33.13
206617	EXXON	-0.37
218423	LINDNCT1	2.99
218424	LINDNCT2	2.99
218425	LINDNCT3	2.99
218426	LINDNST1	5.85
206679	M&M S721	-0.92
94130	O66_NONFIRM	54.37
206638	PEAPACK	-0.36
290745	S-061	0.42
218360	SEWAREN1	32.45
218361	SEWAREN2	34.99
218362	SEWAREN3	31.73
218363	SEWAREN4	35.15
218364	SEWAREN6	31.44
218344	TOSCONUG	2.5
292094	V1-030 C1	0.02

292095	V1-030 E1	0.63
292185	V1-030 E2	0.76
292101	V1-030 E4	0.07
292103	V1-030 E5	0.18
292107	V1-030 E7	0.11
292189	V1-030 EA	0.51
292078	V1-034	0.46
297021	V2-009 E1	0.22
297023	V2-009 E2	0.45
297025	V2-009 E3	0.46
297027	V2-009 E4	0.31
293378	V3-024 E	0.9
292666	V3-058 E	0.3
292668	V3-059 E	0.3
292681	V3-069 E	0.33
902002	W1-121 E	0.34
902251	W2-023	202.76
902652	W2-052E	0.13
903961	W3-077C	-0.36
905642	W4-080 E	3.33
909452	X2-088 E	0.21
909462	X2-089 E	0.46
910562	X3-007 E	0.11
910612	X3-029 E	-0.78
910712	X3-052 E	-0.46
913101	Y1-026	75.93
915251	Y3-049 1	0.79
915252	Y3-049 2	0.79
915253	Y3-049 3	0.79
915271	Y3-051 C	2.67
915272	Y3-051 E1	33.77

Appendix 6

(PSEG - PSEG) The WARINANC-ALDENE1 230 kV line (from bus 218316 to bus 217122 ckt 1) loads from 147.56% to 151.65% (**DC power flow**) of its emergency rating (887 MVA) for the tower line contingency outage of '36PS'. This project contributes approximately 36.3 MW to the thermal violation.

CONTINGENCY '36PS' /* DEANS-WESTFIELD 230KV & SEWAREN(PIERSON AVE) -ROSELAND 230KV DCTL
DISCONNECT BRANCH FROM BUS 218306 TO BUS 218356 CKT 1
DISCONNECT BRANCH FROM BUS 218356 TO BUS 218305 CKT 1
DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1
DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1
DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1
MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402 /* PRSN AVG T1 T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384 /* PRSN AVG T1 KILMER T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399 /* PRSN AVG T1 NEWDVR T2
MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390 /* PRSN AVG T1 LAFAYET T2
MOVE 100 PERCENT LOAD FROM BUS 218415 TO BUS 218416 /* WESTFIELD T1 T2
MOVE 100 PERCENT LOAD FROM BUS 218380 TO BUS 218381 /* FANWOOD T2 T1
END

Bus Number	Bus Name	Full Contribution
218326	EDISON 1	32.8
218327	EDISON 2	32.79
218328	EDISON 3	32.8
206617	EXXON	-0.37
218423	LINDNCT1	2.98
218424	LINDNCT2	2.98
218425	LINDNCT3	2.98
218426	LINDNST1	5.83
206679	M&M S721	-0.91
94130	O66_NONFIRM	54.06
206638	PEAPACK	-0.36
290745	S-061	0.42
218360	SEWAREN1	32.17
218361	SEWAREN2	34.67
218362	SEWAREN3	31.45
218363	SEWAREN4	34.83
218364	SEWAREN6	31.15
218344	TOSCONUG	2.49
293093	U2-077	304.78

292094	V1-030 C1	0.02
292095	V1-030 E1	0.63
292185	V1-030 E2	0.75
292101	V1-030 E4	0.07
292103	V1-030 E5	0.18
292107	V1-030 E7	0.11
292189	V1-030 EA	0.51
292078	V1-034	0.46
297021	V2-009 E1	0.22
297023	V2-009 E2	0.44
297025	V2-009 E3	0.46
297027	V2-009 E4	0.3
293378	V3-024 E	0.89
292666	V3-058 E	0.3
292668	V3-059 E	0.3
292681	V3-069 E	0.32
900801	W1-001	7.26
902002	W1-121 E	0.33
902251	W2-023	201.06
902652	W2-052E	0.13
903961	W3-077C	-0.35
905642	W4-080 E	3.29
909452	X2-088 E	0.21
909462	X2-089 E	0.46
910562	X3-007 E	0.11
910612	X3-029 E	-0.78
910712	X3-052 E	-0.46
913101	Y1-026	75.7
915251	Y3-049 1	0.78
915252	Y3-049 2	0.78
915253	Y3-049 3	0.78
915271	Y3-051 C	2.66
915272	Y3-051 E1	33.65

Appendix 7

(PSEG - PSEG) The G22_MTX5-WARINANC 230 kV line (from bus 218441 to bus 218316 ckt 1) loads from 161.74% to 167.42% (**DC power flow**) of its emergency rating (821 MVA) for the tower line contingency outage of 'PS_GO'. This project contributes approximately 46.61 MW to the thermal violation.

```
CONTINGENCY 'PS_GO'                                    /*DEANS-LINDENG_
WOODBRIDGE TO SEWAREN O
  DISCONNECT BRANCH FROM BUS 218354 TO BUS 218306 CKT 2          /* PRSN AVG
DEANS 230 230
  DISCONNECT BRANCH FROM BUS 218354 TO BUS 218300 CKT 1          /*
MINUESTG LINDEN 230 230
  DISCONNECT BRANCH FROM BUS 218357 TO BUS 218355 CKT 1          /*PRSB AVG
NEW DOVER 230 230
  DISCONNECT BRANCH FROM BUS 218355 TO BUS 218320 CKT 1          /* NEW
DOVER FANWOOD 230 230
  DISCONNECT BRANCH FROM BUS 218320 TO BUS 216950 CKT 1          /* FANWOOD
ROSELAND 230 230
  MOVE 49 PERCENT LOAD FROM BUS 218401 TO BUS 218402           /* PRSN AVG
T1 T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218384           /* PRSN AVG
T1 KILMER T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218399           /* PRSN AVG
T1 NEWDVR T2
  MOVE 17 PERCENT LOAD FROM BUS 218401 TO BUS 218390           /* PRSN AVG
T1 LAFAYET T2
  MOVE 52 PERCENT LOAD FROM BUS 218396 TO BUS 218397           /* MINUESTR
T2 T1
  MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218410           /* MINUESTR
T2 WARINAN T1
  MOVE 24 PERCENT LOAD FROM BUS 218396 TO BUS 218414           /* MINUESTR
T2 WDBRDG T1
  END
```

Bus Number	Bus Name	Full Contribution
218326	EDISON 1	34.4
218327	EDISON 2	34.38
218328	EDISON 3	34.4
218423	LINDNCT1	3.83
218424	LINDNCT2	3.83
218425	LINDNCT3	3.83
218426	LINDNST1	7.48
206679	M&M S721	-0.56
94130	O66_NONFIRM	32.98
206638	PEAPACK	-0.22
290745	S-061	0.53
218360	SEWAREN1	38.11
218361	SEWAREN2	40.59

218362	SEWAREN3	36.82
218363	SEWAREN4	40.32
218364	SEWAREN6	36.06
218344	TOSCONUG	3.15
293093	U2-077	383.44
292094	V1-030 C1	0.02
292095	V1-030 E1	0.81
292185	V1-030 E2	0.79
292101	V1-030 E4	0.07
292103	V1-030 E5	0.15
292107	V1-030 E7	0.11
292189	V1-030 EA	0.29
292078	V1-034	0.28
297021	V2-009 E1	0.22
297023	V2-009 E2	0.45
297027	V2-009 E4	0.3
293378	V3-024 E	0.9
292666	V3-058 E	0.28
292668	V3-059 E	0.28
292681	V3-069 E	0.37
900801	W1-001	9.13
902002	W1-121 E	0.29
902251	W2-023	240.24
902652	W2-052E	0.14
905642	W4-080 E	3.7
909452	X2-088 E	0.21
909462	X2-089 E	0.51
913101	Y1-026	95.71
915251	Y3-049 1	0.82
915252	Y3-049 2	0.82
915253	Y3-049 3	0.82
915271	Y3-051 C	3.41
915272	Y3-051 E1	43.2