

***Generation Interconnection  
Feasibility Study Report***

***For***

***PJM Generation Interconnection Request Queue  
Position Y3-001***

***Hudson 230 kV***

**December / 2013**

## General

The Interconnection Customer (IC) is proposing Queue project Y3-001 to install a 2 x1 Combined Cycle Natural Gas Generator at Hudson 230 kV substation. The Maximum Facility Output (MFO) is 705 MW. The capacity (MWC) is 660 MW.

The planned in service date is May 31, 2017

## Network Impacts

The Queue Project #Y3-001 was studied as a 705.0 MW (Capacity 660.0 MW) injection at the Hudson 1 – 24 kV substation in the PSEG area. Project #Y3-001 was evaluated for compliance with reliability criteria for summer peak conditions in 2017. Potential network impacts were as follows:

Potential network impacts were as follows:

Table 1 – Y3-001 Contingencies	
Contingency Name	Description
KRNY-MARN	CONTINGENCY 'KRNY-MARN' /* KEARNY-HUDSON 230KV **BRH OPTION 4 TRIP LINE FROM BUS 217001 TO BUS 217060 CKT 1 END

## Generator Deliverability

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

Table 2 below provides a summary of the impacts caused by Y3-001 on the PSE&G transmission system and other TO areas for generator deliverability:

Table 2 - Y3-001 Generator Deliverability												
#	Contingency		Facility Description	Bus			Loading		Rating		MW Cont.	FG App.
	Type	Name		From	To	Cir.	Initial	Final	Type	MVA		
1	Non	Non	HUDSN1-6-S WTRFRP 230 kV line	217000	217117	1	60.69	110.22	NR	512	253.6	1
2	N-1	KRNY-MARN	HUDSN1-6-S WTRFRP 230 kV line	217000	217117	1	89.99	118.33	ER	789	223.5	2

## 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)*

None

## 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.*

#	Contingency		Facility Description	Bus			Loading		Rating		MW Cont.	FG App.
	Type	Name		From	To	Cir.	Initial	Final	Type	MVA		
3	Non	Non	HUDSN1-6-S WTRFRP 230 kV line	217000	217117	1	47.68	100.58	NR	512	270.9	
4	N-1	KRNY-MARN	HUDSN1-6-S WTRFRP 230 kV line	217000	217117	1	77.86	108.13	ER	789	238.8	

## Short Circuit

*(Summary of impacted circuit breakers)*

The short circuit analysis of the Y3-001 queue project **Hudson 230 kV**. Two options were considered during this study: the first option was a direct connection to HUDSN1-6, while the second option was a direct connection to HUDSN7-12. Our analysis found **9 new breakers** for option 1 and **8 new breakers** for option 2, to be over-duty in the PSEG transmission area. The new over-duty breakers are listed below:

### Option 1

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
5040	HUDSN1-6 230.kV	1HA	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	1HB	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	2HA	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	2HB	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	3HA	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	3HC	S	109.70%	99.40%	10.30%	New Over-duty	109.7	87785	80000
5040	HUDSN1-6 230.kV	2HC	S	105.70%	95.20%	10.50%	New Over-duty	105.7	84566.9	80000
5040	HUDSN1-6 230.kV	3HB	S	104.40%	93.90%	10.50%	New Over-duty	104.4	83523.2	80000

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
4990	HDSN7-12 230.kV	4HB	S	101.40%	96.30%	5.10%	New Over-duty	101.4	81092.8	80000

## Option 2

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
4990	HDSN7-12 230.kV	4HB	S	106.30%	96.30%	10.00%	New Over-duty	106.3	85031.3	80000
4990	HDSN7-12 230.kV	6HC	S	104.20%	94.20%	10.00%	New Over-duty	104.2	83346.4	80000
5040	HUDSN1-6 230.kV	1HA	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000
5040	HUDSN1-6 230.kV	1HB	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000
5040	HUDSN1-6 230.kV	2HA	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000
5040	HUDSN1-6 230.kV	2HB	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000
5040	HUDSN1-6 230.kV	3HA	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000
5040	HUDSN1-6 230.kV	3HC	S	104.10%	99.40%	4.70%	New Over-duty	104.1	83268.5	80000

In addition, the analysis also showed a significant fault contribution (i.e. above 3%) to the breakers, which were already identified as over-duty. The breakers are listed below:

## Option 1

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
5048	NEWPRTR 230.kV	23H	S	142.40%	134.70%	7.70%	Over 100%, > 3% contribution	142.4	71195.8	50000
4992	KRNY 230.kV	Krny 12	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny 13	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny 15	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny1	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny10	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny3	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny4	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny6	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny7	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny9	S	123.00%	116.70%	6.30%	Over 100%, > 3% contribution	123	98433.2	80000
4992	KRNY 230.kV	Krny 11	S	120.90%	114.60%	6.30%	Over 100%, > 3% contribution	120.9	96718.4	80000
5043	NJT MDW 230.kV	EAST	T	120.10%	115.40%	4.70%	Over 100%, > 3% contribution	120.1	90812.3	75597.7
5043	NJT MDW 230.kV	WEST	T	120.10%	115.40%	4.70%	Over 100%, > 3% contribution	120.1	90812.3	75597.7
4992	KRNY 230.kV	Krny5	S	120.00%	113.70%	6.30%	Over 100%, > 3% contribution	120	95991.4	80000
4992	KRNY 230.kV	krny2	S	120.00%	113.70%	6.30%	Over 100%, > 3% contribution	120	95974.4	80000
5054	ESSEX 230.kV	Bkr 12	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 13	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
5054	ESSEX 230.kV	Bkr 3	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 4	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 6	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 7	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 8	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
5054	ESSEX 230.kV	Bkr 9	S	119.90%	114.60%	5.30%	Over 100%, > 3% contribution	119.9	95898.2	80000
4992	KRNY 230.kV	Krny 14	S	119.90%	113.80%	6.10%	Over 100%, > 3% contribution	119.9	95938.2	80000
5054	ESSEX 230.kV	Bkr 5	S	117.30%	112.00%	5.30%	Over 100%, > 3% contribution	117.3	93806.2	80000
5054	ESSEX 230.kV	Bkr 10	S	117.10%	112.40%	4.70%	Over 100%, > 3% contribution	117.1	93675.4	80000
4992	KRNY 230.kV	Krny8	S	117.00%	110.90%	6.10%	Over 100%, > 3% contribution	117	93579.8	80000
5043	NJT MDW 230.kV	SECT 1-2 TIE	T	113.40%	109.00%	4.40%	Over 100%, > 3% contribution	113.4	85748.8	75597.7
5037	BERGEN 230.kV	GSU1	S	112.30%	109.00%	3.30%	Over 100%, > 3% contribution	112.3	70765	63000
5037	BERGEN 230.kV	GSU2	S	112.30%	109.00%	3.30%	Over 100%, > 3% contribution	112.3	70770.8	63000
5037	BERGEN 230.kV	GSU3	S	111.30%	107.90%	3.40%	Over 100%, > 3% contribution	111.3	70089.1	63000
4990	HDSN7-12 230.kV	4HA	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	4HC	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	5HA	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	5HB	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	6HA	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	6HB	S	107.70%	102.70%	5.00%	Over 100%, > 3% contribution	107.7	86155.5	80000
4990	HDSN7-12 230.kV	5HC	S	106.30%	101.50%	4.80%	Over 100%, > 3% contribution	106.3	85026.1	80000
5170	NWK BAY 230.kV	Bkr 1	S	105.70%	101.60%	4.10%	Over 100%, > 3% contribution	105.7	66599.2	63000

## Option 2

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
5048	NEWPRTR 230.kV	23H	S	142.70%	134.70%	8.00%	Over 100%, > 3% contribution	142.7	71328.2	50000
4992	KRNY 230.kV	Krny 12	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny 13	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny 15	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny1	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny10	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny3	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000

BUS_NO	BUS	BREAKER	Rating Type	With Y3-001	Without Y3-001	Difference	Note	DUTY_P	DUTY_A	BKR_CAPA
4992	KRNY 230.kV	Krny4	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny6	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny7	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny9	S	122.60%	116.70%	5.90%	Over 100%, > 3% contribution	122.6	98048	80000
4992	KRNY 230.kV	Krny 11	S	120.40%	114.60%	5.80%	Over 100%, > 3% contribution	120.4	96336.7	80000
5043	NJT MDW 230.kV	EAST	T	119.80%	115.40%	4.40%	Over 100%, > 3% contribution	119.8	90562.1	75597.7
5043	NJT MDW 230.kV	WEST	T	119.80%	115.40%	4.40%	Over 100%, > 3% contribution	119.8	90562.1	75597.7
4992	KRNY 230.kV	Krny5	S	119.50%	113.70%	5.80%	Over 100%, > 3% contribution	119.5	95609.5	80000
4992	KRNY 230.kV	krny2	S	119.50%	113.70%	5.80%	Over 100%, > 3% contribution	119.5	95592.5	80000
4992	KRNY 230.kV	Krny 14	S	119.40%	113.80%	5.60%	Over 100%, > 3% contribution	119.4	95548.2	80000
5054	ESSEX 230.kV	Bkr 12	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 13	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 3	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 4	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 6	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 7	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 8	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 9	S	119.30%	114.60%	4.70%	Over 100%, > 3% contribution	119.3	95443.1	80000
5054	ESSEX 230.kV	Bkr 10	S	116.90%	112.40%	4.50%	Over 100%, > 3% contribution	116.9	93500	80000
5054	ESSEX 230.kV	Bkr 5	S	116.70%	112.00%	4.70%	Over 100%, > 3% contribution	116.7	93352.6	80000
4992	KRNY 230.kV	Krny8	S	116.60%	110.90%	5.70%	Over 100%, > 3% contribution	116.6	93285.2	80000
5043	NJT MDW 230.kV	SECT 1-2 TIE	T	113.10%	109.00%	4.10%	Over 100%, > 3% contribution	113.1	85497.9	75597.7
4990	HDSN7-12 230.kV	4HA	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	4HC	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	5HA	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	5HB	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	6HA	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	6HB	S	112.70%	102.70%	10.00%	Over 100%, > 3% contribution	112.7	90185.2	80000
4990	HDSN7-12 230.kV	5HC	S	111.50%	101.50%	10.00%	Over 100%, > 3% contribution	111.5	89235.5	80000
5170	NWK BAY 230.kV	Bkr 1	S	105.50%	101.60%	3.90%	Over 100%, > 3% contribution	105.5	66434.6	63000

## **New System Reinforcements**

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

#	Contingency Type	Contingency Name	Facility Description	Description	Schedule	Cost
1	Non	Non	HUDSN1-6-S WTRFRP 230 kV line	(PSEG - PSEG) The HUDSN1-6-S WTRFRP 230 kV line: Add circulation for one Hudson – S. Waterfront 230 kV cables.	3 years	\$18 M
2	N-1	KRNY-MARN	HUDSN1-6-S WTRFRP 230 kV line	Same as #1		

## **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)*

None

## **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.*

## **Short Circuit – Breaker Costs**

To be determined during the Impact Study

## **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 HUDSN1-6-S WTRFRP 230 kV line (from bus 217000 to bus 217117 ckt 1) loads from 60.69% to 110.22% (**DC power flow**) of its normal rating (512 MVA) for non-contingency condition. This project contributes approximately 253.59 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
216908	BAYONNE	2.38
217079	ESSEX	0.43
217076	ESSEX 10	17.14
217077	ESSEX 11	18.78
217078	ESSEX 12	21.99
217083	KEARNY11	13.7
217086	KRNY9&10	2.03
217113	NWK BAY	0.64
94130	O66_NONFIRM	17.79
292142	T-041 1	0.21
292143	T-041 2	0.21
292144	T-041 3	0.21
292145	T-041 4	0.21
292146	T-042 1	0.21
292147	T-042 2	0.21
292331	T-107 1ST	1.67
292332	T-107 2CT	0.84
292333	T-107 3CT	0.84
292078	V1-034	0.15
293443	V3-065 C	< 0.01

<b>Bus Number</b>	<b>Bus Name</b>	<b>Full Contribution</b>
903581	W3-039C	0.15
909131	X2-050 C	78.89
910531	X3-004	0.19
912101	X4-016	0.57
914281	Y2-083 C OP1	20.21
915001	Y3-001 C OP1	253.59

## Appendix 2

(PSEG - PSEG) The HUDSN1-6-S WTRFRP 230 kV line (from bus 217000 to bus 217117 ckt 1) loads from 89.99% to 118.33% (**DC power flow**) of its emergency rating (789 MVA) for the single line contingency outage of 'KRNY-MARN'. This project contributes approximately 223.54 MW to the thermal violation.

CONTINGENCY 'KRNY-MARN'

/\* KEARNY-HUDSON 230KV

\*\*BRH OPTION 4

TRIP LINE FROM BUS 217001 TO BUS 217060 CKT 1

END

Bus Number	Bus Name	Full Contribution
217079	ESSEX	0.84
217076	ESSEX 10	28.55
217077	ESSEX 11	31.31
217078	ESSEX 12	42.72
217083	KEARNY11	29.79
217086	KRNY9&10	4.75
217146	KRNYCT12	0.89
217147	KRNYCT34	0.89
217113	NWK BAY	1.25
94130	O66_NONFIRM	42.49
292142	T-041 1	0.46
292143	T-041 2	0.46
292144	T-041 3	0.46
292145	T-041 4	0.46
292146	T-042 1	0.45
292147	T-042 2	0.45
292331	T-107 1ST	3.25

Bus Number	Bus Name	Full Contribution
292332	T-107 2CT	1.63
292333	T-107 3CT	1.63
292078	V1-034	0.36
909131	X2-050 C	153.25
910531	X3-004	0.36
914281	Y2-083 C OP1	33.69
915001	Y3-001 C OP1	223.54

## Sensitivity Analysis for Option 2

### Network Impacts

The Queue Project #Y3-001 was studied as a 705.0 MW (Capacity 660.0 MW) injection at the HDSN7-12 24 kV substation in the PSEG area. Project #Y3-001 was evaluated for compliance with reliability criteria for summer peak conditions in 2017. Potential network impacts were as follows:

### Generator Deliverability

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

1. (PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 71.87% to 100.71% (**DC power flow**) of its emergency rating (789 MVA) for the single line contingency outage of 'KARNY-MARU'. This project contributes approximately 227.52 MW to the thermal violation.

CONTINGENCY 'KARNY-MARU'

/\* KEARNY-HUDSON 138KV

\*\*BRH OPTION 4

TRIP LINE FROM BUS 217000 TO BUS 217061 CKT 1

END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 60.16% to 109.13% (**DC power flow**) of its normal rating (512 MVA) for non-contingency condition. This project contributes approximately 250.76 MW to the thermal violation.

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

### Light Load Analysis

Light Load Studies to be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

### Multiple Facility Contingency

*(Double Circuit Tower Line, Failed Breaker and Bus Fault contingencies for the full energy output)*

1. (PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 73.01% to 108.92% (**DC power flow**) of its emergency rating (789 MVA) for the

line fault with failed breaker contingency outage of 'PS66C'. This project contributes approximately 283.33 MW to the thermal violation.

```
CONTINGENCY 'PS66C'                                /* HUDSON
DISCONNECT BRANCH FROM BUS 217001 TO BUS 217066 CKT 1
DISCONNECT BRANCH FROM BUS 217001 TO BUS 217137 CKT 1      /* HDSN7-12
MARION 230 230
END
```

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

2. (PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 63.74% to 112.74% (**DC power flow**) of its emergency rating (789 MVA) for the line fault with failed breaker contingency outage of 'PS65'. This project contributes approximately 386.63 MW to the thermal violation.

```
CONTINGENCY 'PS65'                                /* HUDSON BUS BREAKER TO
PENHORN
DISCONNECT BRANCH FROM BUS 216909 TO BUS 217001 CKT 1      /*
BELLEVILLE HDSN7-12 230 230
DISCONNECT BRANCH FROM BUS 217001 TO BUS 217093 CKT 1      /* HDSN7-12
PENHRN Y 230 230
DISCONNECT BRANCH FROM BUS 217093 TO BUS 216999 CKT 1      /* PENHRN Y
49TH STY 230 230
DISCONNECT BRANCH FROM BUS 216999 TO BUS 217072 CKT 1      /* 49TH STY
HOBOKN Y 230 230
DISCONNECT BRANCH FROM BUS 217072 TO BUS 217074 CKT 1      /* HOBOKN
Y NEWPRT Y 230 230
DISCONNECT BRANCH FROM BUS 216909 TO BUS 217098 CKT 2      /*
BELLVILLE T2
MOVE 100 PERCENT LOAD FROM BUS 216977 TO BUS 216976        /* HOBOKN T2
T1
MOVE 100 PERCENT LOAD FROM BUS 217033 TO BUS 217032        /* NEWPRT T2
T1
END
```

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

### **Short Circuit**

*(Summary form of Cost allocation for breakers will be inserted here if any)*

To be determined

### **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)*

None

### **Steady-State Voltage Requirements**

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

To be determined

### **Stability and Reactive Power Requirement**

*(Results of the dynamic studies should be inserted here)*

To be determined

### **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)*

*(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)*

None

### **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.

1. (PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 60.16% to 112.48% (**DC power flow**) of its normal rating (512 MVA) for non-contingency condition. This project contributes approximately 267.86 MW to the thermal violation.

## **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 HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 71.87% to 100.71% (**DC power flow**) of its emergency rating (789 MVA) for the single line contingency outage of 'KARNY-MARU'. This project contributes approximately 227.52 MW to the thermal violation.

CONTINGENCY 'KARNY-MARU'

/\* KEARNY-HUDSON 138KV

\*\*BRH OPTION 4

TRIP LINE FROM BUS 217000 TO BUS 217061 CKT 1

END

Bus Number	Bus Name	Full Contribution
217076	ESSEX 10	10.49
217077	ESSEX 11	11.5
217078	ESSEX 12	14.21
217112	HUDSON 2	8.88
217083	KEARNY11	13.32
217086	KARNY9&10	2.21
217146	KARNYCT12	0.41
217147	KARNYCT34	0.41
94130	O66_NONFIRM	43.57
292142	T-041 1	0.2
292143	T-041 2	0.2
292144	T-041 3	0.2
292145	T-041 4	0.2
292146	T-042 1	0.2
292147	T-042 2	0.2
292331	T-107 1ST	1.08
292332	T-107 2CT	0.54
292333	T-107 3CT	0.54
292078	V1-034	0.37

905291	W4-038	0.37
907341	X1-098	< 0.01
909131	X2-050 C	50.98
914281	Y2-083 C OP1	12.37
915001	Y3-001 C OP2	227.52

## Appendix 2

(PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 73.01% to 108.92% (**DC power flow**) of its emergency rating (789 MVA) for the line fault with failed breaker contingency outage of 'PS66C'. This project contributes approximately 283.33 MW to the thermal violation.

```
CONTINGENCY 'PS66C'                                /* HUDSON
DISCONNECT BRANCH FROM BUS 217001 TO BUS 217066 CKT 1
DISCONNECT BRANCH FROM BUS 217001 TO BUS 217137 CKT 1    /* HDSN7-12
MARION 230 230
END
```

Bus Number	Bus Name	Full Contribution
217112	HUDSON 2	10.35
94130	O66_NONFIRM	28.62
292078	V1-034	0.24
905291	W4-038	0.43
907341	X1-098	< 0.01
915001	Y3-001 C OP2	265.24
915002	Y3-001 E OP2	18.08

### **Appendix 3**

(PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 60.16% to 109.13% (**DC power flow**) of its normal rating (512 MVA) for non-contingency condition. This project contributes approximately 250.76 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
216908	BAYONNE	2.2
217023	COGEN TE	0.37
217112	HUDSON 2	9.79
94130	O66_NONFIRM	27.65
292078	V1-034	0.24
901801	W1-101 C	< 0.01
903581	W3-039C	0.14
905291	W4-038	0.41
907341	X1-098	< 0.01
912101	X4-016	0.52
915001	Y3-001 C OP2	250.76

## Appendix 4

(PSEG - PSEG) The HDSN7-12-S WTRFRP 230 kV line (from bus 217001 to bus 217117 ckt 2) loads from 63.74% to 112.74% (**DC power flow**) of its emergency rating (789 MVA) for the line fault with failed breaker contingency outage of 'PS65'. This project contributes approximately 386.63 MW to the thermal violation.

```

CONTINGENCY 'PS65'                               /* HUDSON BUS BREAKER TO
PENHORN
  DISCONNECT BRANCH FROM BUS 216909 TO BUS 217001 CKT 1 /*
BELLEVILLE HDSN7-12 230 230
  DISCONNECT BRANCH FROM BUS 217001 TO BUS 217093 CKT 1 /* HDSN7-12
PENHRN Y 230 230
  DISCONNECT BRANCH FROM BUS 217093 TO BUS 216999 CKT 1 /* PENHRN Y
49TH STY 230 230
  DISCONNECT BRANCH FROM BUS 216999 TO BUS 217072 CKT 1 /* 49TH STY
HOBOKN Y 230 230
  DISCONNECT BRANCH FROM BUS 217072 TO BUS 217074 CKT 1 /* HOBOKN
Y NEWPRT Y 230 230
  DISCONNECT BRANCH FROM BUS 216909 TO BUS 217098 CKT 2 /*
BELLVILLE T2
  MOVE 100 PERCENT LOAD FROM BUS 216977 TO BUS 216976 /* HOBOKN T2
T1
  MOVE 100 PERCENT LOAD FROM BUS 217033 TO BUS 217032 /* NEWPRT T2
T1
END
  
```

Bus Number	Bus Name	Full Contribution
216908	BAYONNE	5.42
218435	C-001 1CT	1.08
218436	C-001 2ST	1.62
217023	COGEN TE	0.91
217076	ESSEX 10	18.16
217077	ESSEX 11	19.89
217078	ESSEX 12	18.4
217112	HUDSON 2	14.12
217083	KEARNY11	14.69
217086	KRNY9&10	2.53

217147	KRNYCT34	0.47
218318	LINDENAB	0.21
94130	O66_NONFIRM	34.24
292092	V1-030 ED	0.31
292078	V1-034	0.29
297069	V2-025 E	0.28
293444	V3-065 E	0.04
293434	V3-067 E	0.06
293429	V3-068 E	0.03
901801	W1-101 C	< 0.01
901802	W1-101 E	0.11
903581	W3-039C	0.34
903582	W3-039E	2.25
905291	W4-038	0.59
909131	X2-050 C	66.01
909132	X2-050 E	4.5
909442	X2-087 E	0.07
910712	X3-052 E	0.32
912101	X4-016	1.29
914281	Y2-083 C OP1	21.4
914282	Y2-083 E OP1	2.16
915001	Y3-001 C OP2	361.95
915002	Y3-001 E OP2	24.68