

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position Y1-025***

Raritan River 230kV

September 2012

Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

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. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC), has proposed a combined cycle generating facility located in Woodbridge, New Jersey. The installed facilities will have a total capability of 785 MW with 725 MW of this output being recognized by PJM as capacity. This means that the remaining 60 MW will be curtailable should a system reliability constraint occur. The proposed in-service date for this project is June 15, 2015. **This study does not imply a FirstEnergy commitment to this in-service date.**

Point of Interconnection

Y1-025 will interconnect with the transmission system at one of two options. Option 1 is to connect to the Jersey Central Power & Light transmission system at the Raritan River 230kV substation. Option 2 is to connect to the PSEG transmission system at the Metuchen 230kV substation.

Cost Summary

The Y1-025 project will be responsible for the following costs for the Primary Point of Interconnection (Option 1):

Description	Total Cost
Attachment Facilities	\$ 0
Direct Connection Network Upgrades	\$ 0
Non Direct Connection Network Upgrades	\$ 2,261,000
Total Costs	\$ 2,261,000

In addition, the Y1-025 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	\$ 12,513,100
Previously Identified Upgrades	\$ 64,579,800
Total Costs	\$ 77,092,900

Cost allocations for these upgrades will be provided in the System Impact Study Report.

Attachment Facilities

The Y1-025 project will connect through a radial Attachment Line from the proposed generation site to a new bus position at the Raritan River 230 kV double breaker substation. The Interconnection Customer will be responsible for acquiring all of the new right of way, easements and permits needed for this new attachment line to the boundary of the Raritan River 230 kV substation. The Interconnection Customer will also be responsible for constructing, owning, operating and maintaining this attachment line once commissioned. Note that the existing Jersey Central right of way is fully utilized and is not available for use by the Interconnection Customer. Since the path for the attachment line is not yet defined, no Jersey Central costs to accommodate the construction of this new line are defined in this report.

The single line for this connection is shown in Attachment 1.

Non-Direct Connection Cost Estimate

Based on a review by the FE Substation Engineering group, due to space constraints at the peninsular Raritan River 230 substation the Raritan River 115 kV substation will need to be physically moved to make room for the Y1-025 Project connection. The proposed plan is to relocate the 115 kV facilities to an adjacent area where 69 kV facilities were once located that supported the retired Sayreville 1, 2 and 3 units. The remaining 69 kV facilities will be removed and a new 115 kV substation constructed using the existing facilities where possible. The relocation of the 115 kV substation is already required for the W4-009 project. Therefore the Y1-025 project will only be responsible for expanding the 230 kV bus by one additional bay. If the W4-009 project withdraws from the queue process then the 115 kV substation relocation costs would transfer to the Y1-025 Project. Since FE does not own the property at the Raritan River substation, the Interconnection Customer will be required to provide both the easements and the permits necessary to expand the Raritan River 230 kV substation.

In summary, Attachment 2 shows an aerial view of the Raritan River substation with the location of the 230 kV, 115 kV and now retired 69 kV facilities identified. As identified, the Interconnection Customer will be expected to extend the project radial connection line to a riser pole or structure adjacent to the 230 kV substation position identified. Since the Y1-025 Project substation is not located within the Jersey Central service territory, the project construction and station power may need to be provided from PSEG. A summary of the Y1-025 Project Direct Connection facilities that will be required are shown below. The estimated costs for these facilities are **\$2,261,000**. These costs do not include a CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge. This tax may or may not be charged based on whether or not this project meets the eligibility requirements of IRS Notice 88-129.

- Extend the 230kV double breaker substation bus facilities for one new position
- Construct new center termination structure for project Attachment Line.
- Install two new 3000 amp, 80 kA interrupting breakers
- Install four new 3000 amp disconnect switches
- Use bundled (2) 1590 ACSR conductor for substation conductor

- Install fiber optic runs and panels to support project Attachment Line connection
- Miscellaneous metering, RTU, and SCADA
- Engineering oversight and commissioning support

Interconnection Customer Requirements

In addition to the FE facilities, the Interconnection Customer will also be responsible for meeting all criteria as specified in the applicable sections of the "FE Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
2. The purchase and installation of the standard voice grade (analog) telephone line and associated conduit between the telephone company source and the meter socket or enclosure.
3. The purchase and installation of a 230 kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.
4. The purchase and installation of a revenue class meter for the Interconnection Customer unit to measure the power delivered in compliance with the FE standards.
5. A compliance with the FE and PJM generator power factor and voltage control requirements.
6. Since the location of the Y1-025 Project is in PSEG territory, it will be the responsibility of the Interconnection Customer to arrange the agreements for local station and back up service in compliance with the existing PJM and State tariffs prior to energizing the connection line to the Raritan River substation.
7. The purchase and installation of supervisory control and data acquisition (SCADA) equipment to provide information in a compatible format to the FE Transmission System Control Center. The RTU, the communications channel and all related equipment will be furnished and maintained by the Interconnection Customer. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.
8. The following status and metering points will be required:
 - a. Interconnection breaker position.
 - b. Generator real and reactive power output measured at the high-side of the generator step-up transformer.
 - c. Generator voltage at the point of interconnection.

9. The establishment of dedicated communication circuits for SCADA report to the FE Transmission System Control Center.
10. The construction of the 230 kV attachment line from the Y1-025 Project site to a structure adjacent to the Raritan River bus bay extension for its connection.
11. The Interconnection Customer will not excavate, construct facilities or locate its attachment line under the existing FE transmission facilities or on FE right-of-ways without the express permission of FE.

Revenue Metering and SCADA Requirements

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

FirstEnergy Requirements

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

<http://www.firstenergycorp.com/feconnect>

<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

Network Impacts – Option 1

The Queue Project #Y1-025 was studied as a(n) 725.0MW(Capacity725.0MW) injection at RAR RVR 230 kV substation in the JCPL area. Project #Y1-025 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
37PS_B	CONTINGENCY '37PS_B' /*LAKE NELSON-RARITAN RIVER DCTL DISCONNECT BRANCH FROM BUS 206305 TO BUS 218332 /* RARITAN RIVER KILMER W 230 230 DISCONNECT BRANCH FROM BUS 218334 TO BUS 218332 /* LK NELSON KILMER W 230 230 DISCONNECT BRANCH FROM BUS 218332 TO BUS 218386 /* KILMER T2 /* KILMER T1. FEB. 10, 2009 DISCONNECT BRANCH FROM BUS 218332 TO BUS 218387 /* KILMER T4 /* KILMER T3. FEB. 10, 2009. DISCONNECT BRANCH FROM BUS 206305 TO BUS 218331 /* RARITAN RIVER KILMER I 230 230 DISCONNECT BRANCH FROM BUS 218333 TO BUS 218331 /* KILMER LAKE NELSON 230 230 DISCONNECT BRANCH FROM BUS 218333 TO BUS 218427 /* LAKE NELSON 230 69 MOVE 50 PERCENT LOAD FROM BUS 218427 TO BUS 218348 /* LK NELSON 69 BRIDGWTR 26 MOVE 50 PERCENT LOAD FROM BUS 218427 TO BUS 218349 /* LK NELSON 69 BRIDGWTR 69 END
B_CNJ2-SX- #18_W4_021_B	CONTINGENCY 'B_CNJ2-SX-#18_W4_021_B' /* FRENEAU - PARLIN (K1025) 230 KV & FRENEAU BANK 1 DISCONNECT BRANCH FROM BUS 905190 TO BUS 206298 CKT 1 END
B_CNJ2-SX- #8_W4_021_A	CONTINGENCY 'B_CNJ2-SX-#8_W4_021_A' /* ATLANTIC - SOUTH RIVER (P1030) 230 KV DISCONNECT BRANCH FROM BUS 206286 TO BUS 905180 CKT 1 / BUS 206321 -> 295951 DUE TO R11. FEB. 17, 2009. END
B_CNJ2-SX- #8_W4_021_B	CONTINGENCY 'B_CNJ2-SX-#8_W4_021_B' /* ATLANTIC - SOUTH RIVER (P1030) 230 KV DISCONNECT BRANCH FROM BUS 905180 TO BUS 295951 CKT 1 / BUS 206321 -> 295951 DUE TO R11. FEB. 17, 2009. END
B_NJC2-SX-#10	CONTINGENCY 'B_NJC2-SX-#10' /* RARITAN RIVER - LAKE NELSON (I1023) 230 KV LINE DISCONNECT BUS 218331 END

Contingency Name	Description
B_NJC2-SX-#12	CONTINGENCY 'B_NJC2-SX-#12' /* RARITAN RIVER - LAKE NELSON (W1037) 230 KV LINE DISCONNECT BUS 218332 END
B_NJC2-SX-#9	CONTINGENCY 'B_NJC2-SX-#9' /* GILLETTE - LAKE NELSON (I1023) 230 KV LINE DISCONNECT BRANCH FROM BUS 218302 TO BUS 218348 CKT 2 DISCONNECT BRANCH FROM BUS 218333 TO BUS 218388 CKT 1 DISCONNECT BUS 218312 DISCONNECT BUS 218382 DISCONNECT BUS 218301 DISCONNECT BUS 218388 END
B_PN230-SX-#8	CONTINGENCY 'B_PN230-SX-#8' /* EAST TOWANDA - HILLSIDE (ETH) 230 KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1 END
C5_CNJ-DCT-#2	CONTINGENCY 'C5_CNJ-DCT-#2' /* RARITAN RIVER - LAKE NELSON (I1023 & W1037) 230 KV DISCONNECT BUS 218331 DISCONNECT BUS 218332 END
PS56B	CONTINGENCY 'PS56B' DISCONNECT BRANCH FROM BUS 206305 TO BUS 218331 /* RARITAN RIVER KILMER I 230 230 DISCONNECT BRANCH FROM BUS 218333 TO BUS 218331 /* KILMER LAKE NELSON 230 230 DISCONNECT BRANCH FROM BUS 218333 TO BUS 218427 /* LAKE NELSON 230 69 MOVE 100 PERCENT LOAD FROM BUS 218384 TO BUS 218386 /* KILMER I T2 T1 MOVE 100 PERCENT LOAD FROM BUS 218385 TO BUS 218387 /* KILMER I T4 T3 MOVE 50 PERCENT LOAD FROM BUS 218427 TO BUS 218348 /* LK NELSON 69 BRIDGWTR 26 MOVE 50 PERCENT LOAD FROM BUS 218427 TO BUS 218349 /* LK NELSON 69 BRIDGWTR 69 END

Contingency Name	Description
PS56D	CONTINGENCY 'PS56D' DISCONNECT BRANCH FROM BUS 206305 TO BUS 218332 /* RARITAN RIVER KILMER W 230 230 DISCONNECT BRANCH FROM BUS 218334 TO BUS 218332 /* LK NELSON KILMER W 230 230 DISCONNECT BRANCH FROM BUS 218332 TO BUS 218387 /* KILMER T3 DISCONNECT BRANCH FROM BUS 218332 TO BUS 218386 /* KILMER T1 MOVE 100 PERCENT LOAD FROM BUS 218386 TO BUS 218384 /* KILMER W T1 T2 MOVE 100 PERCENT LOAD FROM BUS 218387 TO BUS 218385 /* KILMER W T3 T4 END

Generator Deliverability

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

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To	Circuit		Initial	Final	Type	MVA	
1	N-1	B_CNJ2-SX-#8_W4_021_A	JCPL	FRENEAU-ATLANTIC 230 kV line	206292	206286	1	DC	87.3	105.98	ER	731	136.58
2	Non	Non	JCPL	W4-021 TAP-FRENEAU 230 kV line	905190	206292	1	DC	95.98	107.23	NR	650	73.09
3	N-1	B_PN230-SX-#8	PenElec/NYISO	E.SAYRE-N.WAV115 115 kV line	200676	130836	1	DC	94.89	95.86	ER	128	8.5
4	N-1	B_CNJ2-SX-#18_W4_021_B	JCPL	R11 B-W4-021 TAP 230 kV line	295951	905180	1	DC	95.27	115.82	ER	805	165.36
5	Non	Non	JCPL/PSEG	RAR RVR-KILMER W 230 kV line	206305	218332	1	DC	83.92	119.18	NR	650	229.19
6	Non	Non	JCPL/PSEG	RAR RVR-KILMER I 230 kV line	206305	218331	1	DC	81.94	116.07	NR	678	231.43
7	N-1	B_NJC2-SX-#10	JCPL/PSEG	L.NELSNW-MIDLSEX2 230 kV line	218334	218522	1	DC	88.18	128.83	ER	1000	406.54
8	N-1	B_NJC2-SX-#12	JCPL/PSEG	L.NELSN-MIDLSEX 230 kV line	218333	218301	1	DC	91.47	138.7	ER	831	392.47
9	N-1	B_CNJ2-SX-#8_W4_021_B	JCPL	WILLIAMS-W4-021 TAP 230 kV line	206298	905190	1	DC	97.9	118.6	ER	813	168.24
10	N-1	B_CNJ2-SX-#8_W4_021_B	JCPL	PARLIN-WILLIAMS 230 kV line	206322	206298	1	DC	98.6	119.31	ER	772	168.24

Multiple Facility Contingency

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without Y1-025	Duty Percent With Y1-025	Duty Percent Difference
11	JCPL	2891	S.RIVER 230.kV	BT	S	98.60	105.40	6.80
12	JCPL	2891	S.RIVER 230.kV	PA	S	95.90	102.70	6.80
13	JCPL	2891	S.RIVER 230.kV	TA	S	95.90	102.70	6.80

Contributions to previously identified circuit breakers found to be over-duty:

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without Y1-025	Duty Percent With Y1-025	Duty Percent Difference
14	JCPL	2872	RARTN RV 230.kV	G1047E	S	136.30	156.60	20.30
15	JCPL	2872	RARTN RV 230.kV	G1047F	S	136.30	156.60	20.30
16	JCPL	2872	RARTN RV 230.kV	I1023E	S	136.30	156.60	20.30
17	JCPL	2872	RARTN RV 230.kV	I1023F	S	136.30	156.60	20.30
18	JCPL	2872	RARTN RV 230.kV	T1034E	S	136.30	156.60	20.30
19	JCPL	2872	RARTN RV 230.kV	T1034F	S	136.30	156.60	20.30
20	JCPL	2872	RARTN RV 230.kV	BK15	S	129.30	149.50	20.20
21	JCPL	2882	Red Oak B 230.kV	MT1	S	129.10	139.30	10.20

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without Y1-025	Duty Percent With Y1-025	Duty Percent Difference
22	JCPL	2881	Red Oak A 230.kV	MT2	S	126.30	136.40	10.10
23	JCPL	2882	Red Oak B 230.kV	MT4	S	126.20	136.40	10.20
24	JCPL	2881	Red Oak A 230.kV	MT3	S	126.30	136.30	10.00
25	JCPL	2872	RARTN RV 230.kV	NEPTUNE B27	S	111.90	129.10	17.20
26	JCPL	2872	RARTN RV 230.kV	NEPTUNE B28	S	111.90	129.10	17.20
27	JCPL	2872	RARTN RV 230.kV	W1037E	S	111.90	129.10	17.20
28	JCPL	2872	RARTN RV 230.kV	W1037F	S	111.90	129.10	17.20
29	JCPL	2881	Red Oak A 230.kV	T1034	S	118.40	128.20	9.80
30	JCPL	2882	Red Oak B 230.kV	G1047	S	118.10	128.00	9.90
31	JCPL	90320	G07_MTX1H 230.kV	4 OTHER BRKR	S	105.10	120.10	15.00
32	JCPL	90320	G07_MTX1H 230.kV	NY LINE	S	105.10	120.10	15.00
33	JCPL	90320	G07_MTX1H 230.kV	RAR RVR LINE	S	105.10	120.10	15.00

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)

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
34	Non	Non	JCPL	W4-021 TAP-ATLANTIC 230 kV line	905180	206286	1	DC	100.02	118.67	NR	650	121.18
35	DCTL	37PS_B	JCPL	W4-021 TAP-ATLANTIC 230 kV line	905180	206286	1	DC	141.12	147.85	ER	817	336.29
36	DCTL	C5_CNJ-DCT-#2	JCPL	W4-021 TAP-ATLANTIC 230 kV line	905180	206286	1	DC	141.12	147.85	ER	817	336.29

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To	Circuit		Initial	Final	Type	MVA	
37	N-1	B_CNJ2-SX-#8_W4_021_A	JCPL	W4-021 TAP-FRENEAU 230 kV line	905190	206292	1	DC	125.14	143.16	ER	813	146.45
38	N-1	B_PN230-SX-#8	PenElec	TOWANDA-E.SAYRE 115 kV line	200674	200676	1	DC	139.35	140.29	ER	131	8.5
39	N-1	B_NJC2-SX-#10	JCPL/PSEG	KILMER W-L.NELSNW 230 kV line	218332	218334	1	DC	105.01	151.63	ER	872	406.54
40	N-1	B_NJC2-SX-#12	JCPL/PSEG	KILMER I-L.NELSNW 230 kV line	218331	218333	1	DC	105.4	152.13	ER	872	407.5
41	N-1	PS56B	JCPL/PSEG	RAR RVR-KILMER W 230 kV line	206305	218332	1	DC	123.51	173.84	ER	805	405.21
42	N-1	PS56D	JCPL/PSEG	RAR RVR-KILMER I 230 kV line	206305	218331	1	DC	123.86	174.02	ER	813	407.5

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

Will be confirmed in the System Impact Study.

Stability and Reactive Power Requirement for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

Will be confirmed in the System Impact Study.

New System Reinforcements

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

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
1	FRENEAU-ATLANTIC 230 kV line	(Atlantic substation: Replace wave trap with 2000 amp facility.	Pending	\$ 86,800
2	W4-021 TAP-FRENEAU 230 kV line	This overload will be mitigated by the upgrade in Item #37 below	N/A	\$ 0
3	E.SAYRE-N.WAV115 115 kV line	Open the North Waverly – East Sayre 115kV line per the operating procedure in PJM Manual 3.	N/A	\$ 0
4	R11 B-W4-021 TAP 230 kV line	Transmission Line: Reconductor with 1590 Kcmil 45/7 ACSS conductor (1.2 miles)	Pending	\$ 1,363,800
5	RAR RVR-KILMER W 230 kV line	This overload will be mitigated by the upgrade in Item #41 below	N/A	\$ 0
6	RAR RVR-KILMER I 230 kV line	This overload will be mitigated by the upgrade in Item #42 below	N/A	\$ 0
7	L.NELSNW-MIDDLESEX2 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (0.7 miles). Kilmer substation (PSEG): Replace disconnect switch.	Pending	\$ 968,800
8	L.NELSN-MIDDLESEX 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (0.7 miles). Kilmer substation (JCPL): Replace circuit switcher with a circuit breaker, replace disconnect switch.	Pending	\$ 1,408,900
9	WILLIAMS-W4-021 TAP 230 kV line	Transmission Line: Reconductor with 1590 Kcmil 45/7 ACSS conductor (0.7 miles). Williams substation: Replace 1590 Kcmil 54/19 ACSR bus conductor with bundled 1590 ACSR wire.	Pending	\$ 2,027,800
10	PARLIN-WILLIAMS 230 kV line	Transmission Line: Reconductor with 1590 Kcmil 45/7 ACSS conductor (0.7 miles). Parlin substation: Replace 1590 Kcmil 54/19 ACSR bus conductor with bundled 1590 ACSR wire. Williams substation: Replace 1590 Kcmil 54/19 ACSR bus conductor with bundled 1590 ACSR wire.	Pending	\$ 5,252,500
11	S.RIVER BT 230kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	Pending	\$ 448,900

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
12	S.RIVER PA 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	Pending	\$ 483,900
13	S.RIVER TA 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	Pending	\$ 471,700
Total New Network Upgrades				\$

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)

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
14	RARTN RV G1047E 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1036	\$ 309,100
15	RARTN RV G1047F 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1037	\$ 307,700
16	RARTN RV I1047E 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1046	\$ 310,500
17	RARTN RV I1047F 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1047	\$ 309,100
18	RARTN RV T1047E 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1038	\$ 310,500
19	RARTN RV T1047F 230.kV circuit breaker	Upgrade circuit breaker to a 63kA interrupting capability circuit breaker.	N1039	\$ 309,100
20	RARTN RV BK15 230.kV circuit breaker	This circuit breaker will be replaced by a baseline upgrade.	B1520	\$ 0

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
21	Red Oak B MT1 230.kV circuit breaker	Replace circuit breaker.	N1042	\$ 125,000
22	Red Oak A MT2 230.kV circuit breaker	Replace circuit breaker.	N1043	\$ 125,000
23	Red Oak B MT4 230.kV circuit breaker	Replace circuit breaker.	N1044	\$ 125,000
24	Red Oak A MT3 230.kV circuit breaker	Replace circuit breaker.	N1045	\$ 125,000
25	RARTN RV NEPTUNE B27 230.kV circuit breaker	Upgrade circuit breaker to a 80kA interrupting capability circuit breaker. Note: N3223 was initiated to upgrade this breaker to a 63kA circuit breaker. This original upgrade is insufficient with the contribution of Y -025. Y1-025 will share an allocation of the original upgrade and will be fully responsible for the cost difference between the 63kA and 80kA circuit breaker.	N3223	\$ 493,700
26	RARTN RV NEPTUNE B28 230.kV circuit breaker	Upgrade circuit breaker to a 80kA interrupting capability circuit breaker. Note: N3224 was initiated to upgrade this breaker to a 63kA circuit breaker. This original upgrade is insufficient with the contribution of Y -025. Y1-025 will share an allocation of the original upgrade and will be fully responsible for the cost difference between the 63kA and 80kA circuit breaker.	N3224	\$ 480,800
27	RARTN RV W1037E 230.kV circuit breaker	Upgrade circuit breaker to a 80kA interrupting capability circuit breaker. Note: N3225 was initiated to upgrade this breaker to a 63kA circuit breaker. This original upgrade is insufficient with the contribution of Y -025. Y1-025 will share an allocation of the original upgrade and will be fully responsible for the cost difference between the 63kA and 80kA circuit breaker.	N3225	\$ 493,700
28	RARTN RV W1037F 230.kV circuit breaker	Upgrade circuit breaker to a 80kA interrupting capability circuit breaker. Note: N3226 was initiated to upgrade this breaker to a 63kA circuit breaker. This original upgrade is insufficient with the contribution of Y -025. Y1-025 will share an allocation of the original upgrade and will be fully responsible for the cost difference between the 63kA and 80kA circuit breaker.	N3226	\$ 492,200
29	Red Oak A T1034 230.kV circuit breaker	This circuit breaker will be replaced by a baseline upgrade.	B1155.1	\$ 0
30	Red Oak B G1034 230.kV circuit breaker	This circuit breaker will be replaced by a baseline upgrade.	B1155.2	\$ 0

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
31	G07_MTX1H 4 OTHER BRKR 230.kV circuit breaker	Replace circuit breaker.	Pending	\$ 500,000
32	G07_MTX1H NY LINE 230.kV circuit breaker	Replace circuit breaker.	Pending	\$ 500,000
33	G07_MTX1H RAR RVR LINE 230.kV circuit breaker	Replace circuit breaker.	Pending	\$ 500,000
34	W4-021 TAP- ATLANTIC 230 kV line	Transmission Line: Reconductor with 1590 Kcmil 45/7 ACSS conductor (17.1 miles). Atlantic substation: Replace wave trap with a 3000 amp facility, Replace one disconnect switch with a 300 amp switch, replace four KD-4 relays, replace one MCAG relay, replace digital fault recorder, replace one meter, replace 1590 Kcmil 54/19 ACSR bus conductor with 1590 ACSR wire.	Pending	\$ 13,949,000
35	W4-021 TAP- ATLANTIC 230 kV line	This overload will be mitigated by the upgrade in Item #35 above.	N/A	\$ 0
36	W4-021 TAP- ATLANTIC 230 kV line	This overload will be mitigated by the upgrade in Item #35 above.	N/A	\$ 0
37	W4-021 TAP- FRENEAU 230 kV line	Transmission Line: Reconductor with 1590 Kcmil 45/7 ACSS conductor (7.9 miles). Freneau substation: Replace drop looks with 1590 ACSR wire, replace two bus disconnect switches and one line switch with 3000 amp switches, replace one digital fault recorder, replace 1590 Kcmil 54/19 ACSR bus conductor with 1590 ACSR wire, replace circular pipe work, change three CT tap positions.	Pending	\$ 8,364,400
38	TOWANDA-E.SAYRE 115 kV line	East Sayre substation: Replace GCX17A relays. East Towanda substation: Replace GCX17A relays.	Pending	\$ 693,700
39	KILMER W- L.NELSNW 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (2.7 miles). Kilmer substation (PSEG): Replace disconnect switch.	Pending	\$ 7,555,600

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
40	KILMER I-L.NELSNI 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (2.7 miles). Kilmer substation (PSEG): Replace circuit switcher with a circuit breaker, replace disconnect switch.	Pending	\$ 4,247,700
41	RAR RVR-KILMER W 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (5.9 miles). Raritan River substation (JCPL): Replace 1590 Kcmil 54/19 ACSR drop loops with 1590 ACSR wire Kilmer substation (PSEG): Replace disconnect switch	Pending	\$ 19,431,300
42	RAR RVR-KILMER I 230 kV line	Transmission Line (JCPL): Reconductor with 1590 Kcmil 45/7 ACSS conductor (5.9 miles). Raritan River substation (JCPL): Replace 1590 Kcmil 54/19 ACSR drop loops with 1590 ACSR wire Kilmer substation (PSEG): Replace disconnect switch	Pending	\$ 4,521,700
Total New Network Upgrades				\$ 64,579,800

Potential Congestion due to Local Energy Deliverability

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

None

Network Impacts

The Queue Project #Y1-025 was studied as a 785.0MW (Capacity725.0MW) injection at the Metuchen 230 kV substation in the JCPL area. Project #Y1-025 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
B_PN230-SX-#8	CONTINGENCY 'B_PN230-SX-#8' /* EAST TOWANDA - HILLSIDE (ETH) 230 KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1 END
BRUN_ED	CONTINGENCY 'BRUN_ED' /* BRUNSWICK-EDISON 138KV TRIP LINE FROM BUS 218303 TO BUS 218330 TRIP LINE FROM BUS 218330 TO BUS 218352 TRIP LINE FROM BUS 218352 TO BUS 218315 TRIP LINE FROM BUS 218352 TO BUS 218393 TRIP LINE FROM BUS 218330 TO BUS 218327 MOVE 100 PERCENT LOAD FROM BUS 218393 TO BUS 218392 REMOVE UNIT 1 FROM BUS 218327 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
36PS	CONTINGENCY '36PS' /* DEANS-WESTFIELD 230KV & SEWAREN-ROSELAND 230KV DCTL TRIP LINE FROM BUS 218306 TO BUS 218356 TRIP LINE FROM BUS 218356 TO BUS 218305 TRIP LINE FROM BUS 218355 TO BUS 218357 TRIP LINE FROM BUS 218355 TO BUS 218320 TRIP LINE FROM BUS 218320 TO BUS 216950 TRIP LINE FROM BUS 218311 TO BUS 218341 MOVE 50 PERCENT LOAD FROM BUS 218413 TO BUS 218412 /* WOODBRIDGE T3 T2 MOVE 50 PERCENT LOAD FROM BUS 218413 TO BUS 218414 /* WOODBRIDGE T3 T1 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

Contingency Name	Description
ALD_SPRI	CONTINGENCY 'ALD_SPRI' /* ALDENE 230KV-SPRINGFLD RD 138KV TRIP LINE FROM BUS 218345 TO BUS 216911 MOVE 100 PERCENT LOAD FROM BUS 216927 TO BUS 216926 END
PS49	CONTINGENCY 'PS49' DISCONNECT BRANCH FROM BUS 218353 TO BUS 218300 CKT 1 /* MINUESTR LINDEN 230 230 DISCONNECT BRANCH FROM BUS 218353 TO BUS 218311 CKT 1 /* MINUESTR SEWAREN 230 230 MOVE 52 PERCENT LOAD FROM BUS 218397 TO BUS 218396 /* MINUESTR T1 T2 MOVE 24 PERCENT LOAD FROM BUS 218397 TO BUS 218410 /* MINUESTR T1 WARINAN T1 MOVE 24 PERCENT LOAD FROM BUS 218397 TO BUS 218414 /* MINUESTR T1 WDBRDG T1 END
ALD_ESSEX	CONTINGENCY 'ALD_ESSEXA' /* ALDENE 230KV-ESSEX 230KV TRIP LINE FROM BUS 218307 TO BUS 218430 TRIP LINE FROM BUS 218430 TO BUS 217170 END

Generator Deliverability

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

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
1	Non	Non	PSEG	FANWOODO-ROSELAND 230 kV line	218320	216950	1	DC	72.29	100.15	NR	734	204.51
2	Non	Non	PSEG	DEANS-BRUNSWK8 230 kV line	218306	218342	1	DC	94.81	104.73	NR	651	64.57
3	N-1	B_PN230-SX-#8	PenElec	E.SAYRE-N.WAV115 115 kV line	200676	130836	1	DC	95.29	96.29	ER	128	8.84
4	N-1	BRUN_ED	PSEG	DEANS-BRUNSWK8 230 kV line	218306	218342	1	DC	96.92	109.43	ER	740	92.62
5	Non	Non	PSEG	NEWDOVRO-FANWOODO 230 kV line	218355	218320	1	DC	83.97	111.84	NR	734	204.51
6	Non	Non	PSEG	PRSN AVG-NEWDOVRO 230 kV line	218357	218355	1	DC	89.67	117.53	NR	734	204.51
7	N-1	PS8B	PSEG	FANWOODO-ROSELAND 230 kV line	218320	216950	1	DC	99.84	127.71	ER	870	242.48
8	Non	Non	PSEG	METUCHEN-PRSN AVG 230 kV line	218469	218357	1	DC	93.51	137.27	NR	734	321.17

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

None

Short Circuit

(Summary of impacted circuit breakers)

Contributions to previously identified circuit breakers found to be over-duty:

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without Y1-025	Duty Percent With Y1-025	Duty Percent Difference
9	PSEG	5021	SEWAREN 138.kV	31P	T	118.10%	122.10%	4.00%
10	PSEG	5021	SEWAREN 138.kV	1PL	T	116.40%	120.40%	4.00%
11	PSEG	5021	SEWAREN 138.kV	21P	T	111.30%	115.10%	3.80%
12	PSEG	5022	SEWAREN 230.kV	1HB	S	100.10%	105.70%	5.60%

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)

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
13	DCTL	36PS	PSEG	LINDEN-TOSCO 230 kV line	218300	218343	1	DC	129.67	133.03	ER	1093	226.94
14	DCTL	36PS	PSEG	TOSCO-G22_MTX5 230 kV line	218343	218441	1	DC	124.21	127.39	ER	1150	226.37
15	Non	Non	PSEG	TOSCO-G22_MTX5 230 kV line	218343	218441	1	DC	117.99	132.56	NR	950	138.45
16	N-1	PS8B	PSEG	NEWDOVRO-FANWOODO 230 kV line	218355	218320	1	DC	109.71	137.58	ER	870	242.48
17	N-1	PS8B	PSEG	PRSN AVG-NEWDOVRO 230 kV line	218357	218355	1	DC	114.5	142.38	ER	870	242.48
18	N-1	ALD_SPRI	PSEG	STAN_TER-15THST 230 kV line	218430	217170	1	DC	124.27	142.32	ER	550	99.25

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To	Circuit		Initial	Final	Type	MVA	
19	N-1	ALD_SPRI	PSEG	ALDENE-STAN_TER 230 kV line	218307	218430	1	DC	125.17	142.96	ER	558	99.25
20	N-1	B_PN230-SX-#8	PSEG	TOWANDA-E.SAYRE 115 kV line	200674	200676	1	DC	139.75	140.73	ER	131	8.84
21	N-1	ALD_SPRI	PSEG	15THST-W.ORANGE 230 kV line	217170	216914	1	DC	128.49	146.68	ER	550	100.04
22	N-1	PS49	PSEG	METUCHEN-PRSN AVG 230 kV line	218469	218357	1	DC	120.01	165.81	ER	870	398.42
23	Non	Non	PSEG	WARINANC-ALDENE1 230 kV line	218316	217122	1	DC	140.13	159.04	NR	732	138.45
24	Non	Non	PSEG	LINDEN-TOSCO 230 kV line	218300	218343	1	DC	151.56	170.55	NR	732	138.97
25	DCTL	36PS	PSEG	WARINANC-ALDENE1 230 kV line	218316	217122	1	DC	160.17	164.51	ER	831	223.3
26	Non	Non	PSEG	G22_MTX5-WARINANC 230 kV line	218441	218316	1	DC	166.56	187.76	NR	653	138.45
27	DCTL	36PS	PSEG	G22_MTX5-WARINANC 230 kV line	218441	218316	1	DC	185.23	190.02	ER	752	223.3
28	Non	Non	PSEG	SPRINGRD-W.ORANGE 230 kV line	216911	216914	1	DC	176.49	204.74	NR	249	70.34
29	N-1	ALD_ESSEXA	PSEG	SPRINGRD-W.ORANGE 230 kV line	216911	216914	1	DC	183.27	212.06	ER	374	107.68
30	Non	Non	PSEG	ALDENE2-SPRINGRD 230 kV line	218345	216911	1	DC	222.94	253	NR	234	70.34
31	N-1	ALD_ESSEXA	PSEG	ALDENE2-SPRINGRD 230 kV line	218345	216911	1	DC	232.63	265.26	ER	330	107.68

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

Will be confirmed in the System Impact Study.

Stability and Reactive Power Requirement for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

Will be confirmed in the System Impact Study.

Potential Congestion due to Local Energy Deliverability

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

None

Attachment 1. Single Line Diagram

Attachment 2. Aerial View