



2017 New Jersey State Infrastructure Report

(January 1, 2017 – December 31, 2017)

May 2018

1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

2. Markets

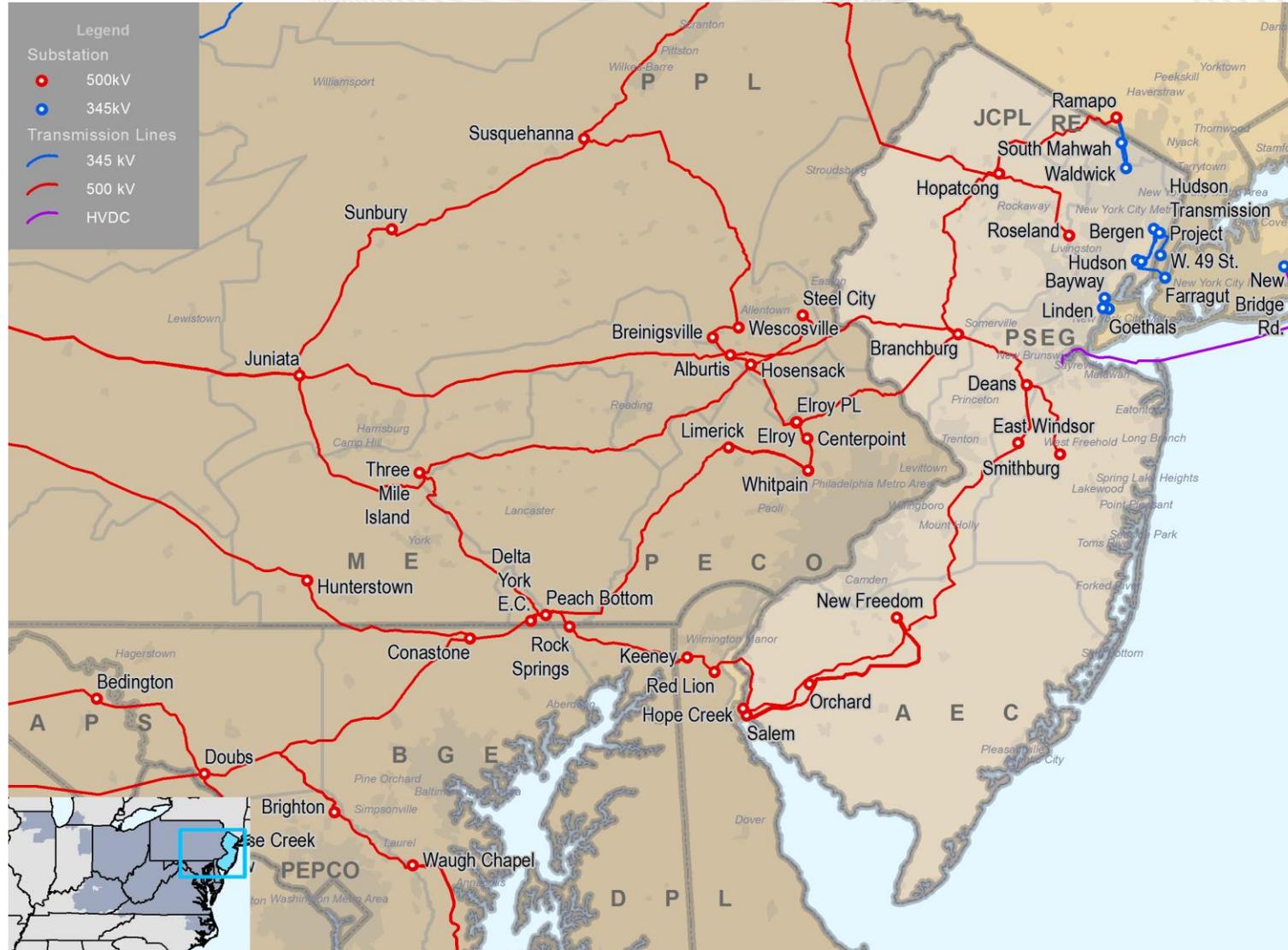
- Capacity Market Results
- Market Analysis

3. Operations

- Emissions Data

- **Existing Capacity:** Natural gas represents approximately 62.7 percent of the total installed capacity in New Jersey while coal represents approximately 3.9 percent. This differs from PJM where natural gas and coal are at 37 and 32 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents approximately 98.3 percent of new interconnection requests in New Jersey.
- **Deactivations:** Approximately 1,259 MW of capacity at three New Jersey coal units retired in 2017. This represents more than 60 percent of the 2,084 MW that retired RTO-wide in 2017.
- **RTEP 2017:** New Jersey RTEP 2017 projects total approximately \$2.89 billion in investment. Approximately 29.7 percent of that represents supplemental projects.
- **Load Forecast:** New Jersey load growth is nearly flat, averaging between -0.3 and 0.0 percent per year over the next 10 years. PJM RTO projected load growth rate is .4%.

- **2021/22 Capacity Market:** New Jersey cleared 364 MW more Demand Response and Energy Efficiency resources than in the prior auction.
- **6/1/15 – 12/31/17 Performance:** New Jersey's average locational marginal prices were consistently at or below PJM average LMPs. Nuclear resources represented 41.3 percent of generation produced in New Jersey while natural gas averaged 27.3 percent.
- **Emissions:** 2017 carbon dioxide emissions are down from 2016; sulfur dioxides are down from 2016 while nitrogen oxides continue to hold flat.



PJM operates and plans the bulk electric system in New Jersey, including facilities owned and operated by Atlantic City Electric Co., Jersey Central Power & Light, Linden Variable Frequency Transformer (VFT), Neptune Regional Transmission System, Public Service Electric & Gas Co.

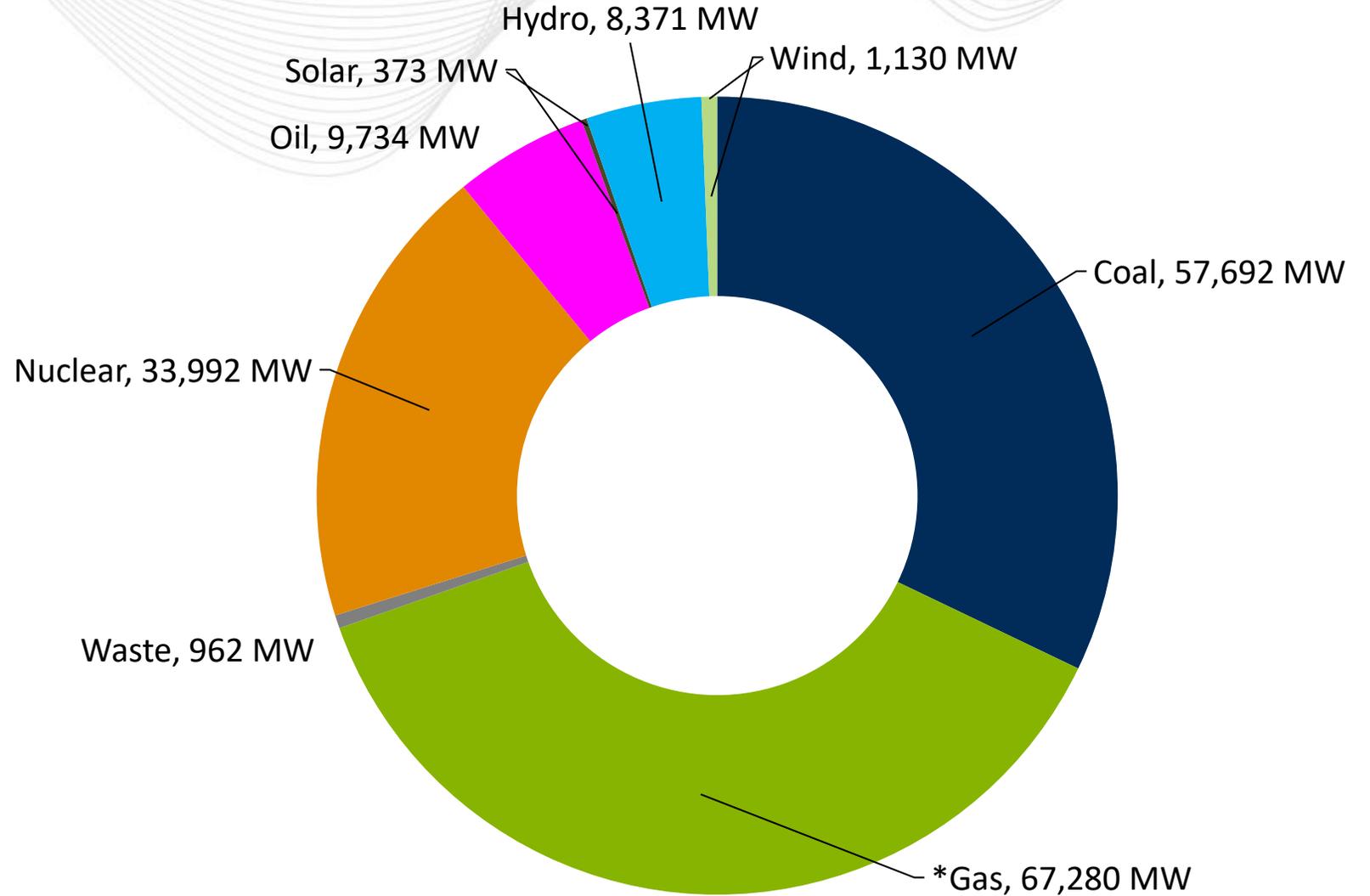
Planning

Generation Portfolio Analysis

PJM – Existing Installed Capacity

(MW submitted to PJM, December 31, 2017)

In PJM, natural gas and coal make up nearly 70 percent total installed capacity. Nuclear represents another 18.9 percent.



* Gas Contains	
Natural Gas	66,836.3 MW
Other Gas	443.8 MW



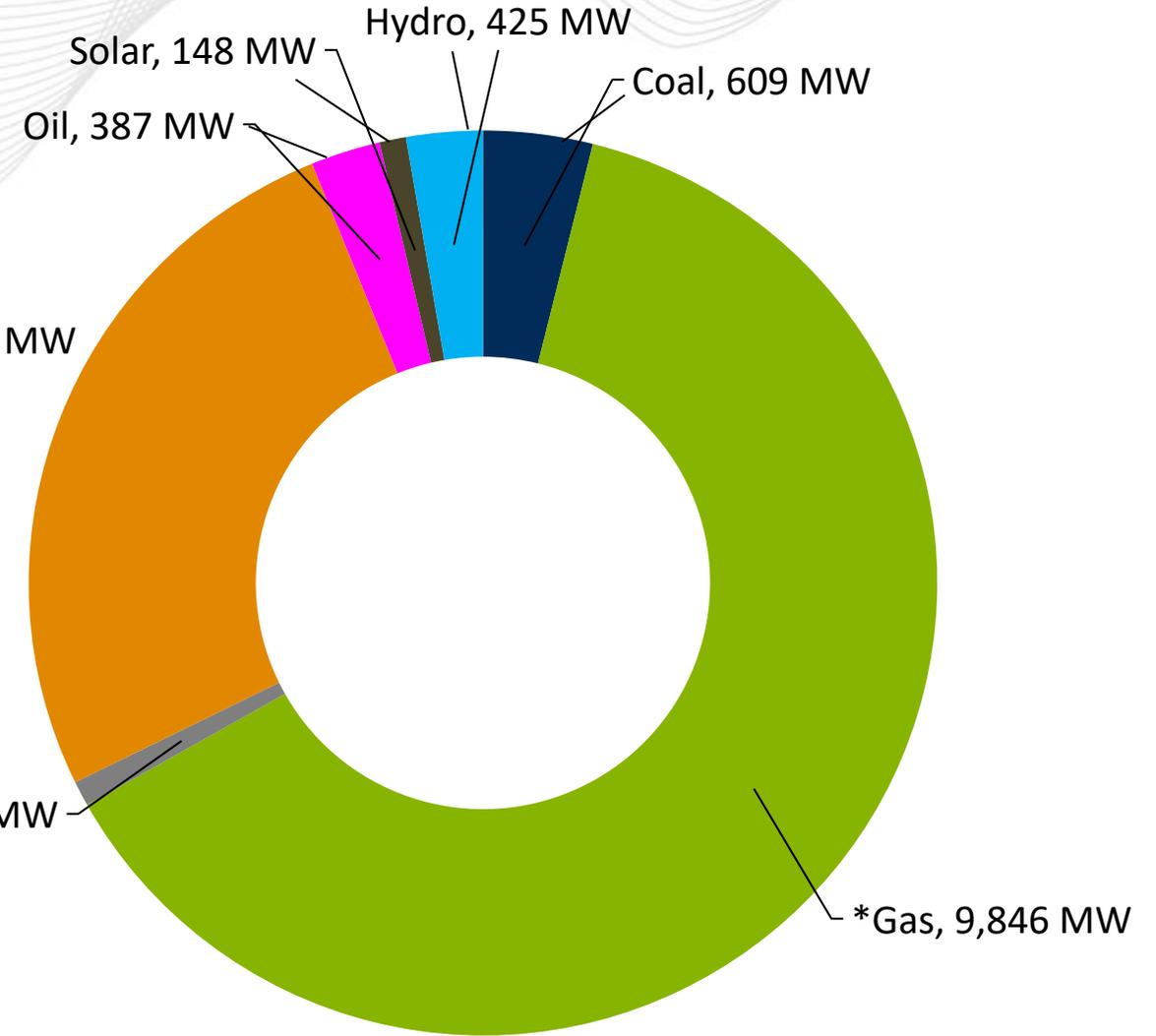
New Jersey – Existing Installed Capacity

(MW submitted to PJM, December 31, 2017)

Summary:

Natural gas represents approximately 62.7 percent of the total installed capacity in the New Jersey territory while coal represents approximately 3.9 percent.

Overall in PJM, natural gas represents approximately 37 percent of installed capacity while coal represents 32 percent.



* Gas Contains

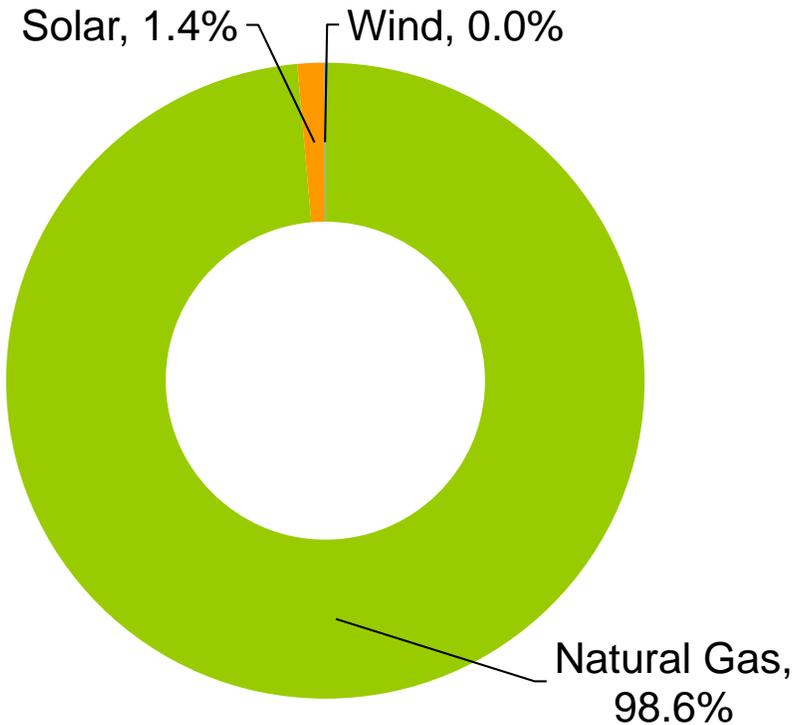
Natural Gas	9,799.6 MW
Other Gas	46.3 MW

New Jersey – Interconnection Requests

(Requested Capacity Rights, December 31, 2017)

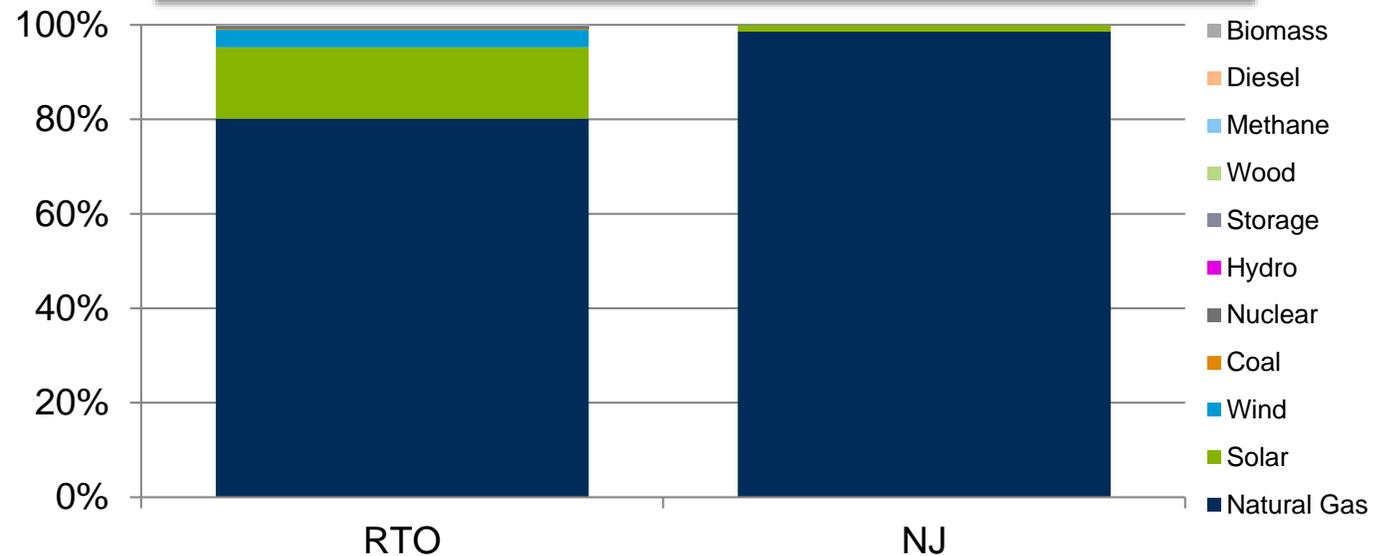
Natural gas represents approximately 98.3 percent of new interconnection requests in New Jersey.

Percent MW Capacity by Fuel Type



Fuel Source	Capacity, MW	Nameplate Capability, MW
Natural Gas	7,037.7	7,228.1
Solar	97.1	309.3
Wind	3.3	25.0
Storage	-	105.0
Total	7,138.1	7,667.4

Fuel as a Percentage of Projects in Queue





New Jersey – Interconnection Requests

(As of December 31, 2017)

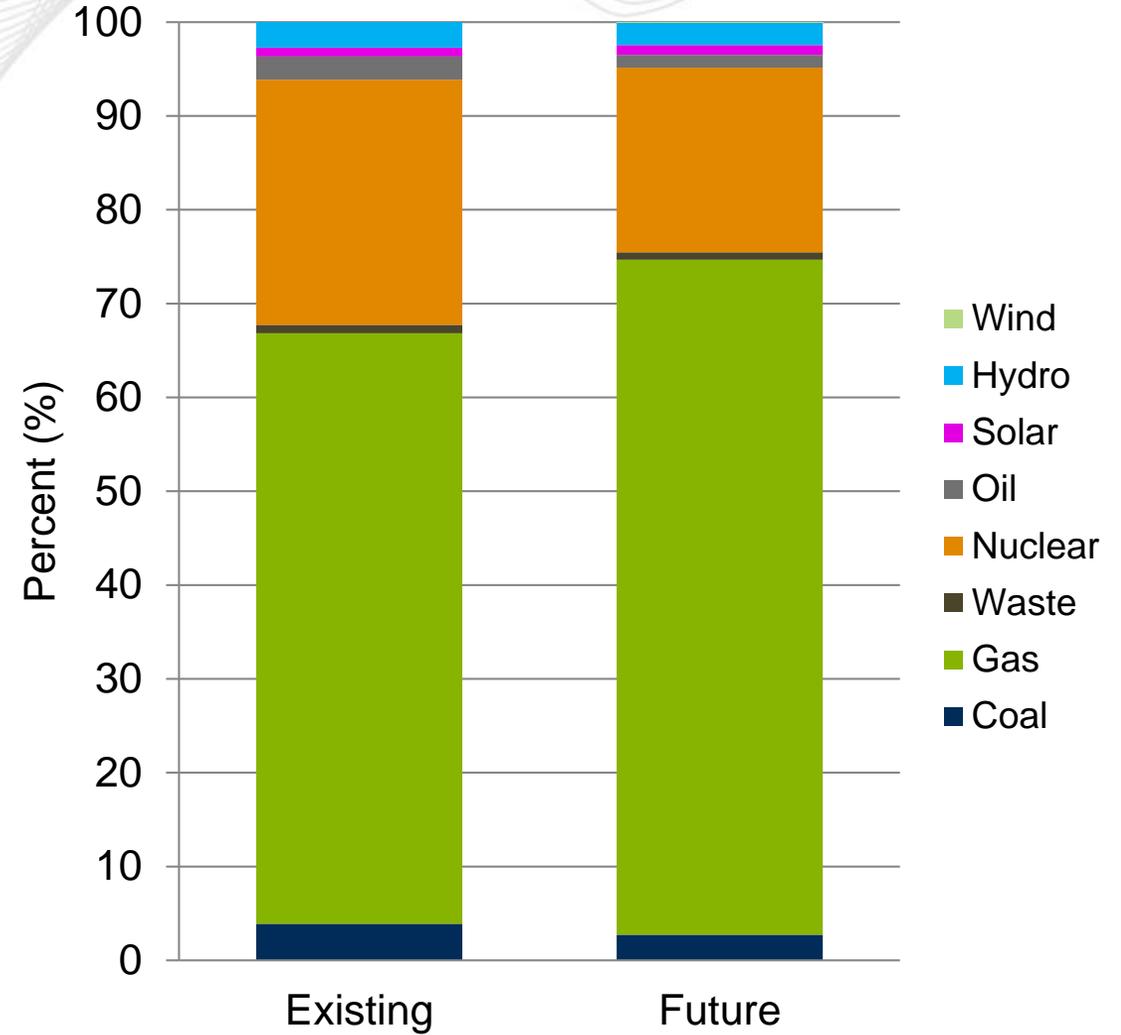
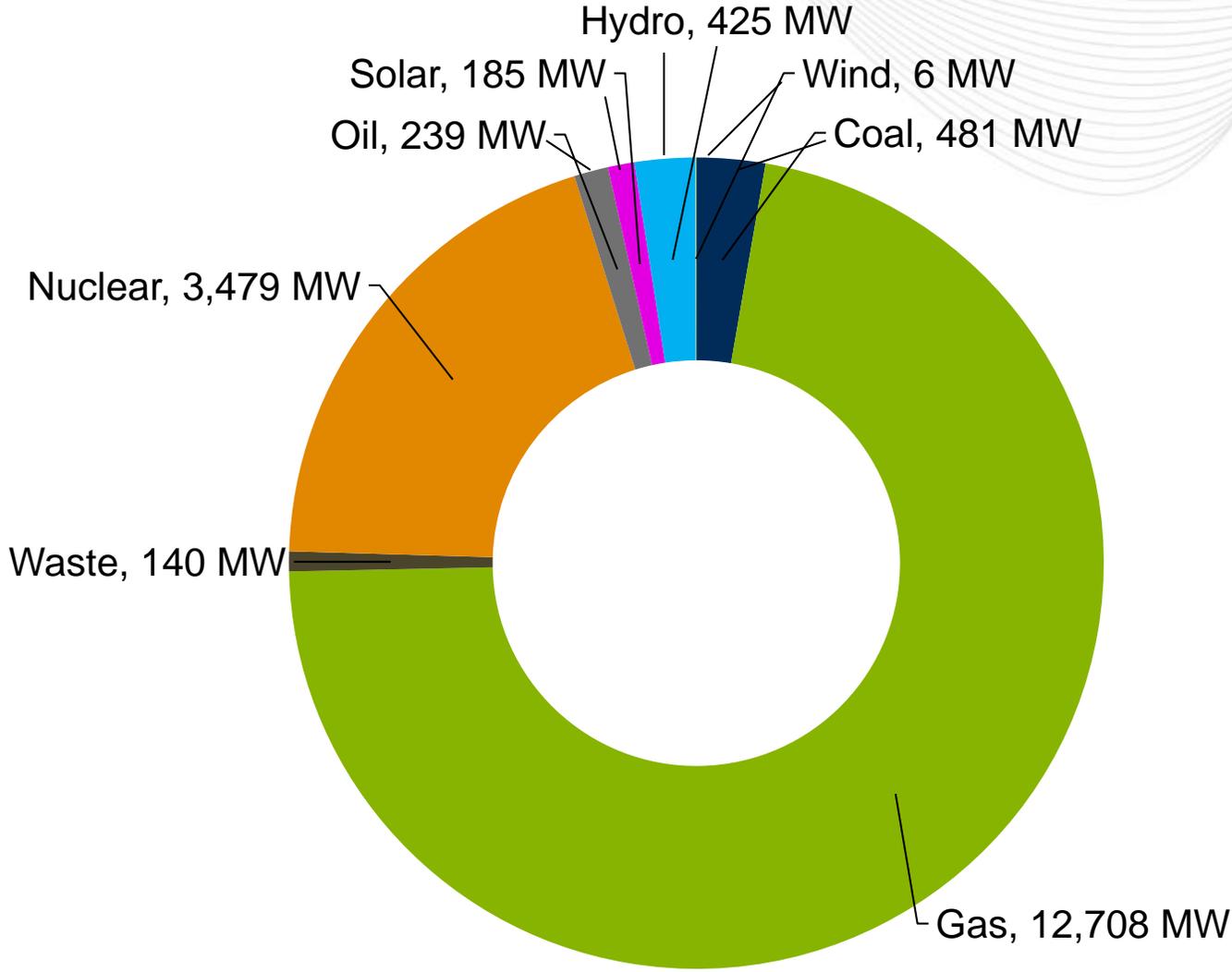
	Complete				In Queue						Grand Total	
	In Service		Withdrawn*		Active		Suspended**		Under Construction**			
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Non-Renewable	7,415	77	46,374	191	4,560	24	875	10	1,627	25	60,851	327
Coal	24	1	15	1							39	2
Diesel	8	1									8	1
Natural Gas	6,991	66	45,349	146	4,560	23	875	3	1,603	21	59,378	259
Nuclear	381	6									381	6
Oil	35	2	945	8							980	10
Other			46	7							46	7
Storage	0	2	20	29	0	1	0	7	0	3	20	42
Renewable	251	107	2,932	421	14	10	13	9	73	22	3,283	569
Biomass			10	1							10	1
Hydro	21	2	1,001	2							1,022	4
Methane	45	16	41	9							86	25
Solar	185	88	1,279	392	14	10	10	7	73	22	1,561	519
Wind		1	602	17			3	2			605	20
Grand Total	7,690	185	49,307	612	4,574	34	888	19	1,676	46	128,269	1,792

*May have executed final agreement

** Executed final agreement (ISA / WMPA)

New Jersey – Future Capacity Mix

Based on known queued interconnection requests and deactivation notices through December 31, 2022, adjusted to reflect the probability of commercialization as indicated by historical trends specific to an interconnection request's state/zonal location and fuel type.





New Jersey – Progression History Interconnection Requests

Projects under construction, suspended, in service, or withdrawn – As of December 31, 2017



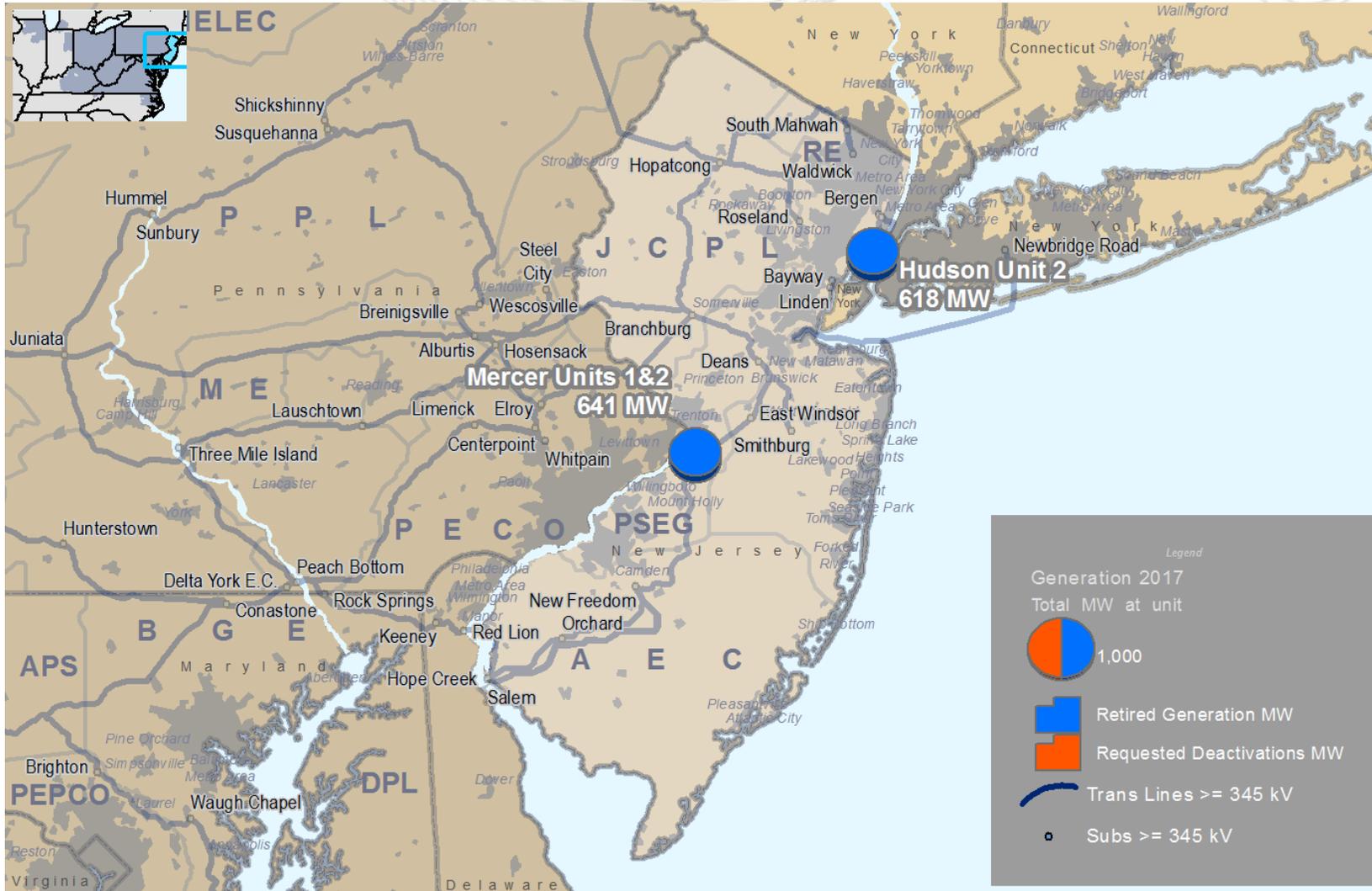
Projects that withdrew after a final agreement

	Number of Projects	Capacity, MW	Nameplate Capability, MW
ISA	9	921	1,248
WMPA	115	351	988

12.9% of requested capacity megawatt and 22.8% of projects reaches commercial operation



New Jersey – Actual Generation Deactivations and Deactivation Notifications in 2017



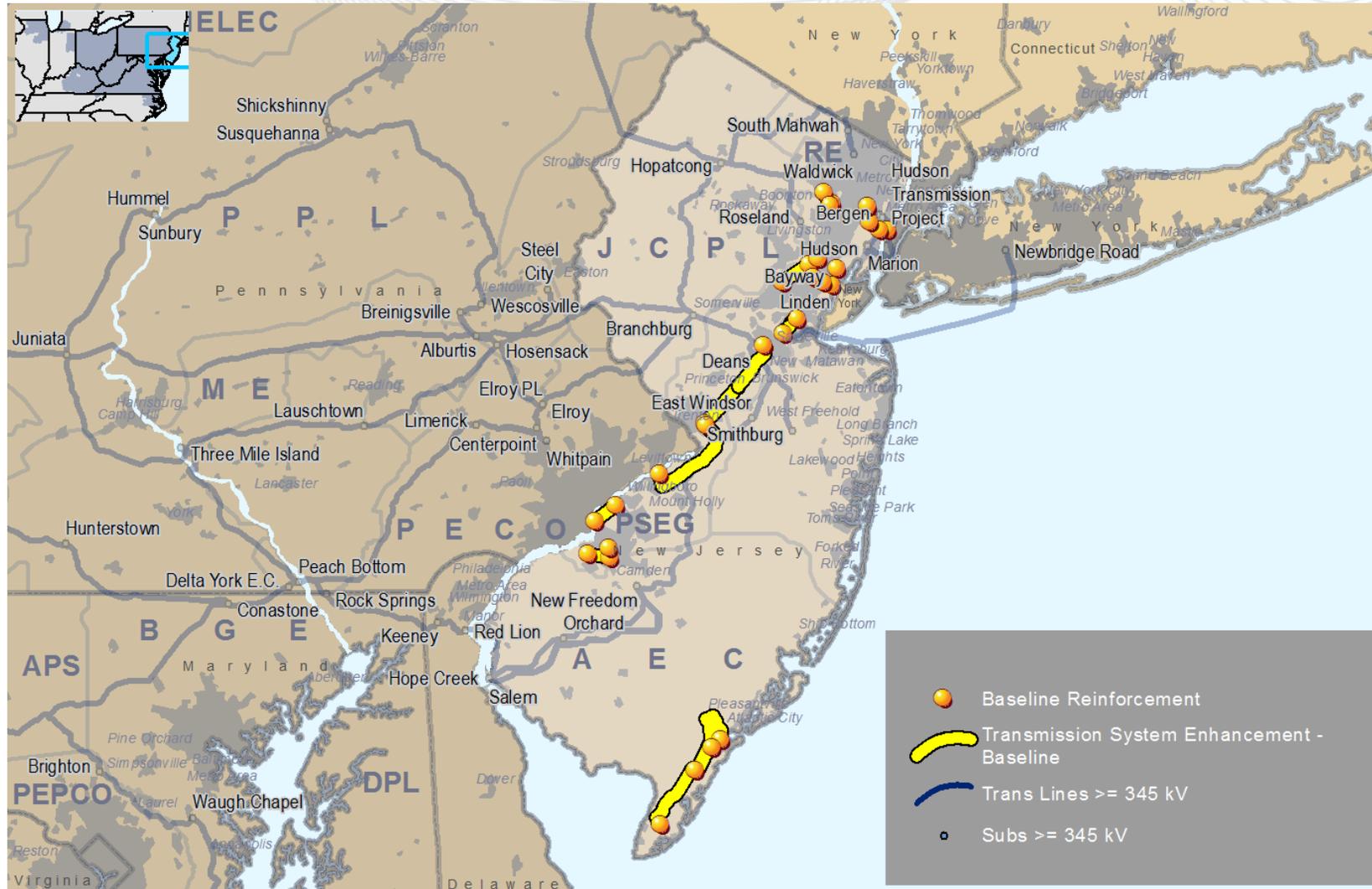
Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
Mercer 1	321	PSEG	56	6/1/2017
Mercer 2	320.3	PSEG	55	6/1/2017
Hudson 2	617.9	PSEG	48	6/1/2017

Summary:

- Three units in New Jersey deactivated in 2017.
- 10 generating units totaling 2,084 MW of capacity deactivated in PJM in 2017, 98 percent of which were coal resources.
- New Jersey did not receive any generation deactivation notifications in 2017.

Planning

Transmission Infrastructure Analysis



Note: Baseline upgrades are those that resolve a system reliability criteria violation.



New Jersey - RTEP Baseline Projects

(Greater than \$5 million)

Project ID	Project	Required In Service Date	Project Driver	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
b2810	Install second 230/69 kV transformer at Cedar Grove	6/1/2019	TO Criteria Violation	\$ 44.0	PSEG	12/1/2016
	Build a new 69 kV circuit from Cedar Grove to Great Notch					
b2811	Build 69 kV circuit from Locust Street to Delair	6/1/2017	TO Criteria Violation	\$ 13.5	PSEG	12/1/2016
b2812	Construct River Road to Tonnelle Avenue 69kV Circuit	6/1/2017	TO Criteria Violation	\$ 31.0	PSEG	12/1/2016
b2825	Increase the size of the Hudson 230 kV, 2X50 MVAR shunt reactors to 2X100 MVAR	9/1/2018	Baseline Load Growth Deliverability & Reliability	\$ 90.4	PSEG	1/12/2017
	Install 2X100 MVAR shunt reactors at Bayway 345 kV substation					
	Install 2X100 MVAR shunt reactors at Linden 345 kV substation					
	Install 2X50 MVAR shunt reactors at Kearny 230 kV substation					



New Jersey - RTEP Baseline Projects

(Greater than \$5 million)

Project ID	Project	Required In Service Date	Project Driver	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
b2835	Convert the R-1318 and Q1317 (Edison – Metuchen) 138 kV circuits to one 230 kV circuit	6/1/2017	TO Criteria Violation	\$ 125.0	PSEG	1/12/2017
b2836	Convert the N-1340 and T-1372/D-1330 (Brunswick – Trenton) 138 kV circuits to 230 kV circuits	6/1/2017	TO Criteria Violation	\$ 302.0	PSEG	1/12/2017
b2837	Convert the F-1358/Z1326 and K1363/Y-1325 (Trenton - Burlington) 138 kV circuits to 230 kV circuits	6/1/2017	TO Criteria Violation	\$ 312.0	PSEG	1/12/2017
b2870	Build new 138/26 kV Newark GIS station in a building (layout #1A) located adjacent to the existing Newark Switch and demolish the existing Newark Switch	6/1/2017	TO Criteria Violation	\$ 275.0	PSEG	3/9/2017
b2933	Third Source for Springfield Rd. and Stanley Terrace Stations	6/1/2018	TO Criteria Violation	\$ 197.0	PSEG	8/31/2017
	Construct a 230/69 kV station at Springfield.					
	Construct a 230/69 kV station at Stanley Terrace					
	Construct a 69 kV network between Front Street, Springfield and Stanley Terrace					



New Jersey - RTEP Baseline Projects

(Greater than \$5 million)

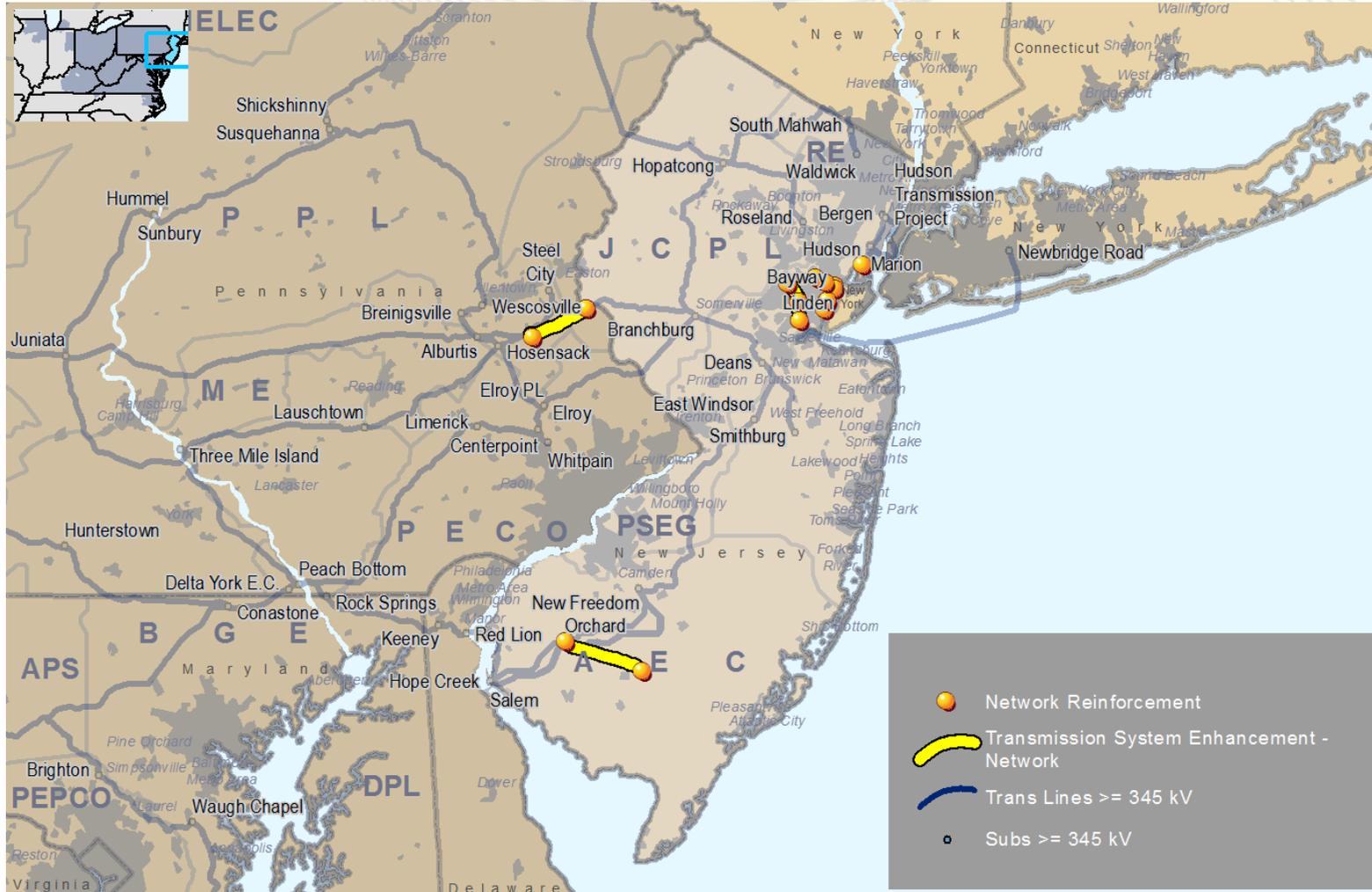
Project ID	Project	Required In Service Date	Project Driver	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
b2934	Build a new 69kV line between Hasbrouck Heights and Carlstadt	6/1/2018	TO Criteria Violation	\$ 21.0	PSEG	8/31/2017
b2935	Third Supply for Runnemedede 69kV and Woodbury 69kV	6/1/2018	TO Criteria Violation	\$ 98.0	PSEG	8/31/2017
	Build a new 230/69 kV switching substation at Hilltop utilizing the PSE&G property and the K-2237 230 kV line.					
	Convert Runnemedede's straight bus to a ring bus and construct a 69 kV line from Hilltop to Runnemedede 69 kV.					
	Build a new line between Hilltop and Woodbury 69 kV providing the 3rd supply					
b2945	Rebuild the BL England – Middle Tap 138kV line to 2000A on double circuited steel poles and new foundations	6/1/2022	Baseline Load Growth Deliverability & Reliability	\$ 36.4	AEC	10/31/2017
	Re-conductor BL England – Merion 138kV (1.9miles) line					
	Re-conductor Merion – Corson 138kV (8miles) line					



New Jersey - RTEP Baseline Projects

(Greater than \$5 million)

Project ID	Project	Required In Service Date	Project Driver	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
b2955	Wreck and re-build the VFT – Warinanco – Aldene 230 kV circuit with paired conductor.	6/1/2018	Baseline Load Growth Deliverability & Reliability	\$ 90.4	PSEG	10/12/2017
b2956	Replace existing cable on Cedar Grove-Jackson Rd. with 5000kcmil XLPE cable.	6/1/2018	Baseline Load Growth Deliverability & Reliability	\$ 80.0	PSEG	10/12/2017



Note: Network upgrades are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests.



New Jersey - RTEP Network Projects

(Greater than \$5 million)

Project ID	Description	Project Driver	Queue	Required In Service Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
n5148	Install two line terminal breakers, risers, necessary disconnects and controls for the AB1-154 terminal at Gilbert 230kV substation.	Generation	AB1-154	6/1/2020	\$ 5.2	JCPL	10/12/2017
n5150	Reconstruct Gilbert 230kV yard as a breaker and a half layout.	Generation	AB1-154	6/1/2020	\$ 12.2	JCPL	10/12/2017
	Replace Gilbert 230 kV breaker A13 with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade						
	Replace Gilbert 230 kV breaker PV with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade						
	Replace Gilbert 230 kV breaker C11 with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade						
	Replace Gilbert 230 kV breaker 13P with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade						
	Replace Gilbert 230 kV breaker VC with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade						
Replace Gilbert 230 kV breaker 1216 with a 63 kA breaker Note: the cost of the replacement is lumped in the n5150 Network upgrade							



New Jersey - RTEP Network Projects

(Greater than \$5 million)

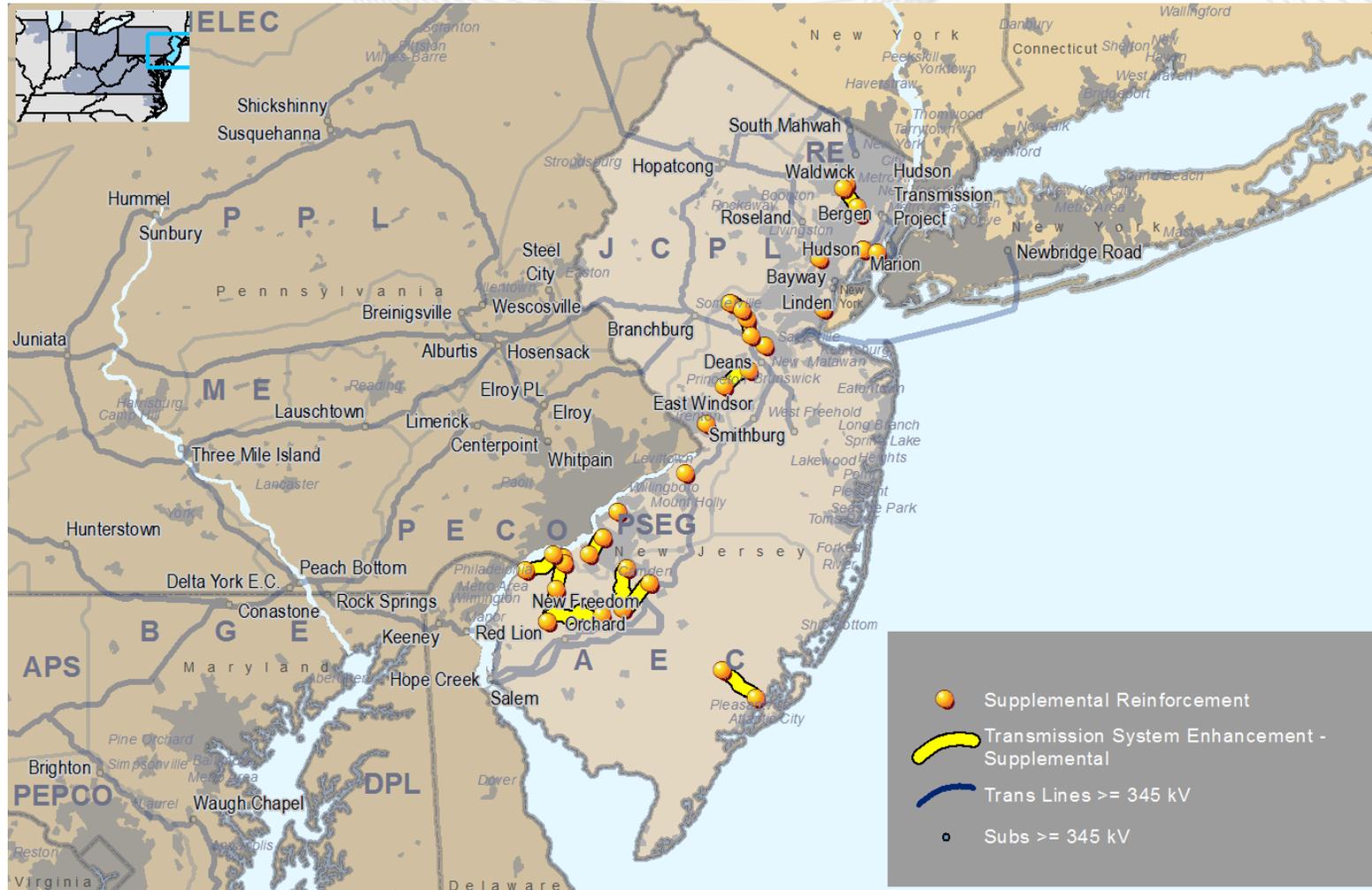
Project ID	Description	Project Driver	Queue	Required In Service Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
n5165	Re-conductor 11.9 miles of Gilber-Springfield 230kV circuit replacing 1590 ACSR with 1590 ACSS.	Generation	AB1-154	6/1/2020	\$ 15.3	JCPL	10/12/2017
n5210	Install 1-138kV breaker and 1-230/138kV transformer at Minotola Substation	Generation	AB1-169A	6/1/2020	\$ 21.8	AEC	10/12/2017
	Install 1-138kV breaker and 1-230/138kV transformer at Minotola Substation						
	Tap the existing (see baseline upgrade b2479) new Orchard – Cardiff 230kV line to install a 230kV 4 position ring bus at Minotola substation, with 4-230 kV breakers						
n5263	Linden-Tosco 3 230 kV line Rebuild with paired 795 ACSS.	Generation	AB2-055	6/1/2021	\$ 13.7	PSEG	10/12/2017
n5264	TOSCO_2-VFT 2 230 kV line Rebuild with paired 1033 ACSS	Generation	AB2-055	6/1/2021	\$ 7.5	PSEG	10/12/2017
n5265	VFT 1-WARINICO_1 230 kV line Rebuild with paired 795 ACSS	Generation	AB2-055	6/1/2021	\$ 38.9	PSEG	10/12/2017
n5266	Bayonne 345kV substation- Install a new GIS Breaker on the spare bay position and associated GIS / AIS buswork, UG cable, relaying, metering.	Generation	AB2-055	6/1/2021	\$ 18.9	PSEG	10/12/2017



New Jersey - RTEP Network Projects

(Greater than \$5 million)

Project ID	Description	Project Driver	Queue	Required In Service Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
n5268	SEWAREN-MINUEST_R 230 kV line Rebuild with paired 795 ACSS	Generation	AB2-082	6/1/2019	\$ 30.8	PSEG	10/12/2017
n5269	MINUEST_R-LINDEN 230 kV line Wreck & Rebuild with paired 795 ACSS	Generation	AB2-082	6/1/2019	\$ 34.8	PSEG	10/12/2017
n5270	WARINICO_2-ALDENE_4 230 kV line Reconductor with 1590 ACSS	Generation	AB2-082	6/1/2019	\$ 8.6	PSEG	10/12/2017
n5271	METUCHEN-NEWDOVR_H 230 kV line Rebuild with paired 795 ACSS	Generation	AB2-082	6/1/2019	\$ 51.9	PSEG	10/12/2017
n5272	NEWDOVR_H-FANWOOD_1 230 kV line Rebuild with paired 795 ACSS	Generation	AB2-082	6/1/2019	\$ 47.9	PSEG	10/12/2017
n5273	Metuchen 230kV substation- Expand the existing substation yard and Install a new breaker position and associated fencing, ground grid, dead end structures, buswork, switches, relaying, and metering.	Generation	AB2-082	6/1/2019	\$ 10.3	PSEG	10/12/2017



Note: Supplemental projects are transmission expansions or enhancements that are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.



New Jersey - TO Supplemental Projects

(Greater than \$5 million)

Project ID	Description	Required Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
s1096	Replace Brunswick 230/69 kV transformer 220-4 with a new TMP equipped 230/69 kV Auto-transformer with LTC	10/9/2018	\$ 8.00	PSEG	1/5/2017
s1178	Replace Bustleton 230/13 kV T-1 and T-2 transformers	12/31/2019	\$ 7.80	PSEG	1/5/2017
s1179	Replace Trenton 138/26/11 kV 132-1, 132-2 and 132-3 transformers	12/31/2020	\$ 36.00	PSEG	1/5/2017
s1183	Replace Trenton 230/138 kV 220-2 transformer	12/31/2019	\$ 12.00	PSEG	1/5/2017
s1241	Build a 13 kV class-H substation at Stanley Terrace with two 230/13kV transformers	5/1/2018	\$ 20.70	PSEG	1/5/2017
s1255	Rebuild and upgrade 18.7 miles of existing Woodstown - Paulsboro 34.5 kV distribution line to create two (2) 69 kV sources to the new High Street Substation	5/31/2018	\$ 38.20	AEC	1/5/2017
s1257	Upgrade Tansboro 69 kV Bus to Ring Bus configuration	9/28/2019	\$ 5.74	AEC	1/5/2017
s1260	Replace the existing Mickleton 69 kV line bus with a 69 kV ring bus configuration.	9/30/2020	\$ 12.30	AEC	1/5/2017
s1273	Replace the existing station light & power (SL&P) transformers with Station Service Voltage Transformers (SSVTs) fed from Kearny 230kV Bus 1 and Bus 2	9/30/2018	\$ 6.30	PSEG	6/9/2017
s1343	Rebuild line 0752 between Monroe and Pine Hill substations. All structures, conductor, and static wire will be replaced with new weathering steel poles, conductor, and OPGW.	5/31/2020	\$ 16.04	AEC	6/9/2017



New Jersey - TO Supplemental Projects

(Greater than \$5 million)

Project ID	Description	Required Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
s1344	Rebuild line 0754 between Monroe and Tansboro substations. All structures, conductor, and static wire will be replaced with new weathering steel poles, conductor, and OPGW.	12/31/2019	\$ 13.62	AEC	6/9/2017
s1345	Rebuild line 0763 between Monsanto and River substations. All structures, conductor, and static wire will be replaced with new weathering steel poles, conductor, and OPGW. Tie the Monsanto – River (0763) line to the Mickleton – River (0747) to create a ne	5/31/2020	\$ 14.36	AEC	6/9/2017
s1347	Rebuild line 0721 between Lewis and Lenox substations. All structures, conductor, and static wire will be replaced with new weathering steel poles, conductor, and OPGW.	12/31/2020	\$ 13.16	AEC	6/9/2017
s1348	Rebuild Circuit 6734 from Harbeson substation to the Zoar tap. All structures, conductor, and static wire will be replaced with new weathering steel poles, conductor, and OPGW.	5/31/2019	\$ 6.50	DPL	6/9/2017
s1352	Providing a more robust and reliable power source to the 230kV Kearny Switching Station, the existing station light & power (SL&P) transformers fed from street power will be replaced with Station Service Voltage Transformers (SSVTs) fed from Kearny 230kV	9/30/2018	\$ 6.30	PSEG	6/9/2017
s1366	Paterson Area Asset Condition and Reliability	3/1/2021	\$ 169.00	PSEG	8/31/2017
	Convert Paterson 26 kV to 69 kV station.				
	Convert Passaic 26 kV to 69 kV station.				
	Build a 69 kV network between South Paterson, Paterson, North Paterson, Passaic and East Rutherford.				
s1367	Replace the 69kV AIS bus at Camden with a GIS breaker-and-a-half design	12/31/2020	\$ 80.20	PSEG	8/31/2017



New Jersey - TO Supplemental Projects

(Greater than \$5 million)

Project ID	Description	Required Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
s1368	Install 18 MVAR capacitor banks at Ridge Rd. 69 kV station	12/1/2020	\$ 72.10	PSEG	8/31/2017
	Station Reliability and Customer Load Growth at Penns Neck 69kV				
	Replace the 69kV AIS straight bus at Penns Neck with an AIS breaker-and-a-half design				
	Install a 69 kV line between Penns Neck and Ridge Rd.				
s1369	Replace the 69kV AIS straight bus at Gloucester with a GIS breaker-and-a-half design	12/1/2020	\$ 74.30	PSEG	8/31/2017
s1370	Station and Supply Circuit Condition at Woodbury 26kV	12/31/2020	\$ 79.90	PSEG	8/31/2017
	Convert Woodbury 26 kV to a 69 kV substation.				
	Build two new lines between Gloucester and Woodbury 69 kV				
s1405	Newport Solution	12/31/2020	\$ 40.10	PSEG	10/31/2017
	Install a new 230kV bay at Newport 230 kV				
	Build a second 230/13kV substation at Newport				
s1406	Install one (1) new 69kV line position at Bennetts Lane	10/31/2021	\$ 55.50	PSEG	10/31/2017
	Replace Franklin 69kV with a GIS ring.				
	Franklin Solution				
	Construct a new 69kV line from Bennetts Lane to Franklin				
s1409	Sewaren, work associated with Sewaren generation retirement	10/1/2018	\$ 7.40	PSEG	10/31/2017

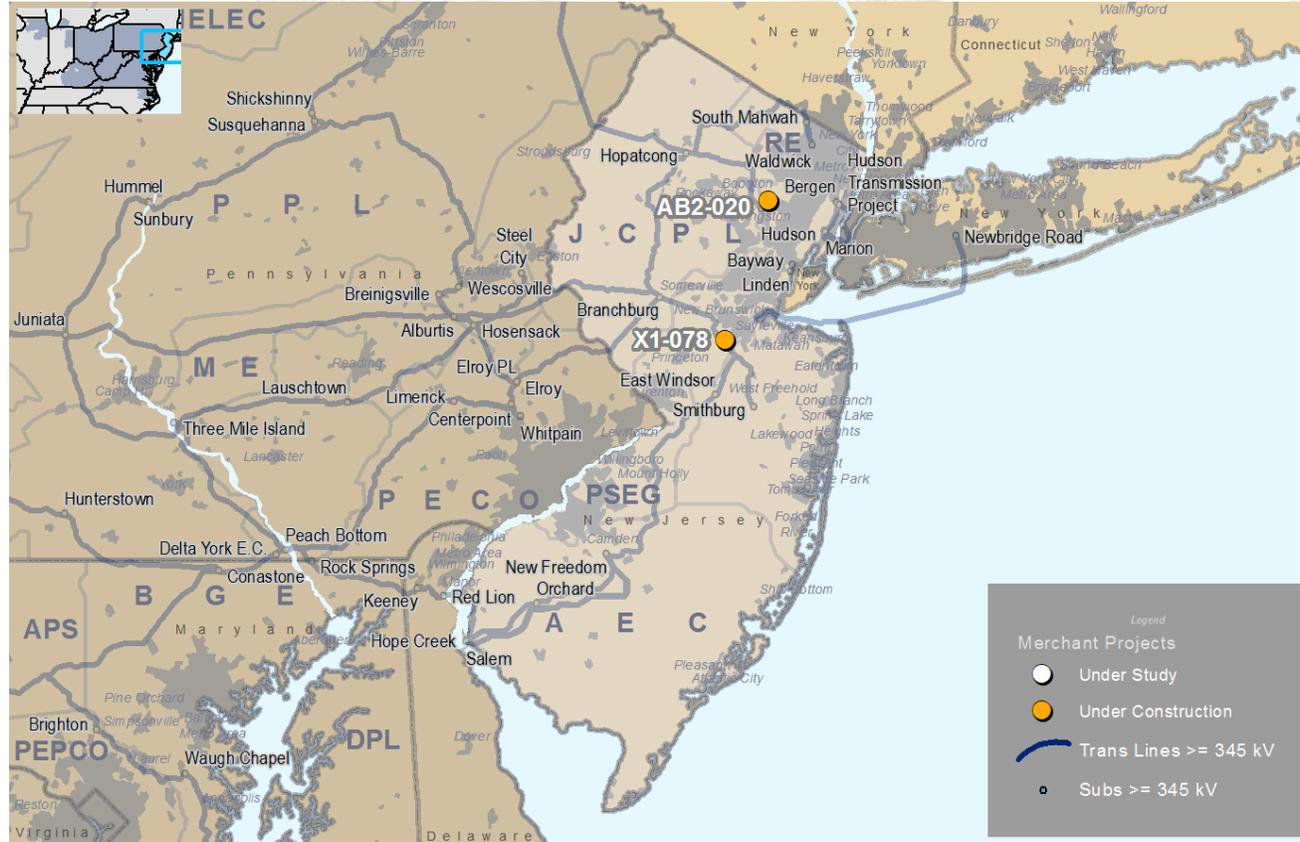


New Jersey - TO Supplemental Projects

(Greater than \$5 million)

Project ID	Description	Required Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
s1411	Rebuild line 0714 69 kV between Clayton and Woodstown substations. All structures, conductor, and static wire will be replaced with new wood (in county ROW) and steel poles, conductor, and OPGW	12/31/2022	\$ 22.30	AEC	10/31/2017
s1459	Rebuild North Bridge Street 69kV bus as a GIS ring bus.	10/31/2021	\$ 41.00	PSEG	12/19/2017
	Construct a new 69kV line from Bridgewater to North Bridge Street				
	Install new 69kV overhead line from Bridgewater to North Bridge Street using existing line position at Bridgewater				

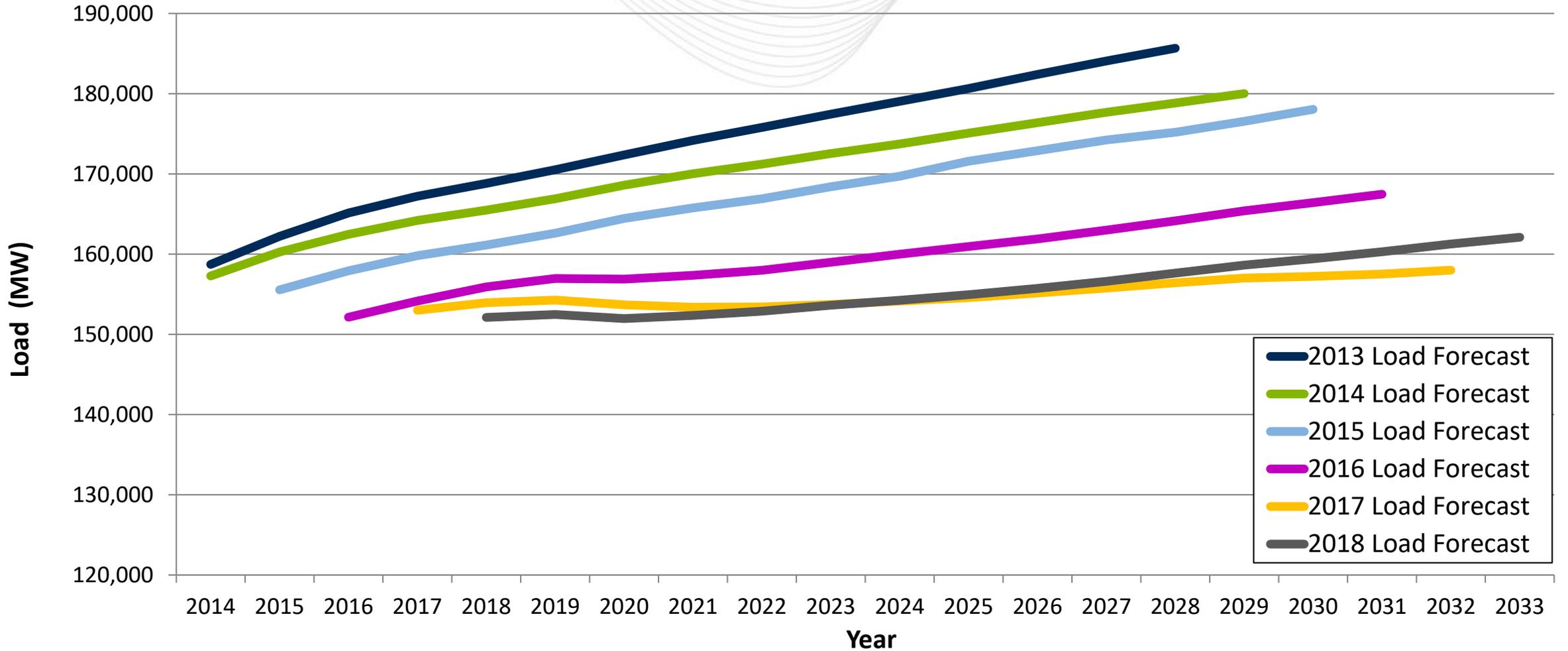
New Jersey - Merchant Transmission Project Requests



Queue	Project Name	MFO	Status	In Service Date	TO
X1-078	Deans (Poseidon) 500kV	525.0	Under Construction	05/01/2020	PSEG
AB2-020	Roseland-Williams 230kV	40	Under Construction	6/1/2018	PSEG

Planning Load Forecast

PJM RTO Summer Peak Demand Forecast





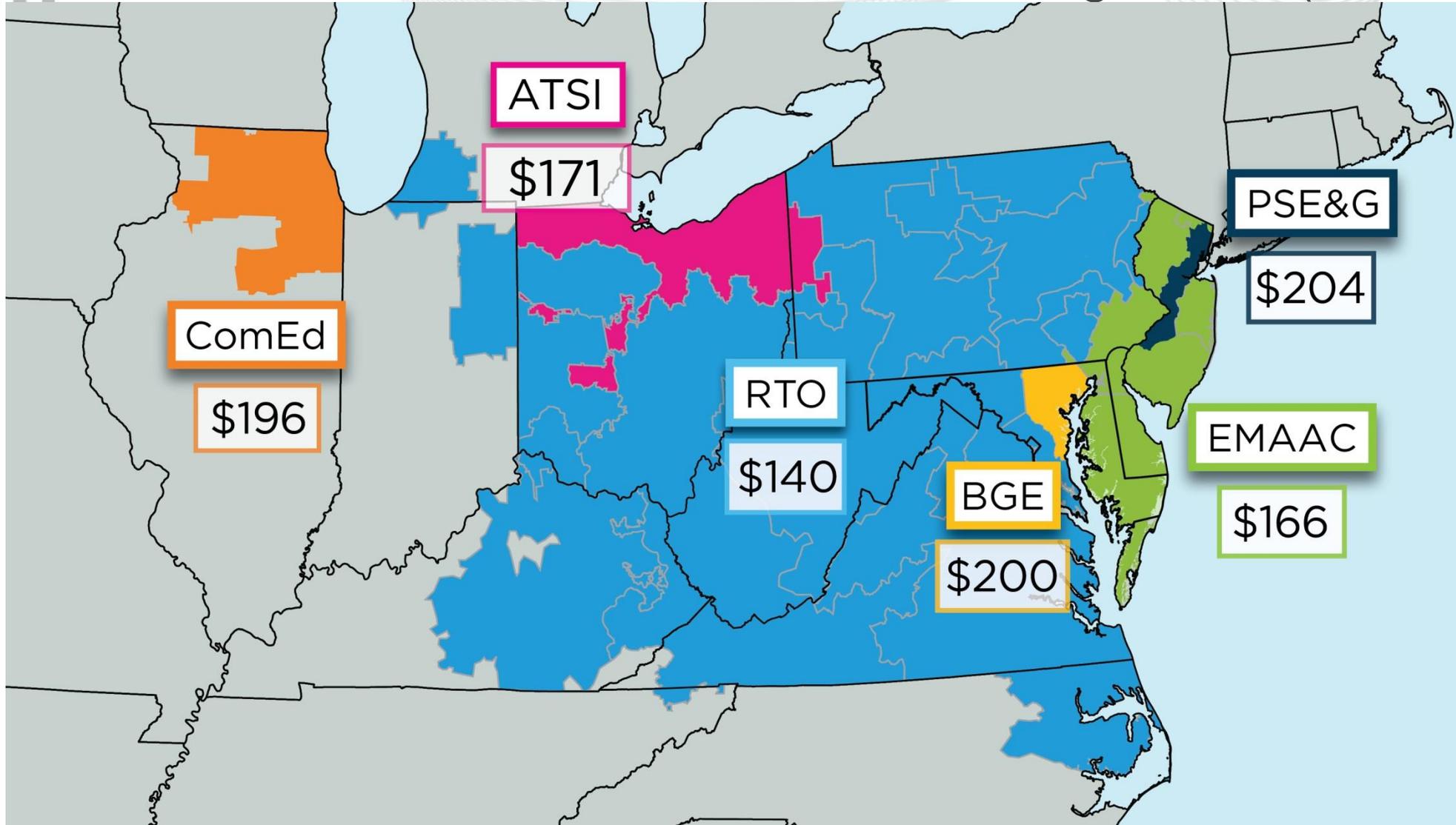
New Jersey – 2018 Load Forecast Report

Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2018	2028	Growth Rate (%)	2017/18	2027/28	Growth Rate (%)
Atlantic City Electric Company	2,460	2,409	-0.2%	1,589	1,537	-0.3%
Jersey Central Power and Light	5,942	5,943	0.0%	3,720	3,681	-0.1%
Public Service Electric and Gas Company	9,903	9,876	0.0%	6,655	6,626	0.0%
Rockland Electric Company	402	402	0.0%	230	229	0.0%
PJM RTO	152,108	157,635	0.4%	131,463	136,702	0.4%

Markets

Capacity Market Results

2021/22 Base Residual Auction Clearing Prices (\$/MW-Day)





New Jersey - Cleared Resources in 2021/22 Auction

(May 23, 2018)

	Cleared MW (Unforced Capacity)	Change from 2020/21 Auction
Generation	12,094	(537)
Demand Response	667	94
Energy Efficiency	468	270
Total	13,230	(174)

EMAAC Locational Clearing Price
\$166

PSE&G Locational Clearing Price
\$204



PJM - 2021/2022 Cleared MW (UCAP) by Resource Type

	Annual	Summer	Winter	Total
Generation	149,616 MW	54 MW	716 MW	150,385 MW
DR	10,674 MW	452 MW	- MW	11,126 MW
EE	2,623 MW	209 MW	- MW	2,832 MW
Total	162,912 MW	716 MW	716 MW	164,343 MW



New Jersey – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

		Unforced Capacity
Generation	Offered MW	13,839
	Cleared MW	12,094
Demand Response	Offered MW	686
	Cleared MW	667
Energy Efficiency	Offered MW	493
	Cleared MW	468
Total Offered MW		15,018
Total Cleared MW		13,230

Markets

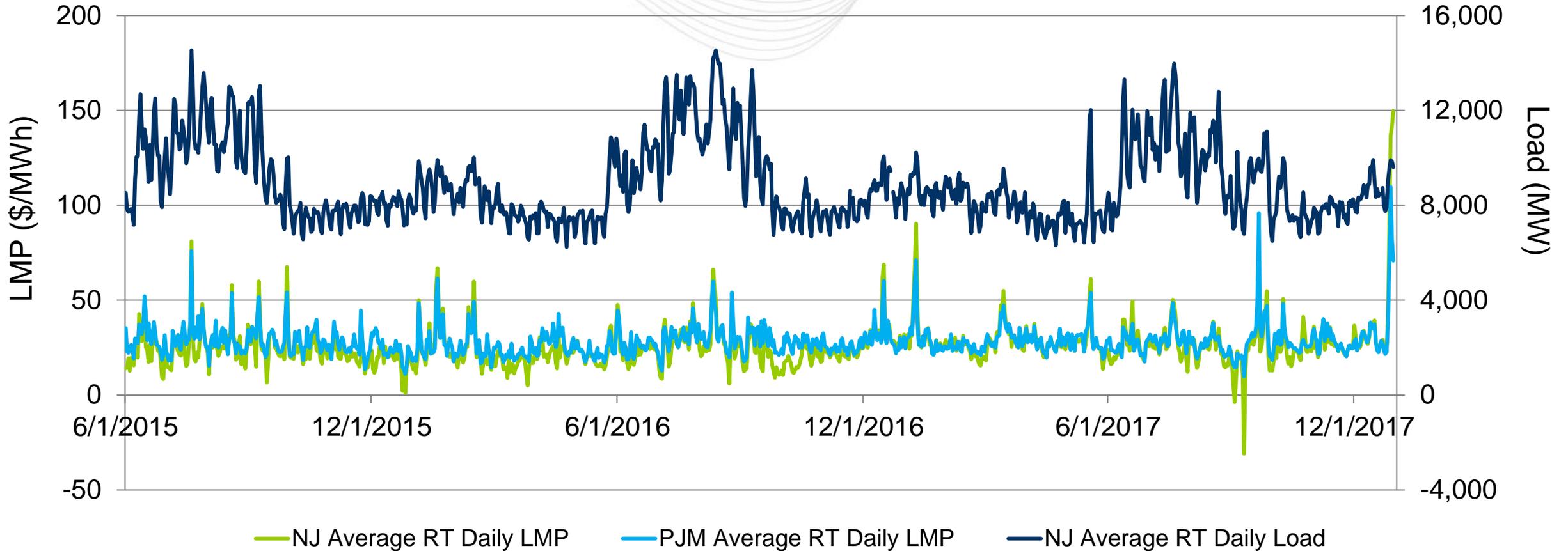
Market Analysis



New Jersey - Average Daily Load and LMP

(June 1, 2015 - December 31, 2017)

New Jersey's average daily LMPs generally align with the PJM average daily LMP



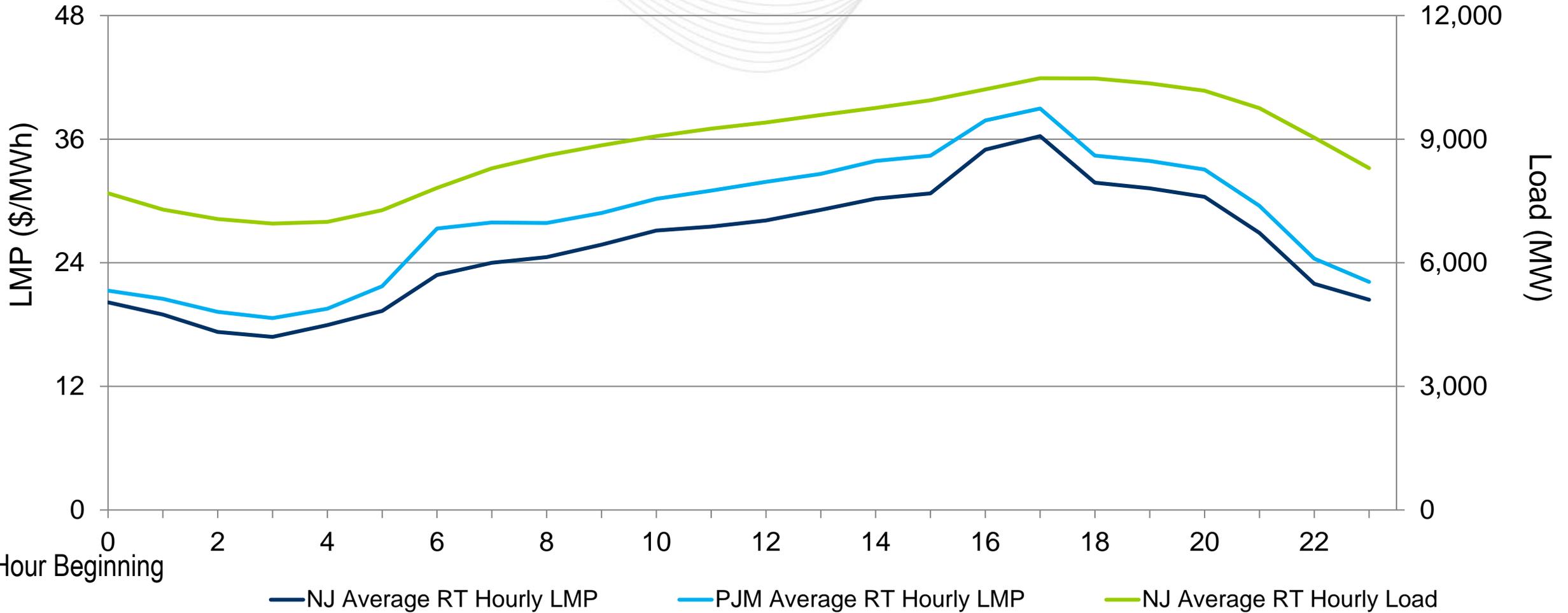
Note: The price spike on 9/21/2017 reflects the PJM shortage pricing event. The price spike starting 12/28/2017 reflects the beginning of the Cold Snap.



New Jersey – Hourly Average LMP and Load

(June 1, 2015 – December 31, 2017)

New Jersey's hourly LMPs were lower than the PJM average.



Operations Emissions Data

