



2017 Delaware State Infrastructure Report

(January 1, 2017 – December 31, 2017)

May 2018

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- Market Analysis

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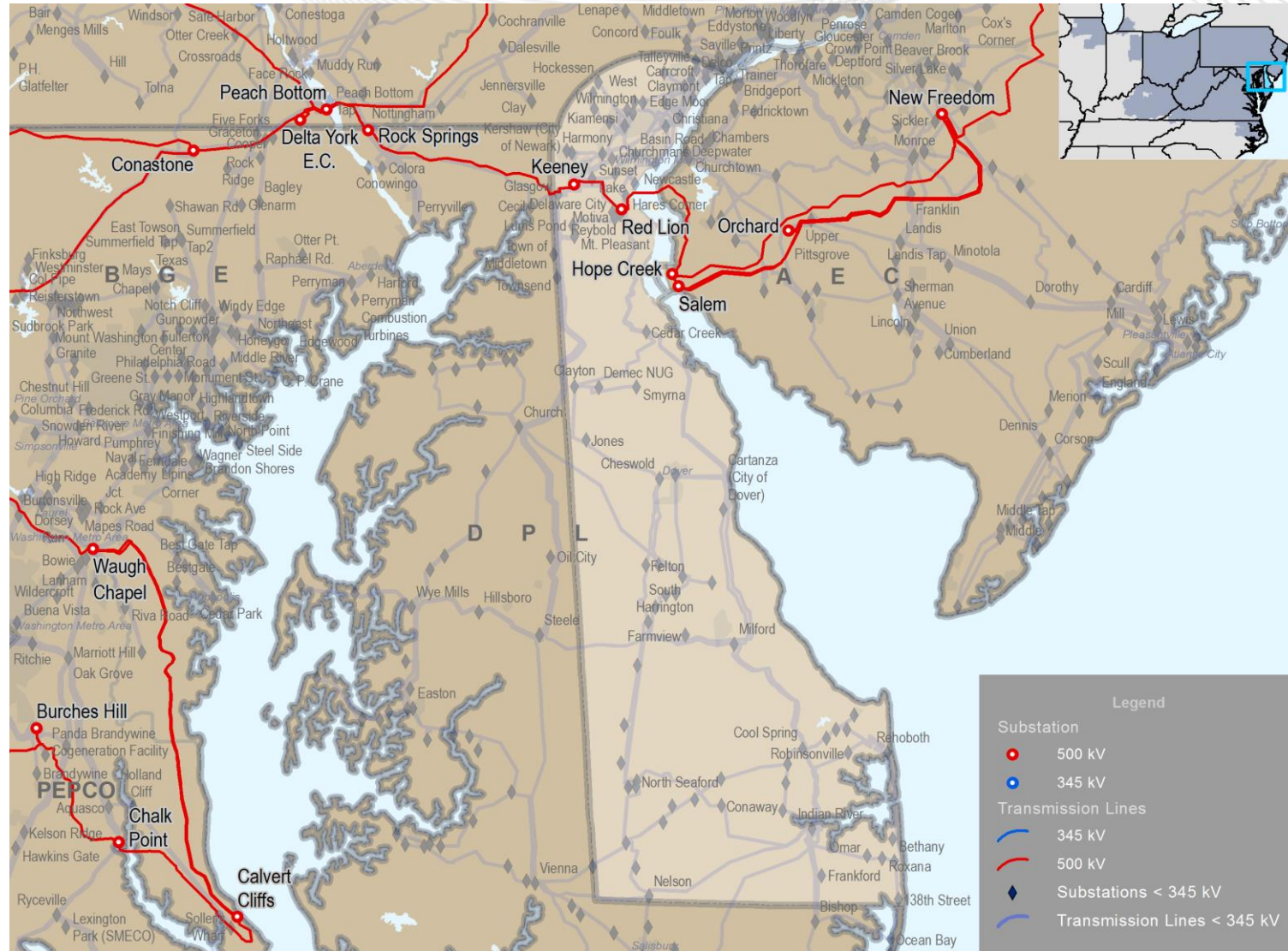
- Emissions Data

- **Existing Capacity:** Natural gas represents approximately 62.9 percent of the total installed capacity in Delaware while oil represents approximately 24.1 percent, and coal 12.7 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 61 percent of new interconnection requests in Delaware.
- **Deactivations:** Approximately 34 MW of capacity from oil resources in Delaware retired in 2017. This represents less than 2 percent of the 2,084 MW that retired RTO-wide in 2017.
- **RTEP 2017:** Delaware RTEP 2017 projects total nearly \$290 million in investment. Approximately 6 percent of that represents supplemental projects.
- **Load Forecast:** Delaware load growth is nearly flat, averaging between 0.2 and 0.4 percent per year over the next 10 years and slightly up from last year's projections. This aligns with PJM RTO load growth projections.

- **2021/22 Capacity Market:** Compared to the PJM footprint, Delaware's distribution of cleared generation, demand response and energy efficiency is similar.
- **6/1/15 – 12/31/17 Performance:** Delaware's average locational marginal prices were consistently at or below PJM average LMPs. Natural Gas resources represented 49.6 percent of generation produced in Delaware while imports averaged 27.8 percent.
- **Emissions:** 2017 carbon dioxide emissions are slightly down from 2016; sulfur dioxides and nitrogen oxides continue to hold flat from 2014.



PJM Service Area – Delaware



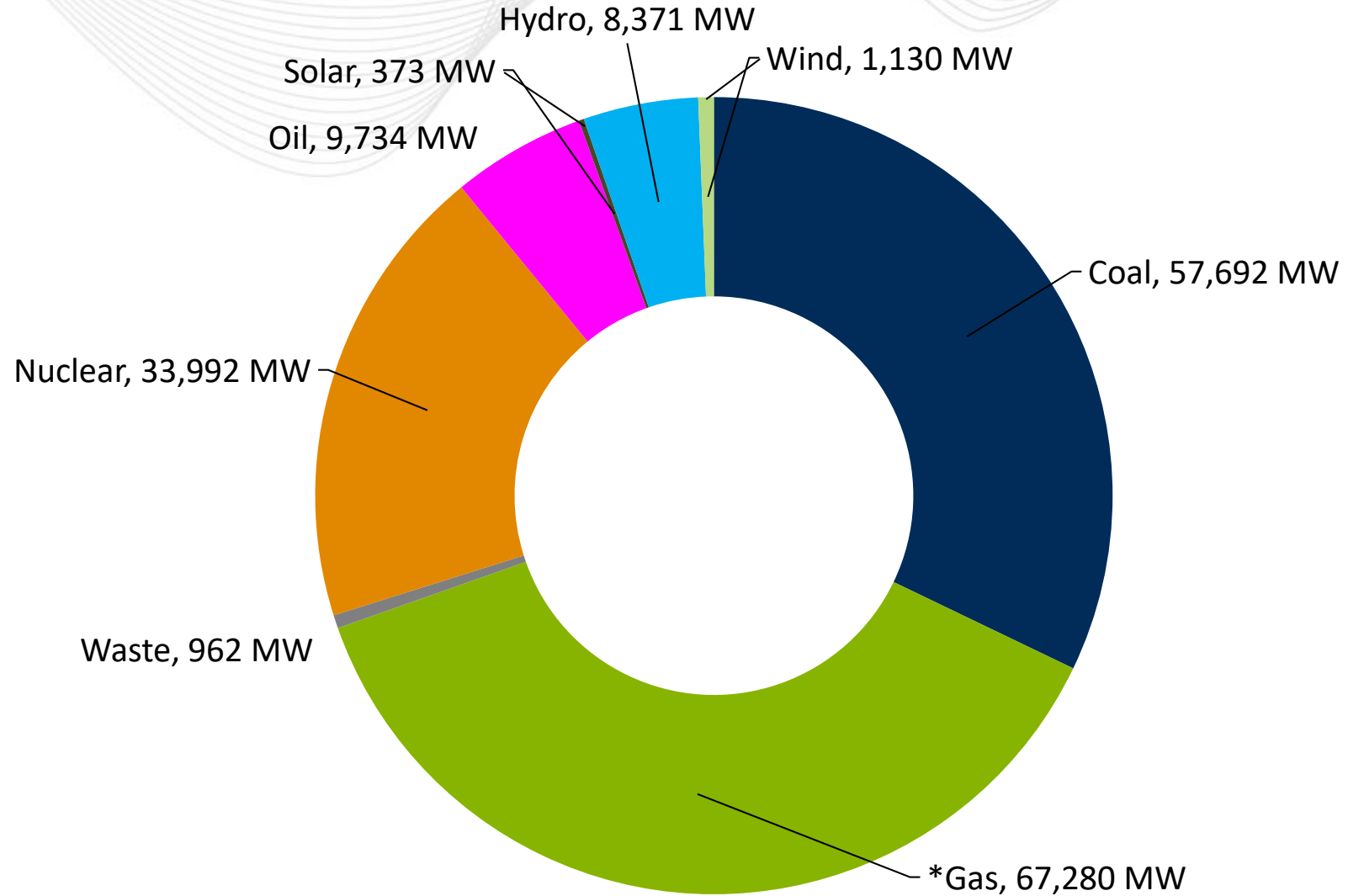
Planning

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.

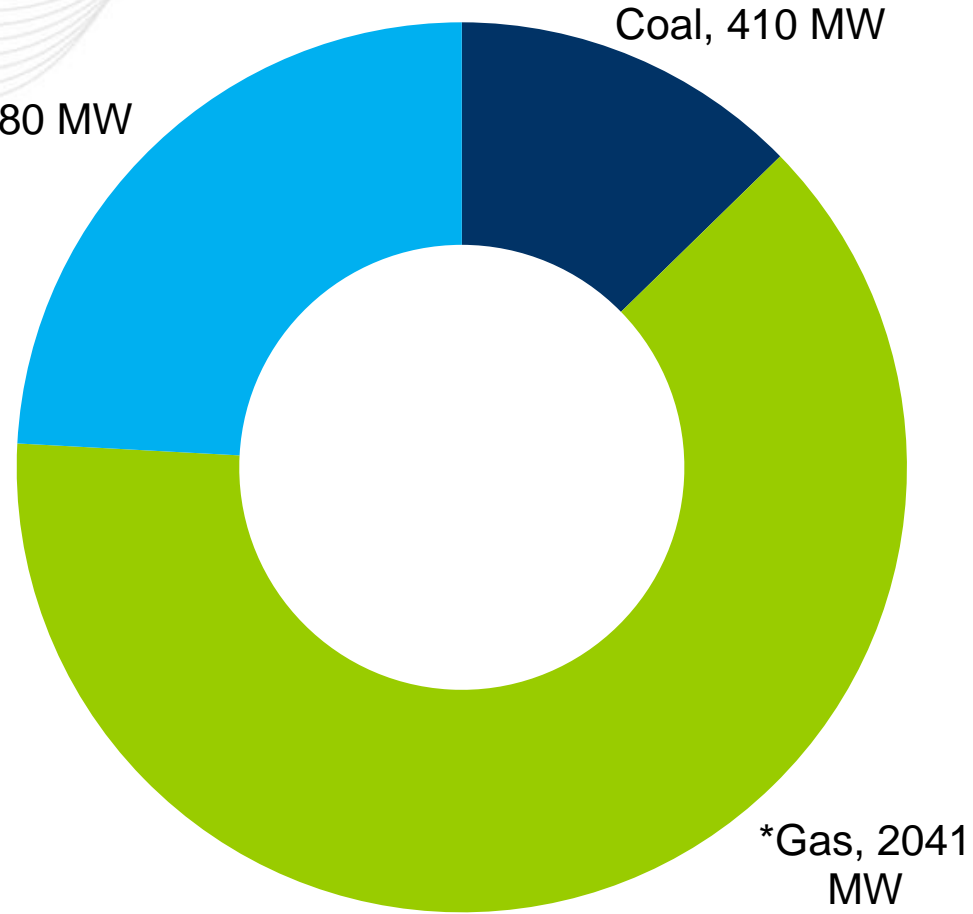


* Gas Contains	
Natural Gas	66,836.3 MW
Other Gas	443.8 MW

Summary:

Natural gas represents 62.9 percent of the total installed capacity in Delaware while coal represents approximately 12.7 percent.

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



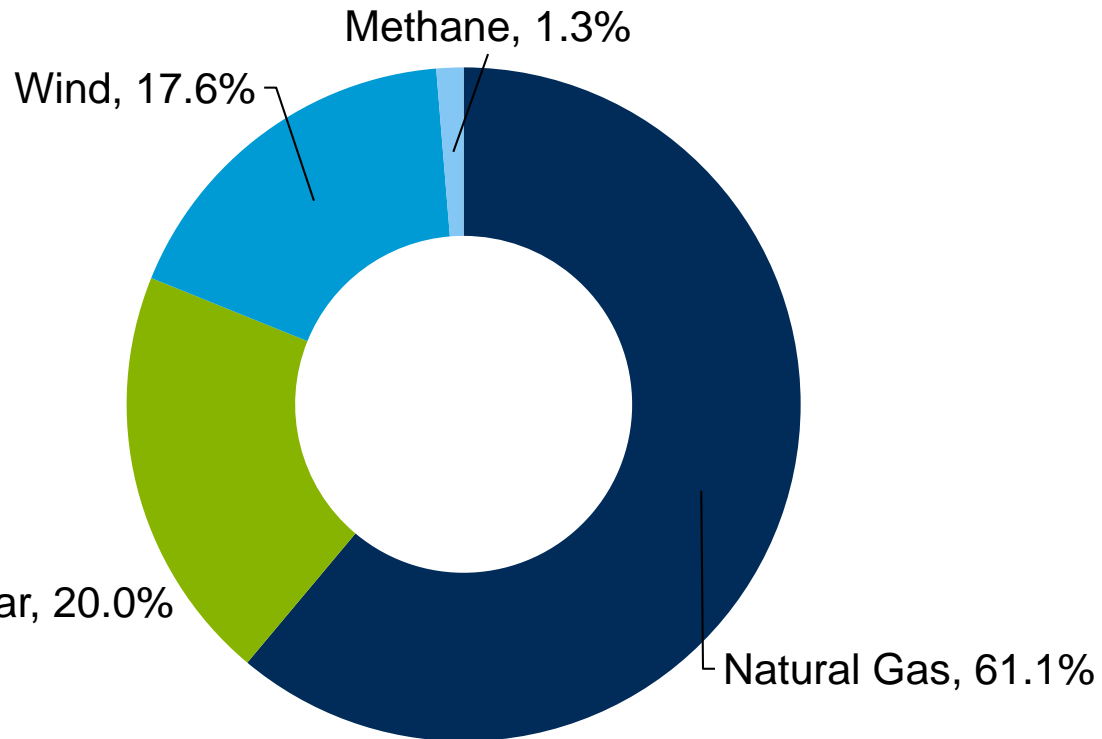
* Gas Contains	
Natural Gas	2,033 MW
Other Gas	8 MW

Delaware – Interconnection Requests

(Requested Capacity Rights, December 31, 2017)

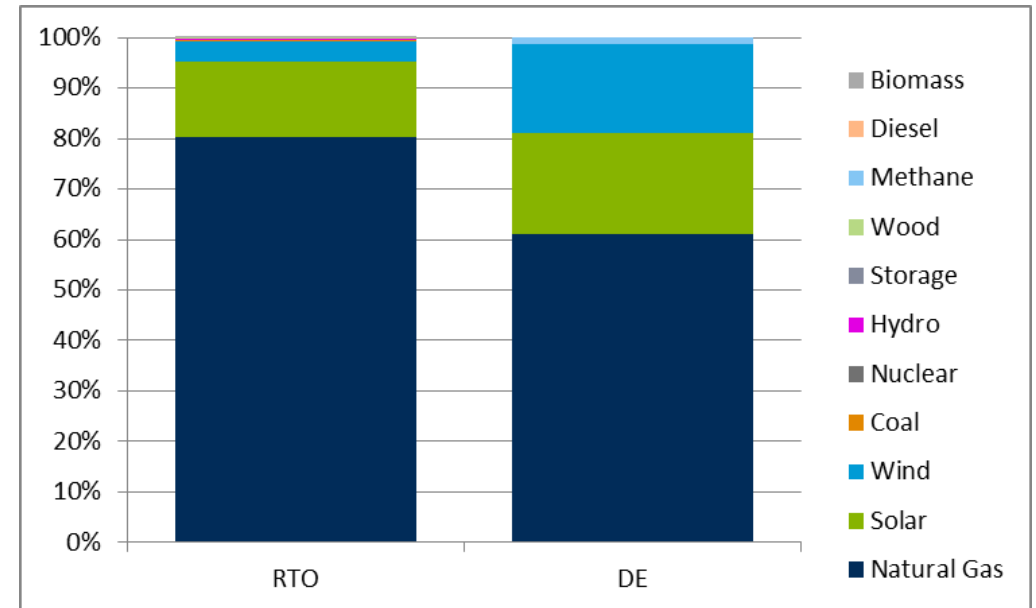
Natural gas represents approximately 61 percent of new interconnection requests in Delaware.

Total MW Capacity by Fuel Type



Fuel Source	Capacity, MW	Nameplate Capability, MW
Natural Gas	451.0	451.0
Solar	147.8	335.2
Wind	129.8	499.6
Methane	9.6	9.6
Total	738.2	1,295.4

Fuel as a Percentage of Projects in Queue





Delaware – Interconnection Requests

(As of December 31, 2017)

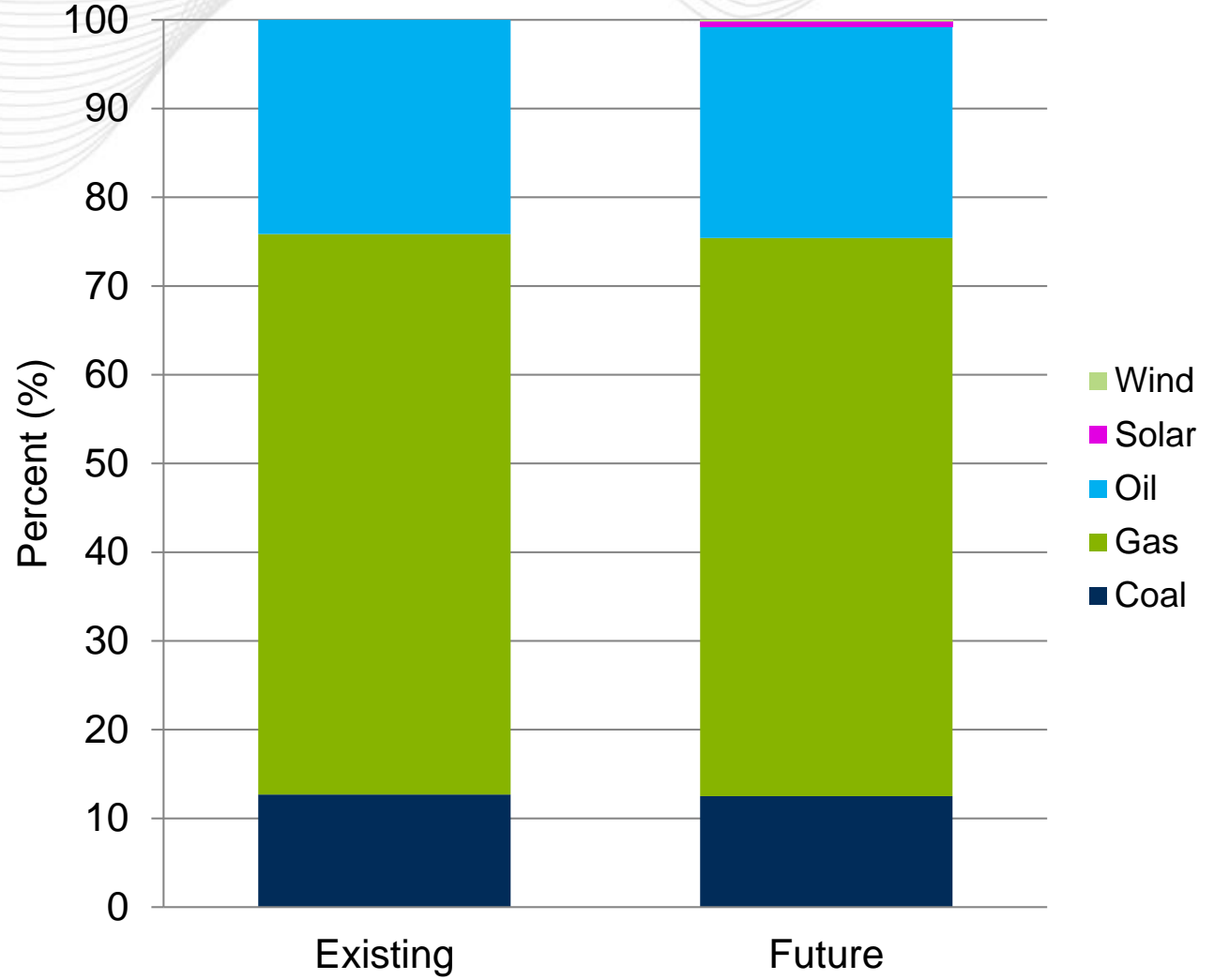
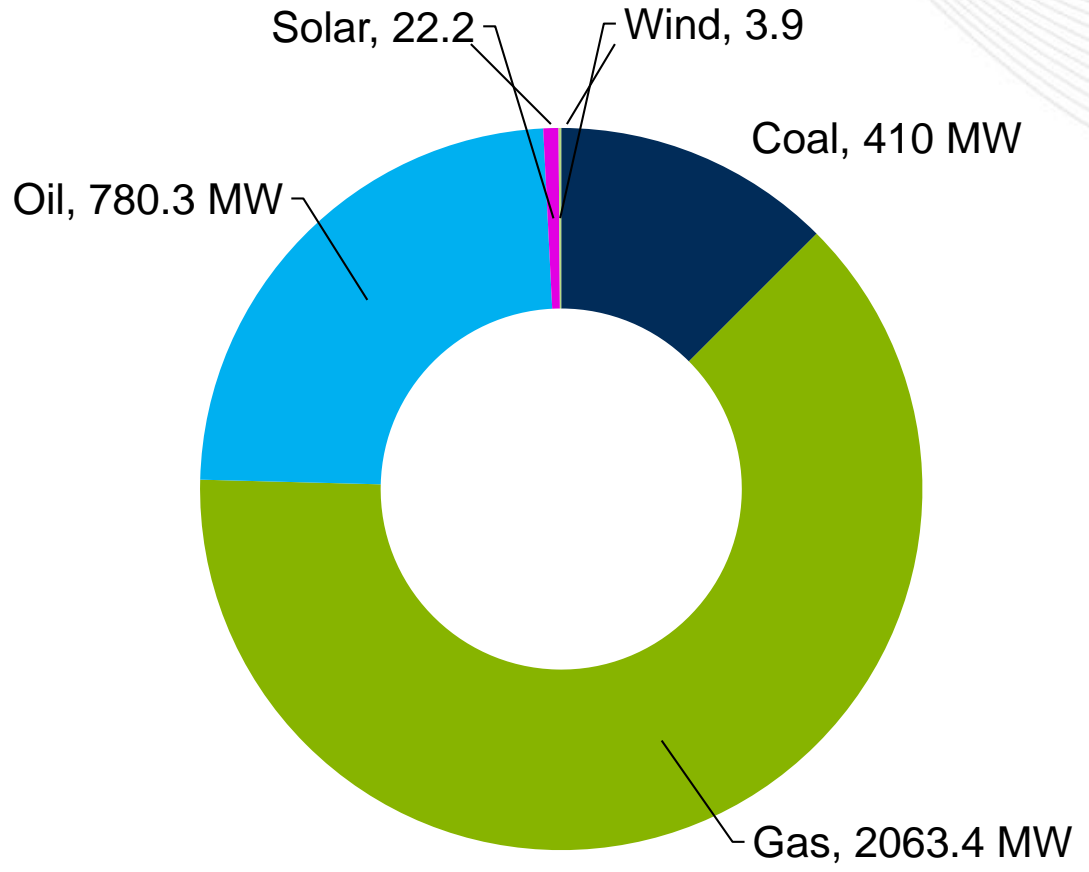
	Complete				In Queue		Grand Total	
	In Service		Withdrawn*		Active			
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Non-Renewable	1,316	28	6,232	25	451	1	8,000	54
Coal	23	2	630	1			653	3
Natural Gas	1,095	19	5,556	19	451	1	7,103	39
Oil	168	5	1	1			169	6
Other	30	2					30	2
Storage			45	4			45	4
Renewable	9	5	501	22	287	18	797	45
Biomass		1	24	4			24	5
Methane	9	4	19	2	10	1	38	7
Solar			168	13	148	15	316	28
Wind			290	3	130	2	420	5
Grand Total	1,325	33	6,733	47	738	19	8,797	99

*May have executed final agreement

** Executed final agreement (ISA / WMPA)

Delaware – 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.





Delaware – Progression History Interconnection Requests

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

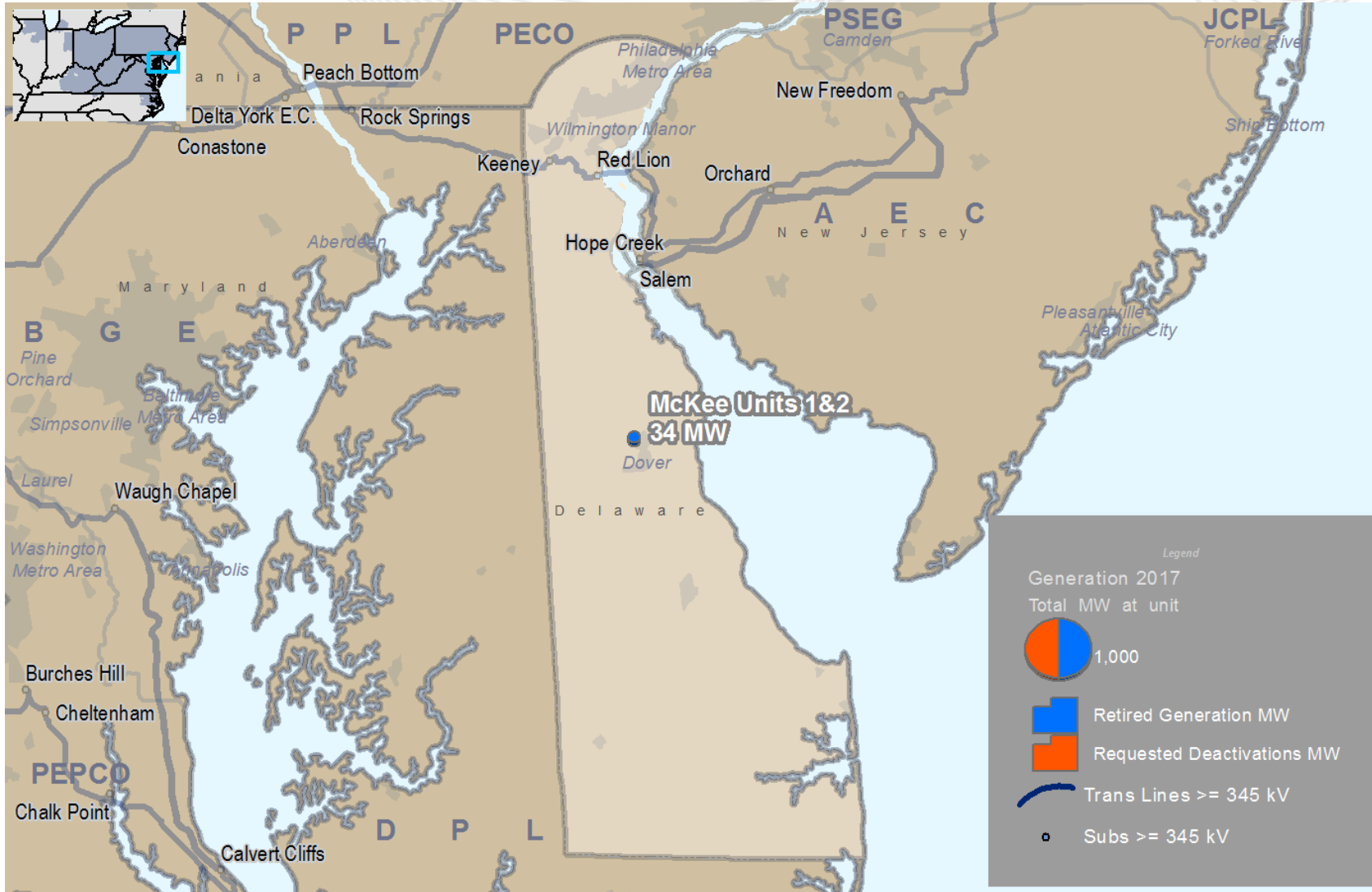


Projects that withdrew after a final agreement

	Number of Projects	Capacity, MW	Nameplate Capability, MW
ISA	3.0	420.0	780.0
WMPA	4.0	13.3	46.9

16.4% of requested capacity megawatt and **41.3%** of projects reaches commercial operation

Delaware – Actual Generation Deactivations in 2017





Delaware – 2017 Generation Deactivations

(Capacity, As of December 31, 2017)

Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
McKee 1	17	DPL	52	5/31/2017
McKee 2	17	DPL	52	5/31/2017

Summary:

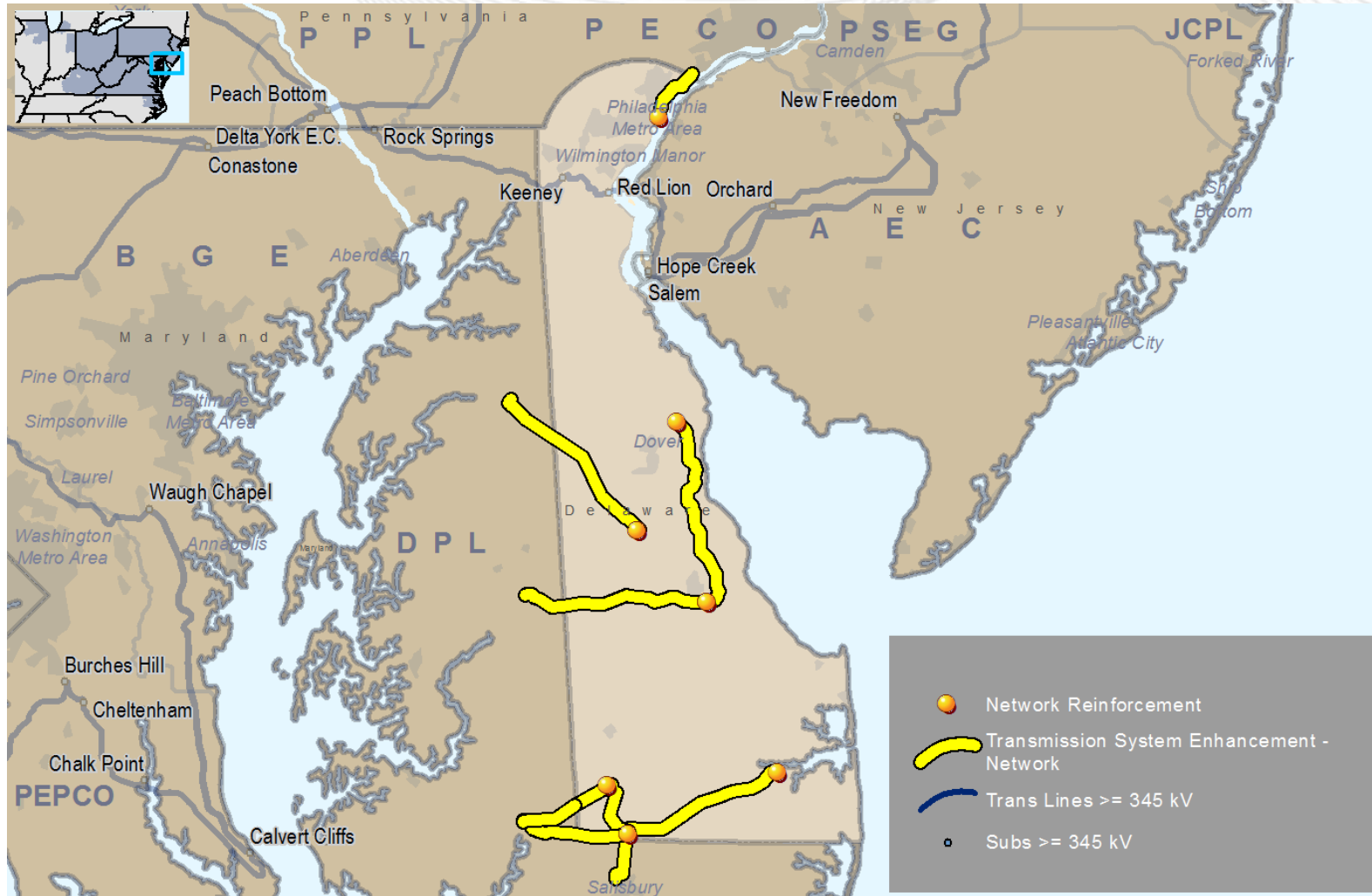
- Two units in Delaware deactivated in 2017.
- 10 generating units totaling 2,084 MW of capacity deactivated in PJM in 2017.
- No generating units in Delaware gave deactivation notifications in 2017.

Planning

Transmission Infrastructure Analysis

Delaware – RTEP Network Projects

(Greater than \$5 million)



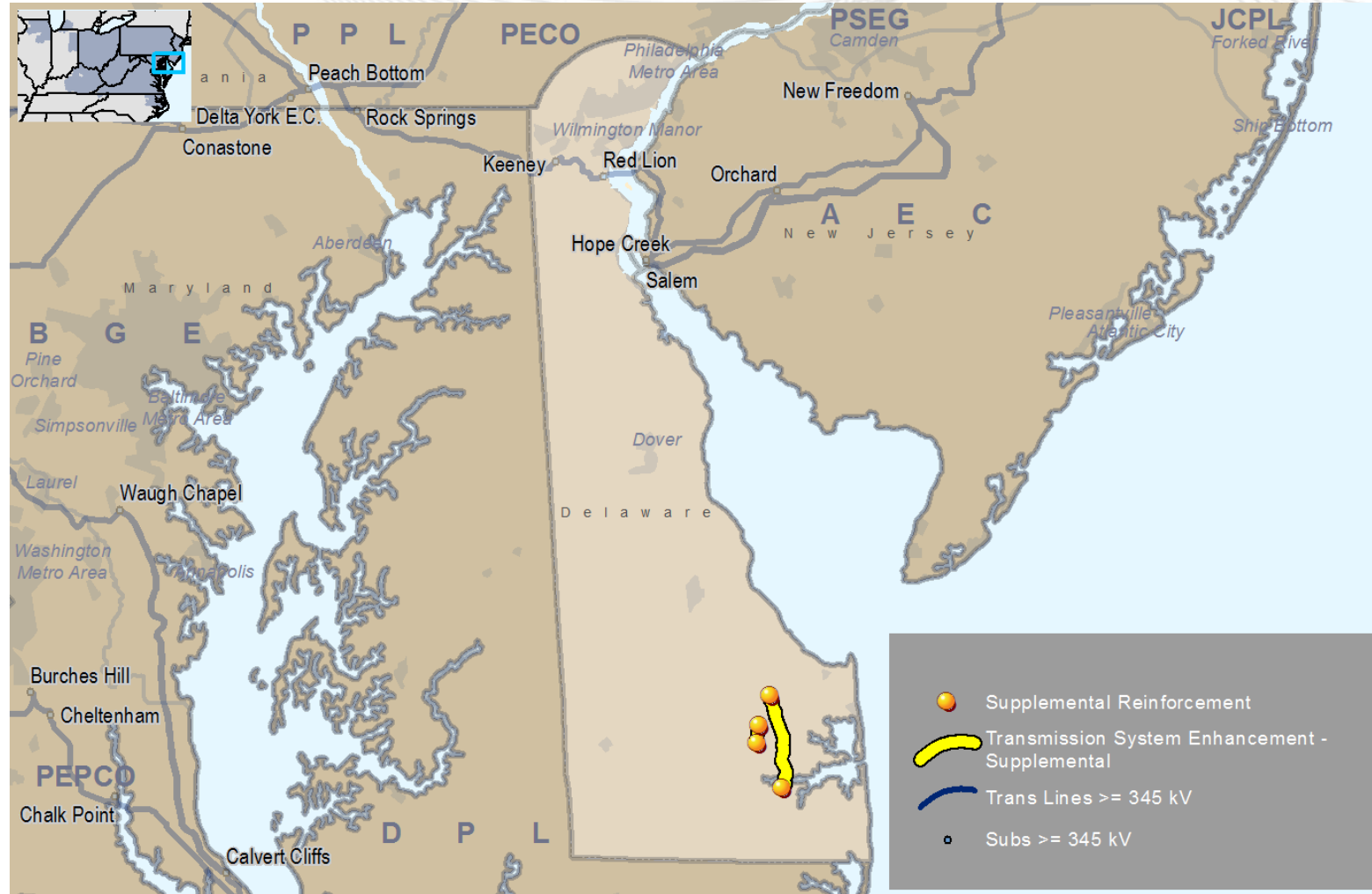
Note: Network upgrades are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests.



Delaware – 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
n5015	Replace disconnect switch, rebuild line & replace conductor for Church-NewMeredith 69kV line	Auction Revenue Requests	AA1-119	12/31/2022	\$ 11.3	DPL	10/12/2017
n5117	Increase the emergency rating of the Milford to Steele 230 kV line by rebuilding the circuit, including the replacement of poles. The estimate to perform this work is \$43,965,000 and will take 4 years to complete.	Generation	AB1-057	3/1/2020	\$ 43.9	DPL	10/12/2017
n5442	Rebuild Line #23033 Cartanza to Mil 230 kV	Auction Revenue Requests	AB1-186	6/1/2016	\$ 39.8	DPL	10/12/2017
n5444	Replace disconnect switch, rebuild line 6704-1 from Church 69_NMeredth & replace conductor on 6701-1 line	Auction Revenue Requests	AB1-186	6/1/2016	\$ 11.3	DPL	10/12/2017
n5446	Rebuild Line #22085 from Edgemr5_Linwood to dual 1590 ACSR	Auction Revenue Requests	AB1-186	6/1/2016	\$ 38.3	DPL	10/12/2017
n5448	Rebuild line #13703 INDRV 2&3 to NELSON and replace substation bus	Auction Revenue Requests	AB1-186	6/1/2016	\$ 31.5	DPL	10/12/2017
n5451	Rebuild line 6705_1 from Laurel to AA1-142 Tap with 954 ACSR	Auction Revenue Requests	AB1-186	6/1/2016	\$ 10.9	DPL	10/12/2017
n5452	Rebuild line 6705_1 from Sharptwnto AA1-142 Tap with 954 ACSR	Auction Revenue Requests	AB1-186	6/1/2016	\$ 10.9	DPL	10/12/2017
n5453	Rebuild line #23076 from Milf230 to Steele with 1590 ACSR 125 C	Auction Revenue Requests	AB1-186	6/1/2016	\$ 44.0	DPL	10/12/2017
n5454	Rebuild line 13707 from Nelson to Vienna8 with 1590 ACSR	Auction Revenue Requests	AB1-186	6/1/2016	\$ 17.5	DPL	10/12/2017
n5455	Rebuild Line 6705_2 from sharptwn to vienn 69 kV with 1590 ASCR, upgrade all substation equipment to 2000 A	Auction Revenue Requests	AB1-186	6/1/2016	\$ 12.5	DPL	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.



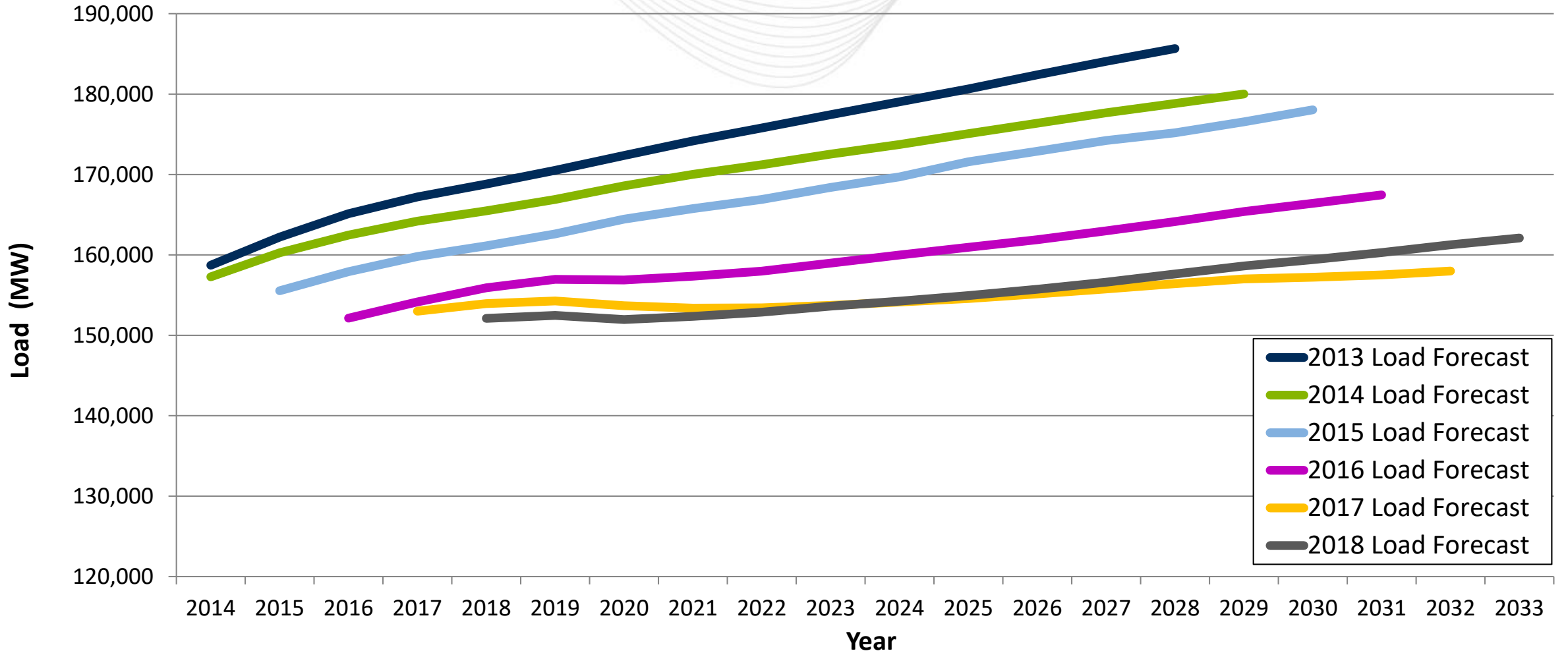
Delaware – TO Supplemental Projects

(Greater than \$5 million)

Project ID	Description	Required Date	Project Cost (\$M)	TO Zone(s)	2017 TEAC Review
s1455	Rebuild line 23070 circuit between Cool Spring and Indian River 230 kV substations. All structures, conductor, and static wire will be replaced with new steel poles, conductor, and OPGW	12/31/2021	17.8	DPL	12/14/2017

Planning Load Forecast

PJM RTO Summer Peak Demand Forecast



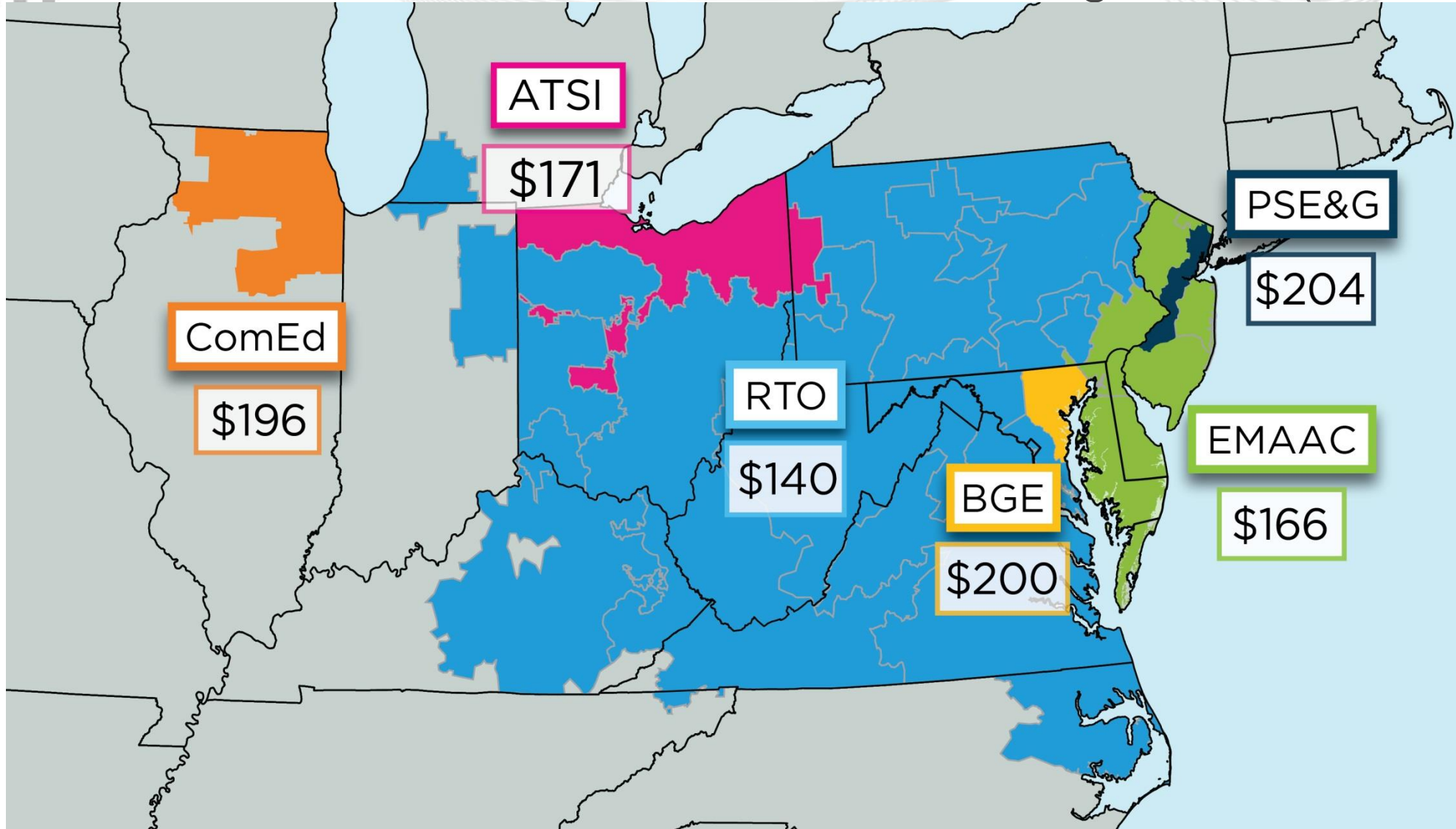
Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2018	2028	Growth Rate (%)	2017/18	2027/28	Growth Rate (%)
Delmarva Power and Light *	2,617	2,670	0.2%	2,117	2,200	0.4%
PJM RTO	152,108	157,635	0.4%	131,463	136,702	0.4%

* PJM notes that Delmarva Power and Light serves load other than in Delaware. The Summer Peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by Delmarva Power solely in Delaware. Estimated amounts were calculated based on the average share of Delmarva Power’s real-time summer and winter peak load located in Delaware over the past five years.

Markets

Capacity Market Results

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





Delaware - Cleared Resources in 2021/22 Auction

(May 23, 2018)

	Cleared MW (Unforced Capacity)	Change from 2020/21 Auction
Generation	2,944	(136)
Demand Response	162	2
Energy Efficiency	29	(6)
Total	3,135	(141)

EMMAC Locational Clearing Price

\$166



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



Delaware – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

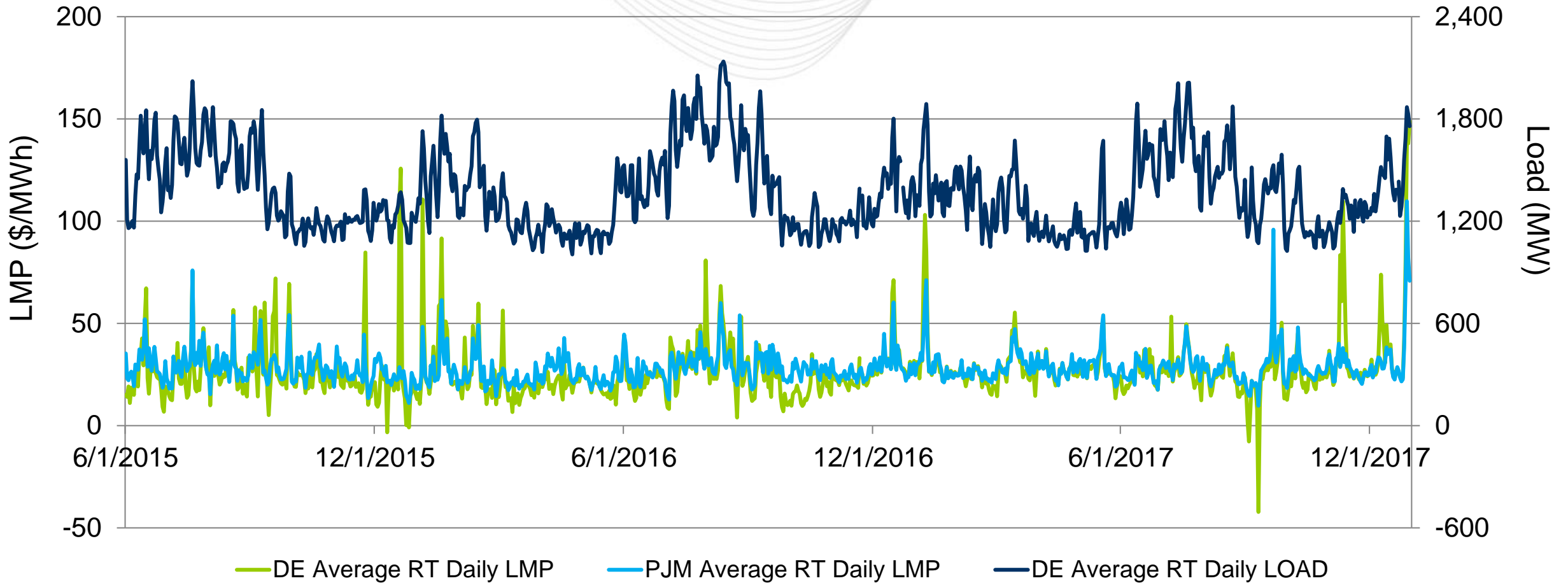
		Unforced Capacity
Generation	Offered MW	3,058
	Cleared MW	2,944
Demand Response	Offered MW	195
	Cleared MW	162
Energy Efficiency	Offered MW	31
	Cleared MW	29
Total Offered MW		3,284
Total Cleared MW		3,135

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.

Markets

Market Analysis

Delaware's average daily LMPs generally align with the PJM average daily LMP



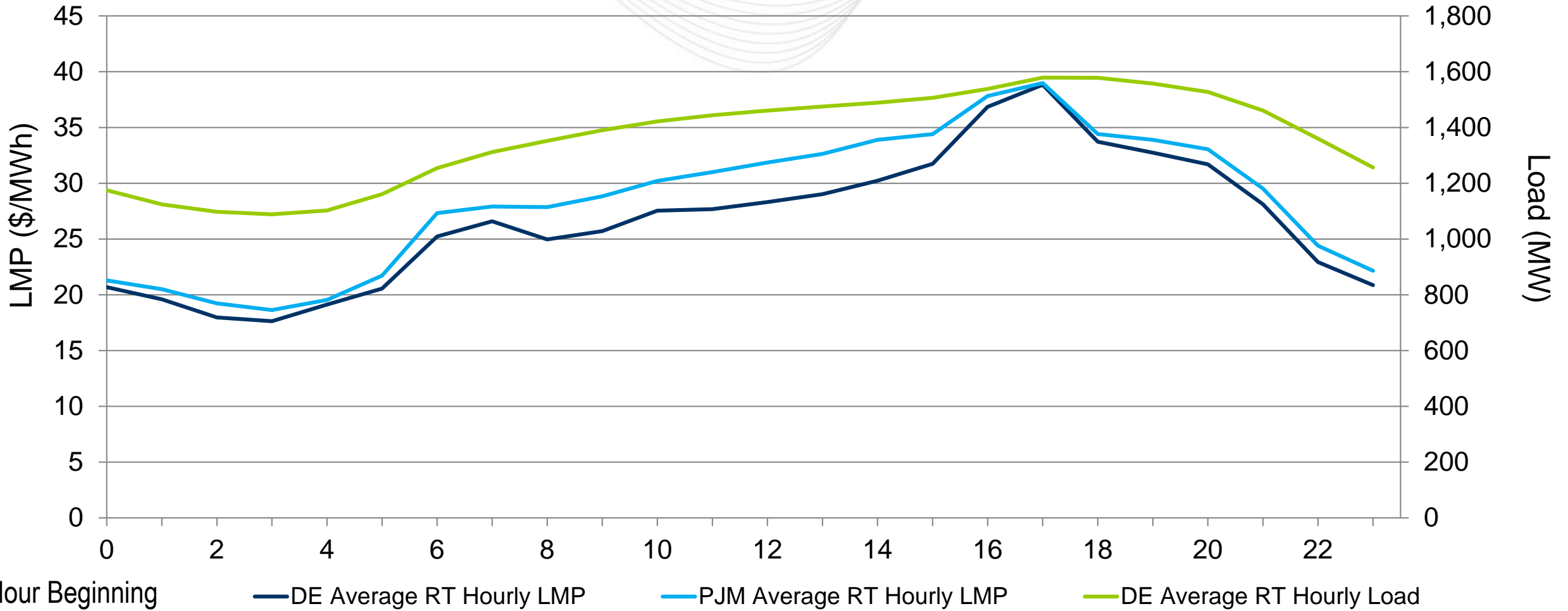
Note: The price spike on 9/21/2017 reflects the PJM shortage pricing event. The price spike starting 12/28/2017 reflects the beginning of the Cold Snap.



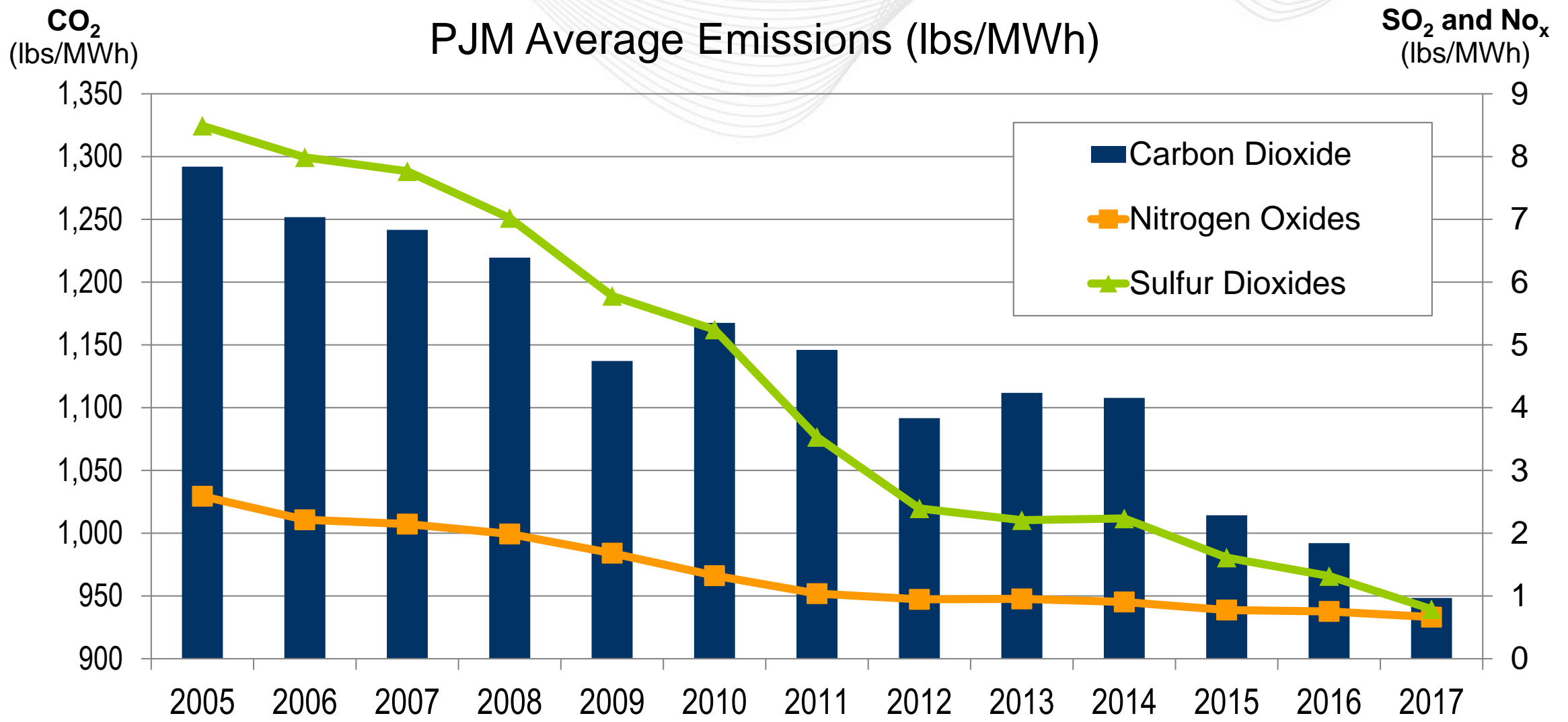
Delaware – Hourly Average LMP and Load

(June 1, 2015 – December 31, 2017)

Delaware's hourly LMPs were generally lower than the PJM average.



Operations Emissions Data



CO₂
(lbs/MWh)

Delaware Average Emissions (lbs/MWh)

SO₂ and NO_x
(lbs/MWh)

