2017 Maryland and District of Columbia Infrastructure Report

(January 1, 2017 – December 31, 2017)

May 2018

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Executive Summary

(May 2018)

- **Existing Capacity:** Natural gas represents approximately 31.5 percent of the total installed capacity in Maryland and Washington, D.C. while coal represents approximately 37.1 percent. This differs slightly from PJM where natural gas and coal are at 37 and 32 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents approximately 81 percent of new interconnection requests in Maryland.
- **Deactivations**: Approximately 0.8 MW of capacity in Maryland retired in 2017. A total of 2,084 MW retired RTO-wide in 2017.
- **RTEP 2017:** Maryland RTEP 2017 projects total more than $233 million in investment. Approximately 94 percent of that represents supplemental projects.
- **Load Forecast:** Maryland and Washington, D.C. load growth is relatively flat, averaging between -.2 and .8 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

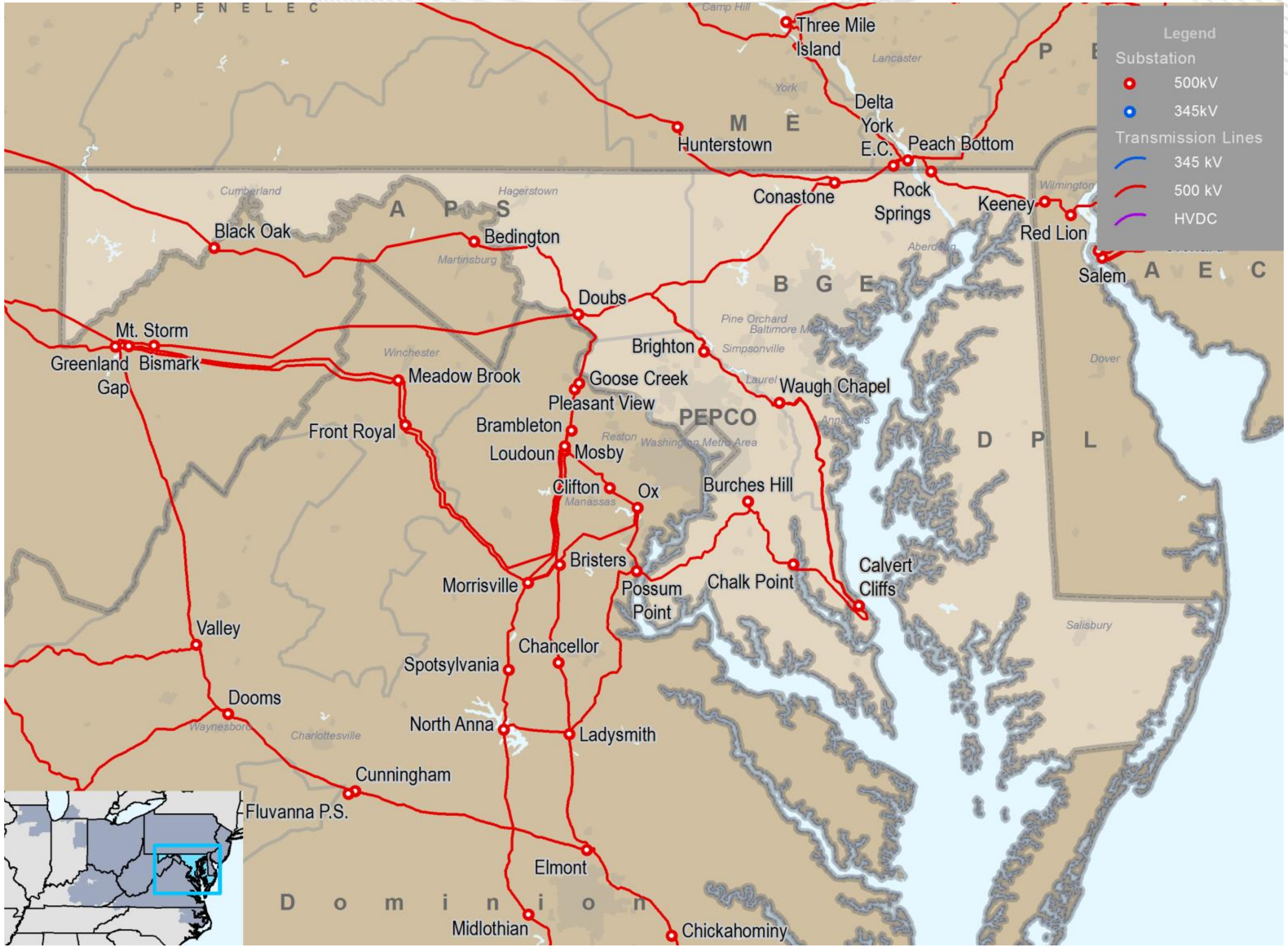
Executive Summary

(May 2018)

- **2021/22 Capacity Market:** Maryland and Washington, D.C. cleared 291 MW more Demand Response and Energy Efficiency resources than in the prior auction.
- **6/1/15 – 12/31/17 Performance:** Maryland and Washington, D.C.’s average locational marginal prices were consistently above PJM average LMPs. Imported resources represented 47.1 percent of generation produced in Maryland while nuclear averaged 23.5 percent. 100 percent of generation in District Columbia is imported.
- **Emissions:** 2017 carbon dioxide emissions in Maryland are down from 2016; sulfur dioxides and nitrogen oxides have continued to hold flat since 2012.

PJM Service Area – Maryland and Washington, D.C.

(December 31, 2017)



Planning

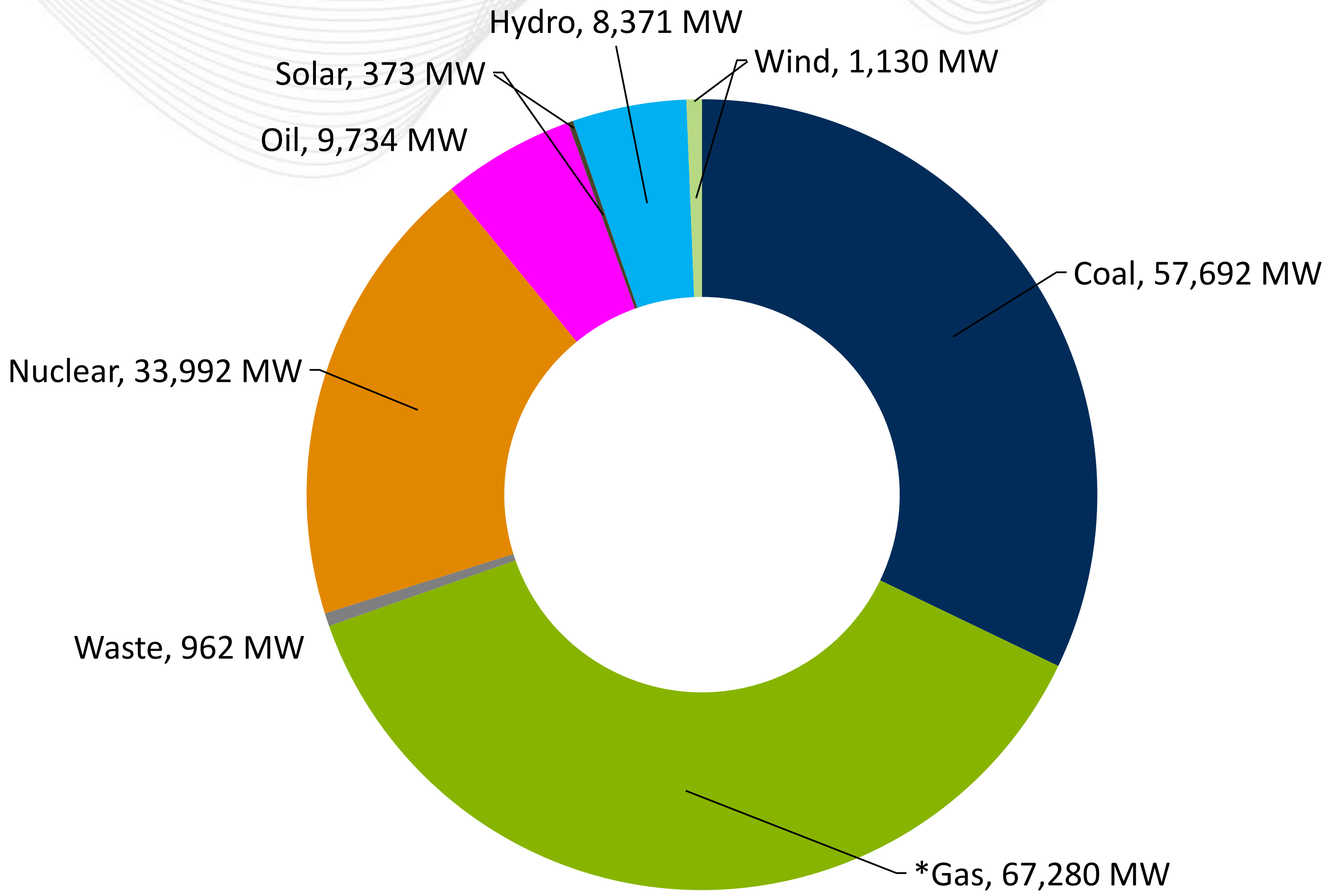
Generation Portfolio Analysis

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



Maryland – Existing Installed Capacity

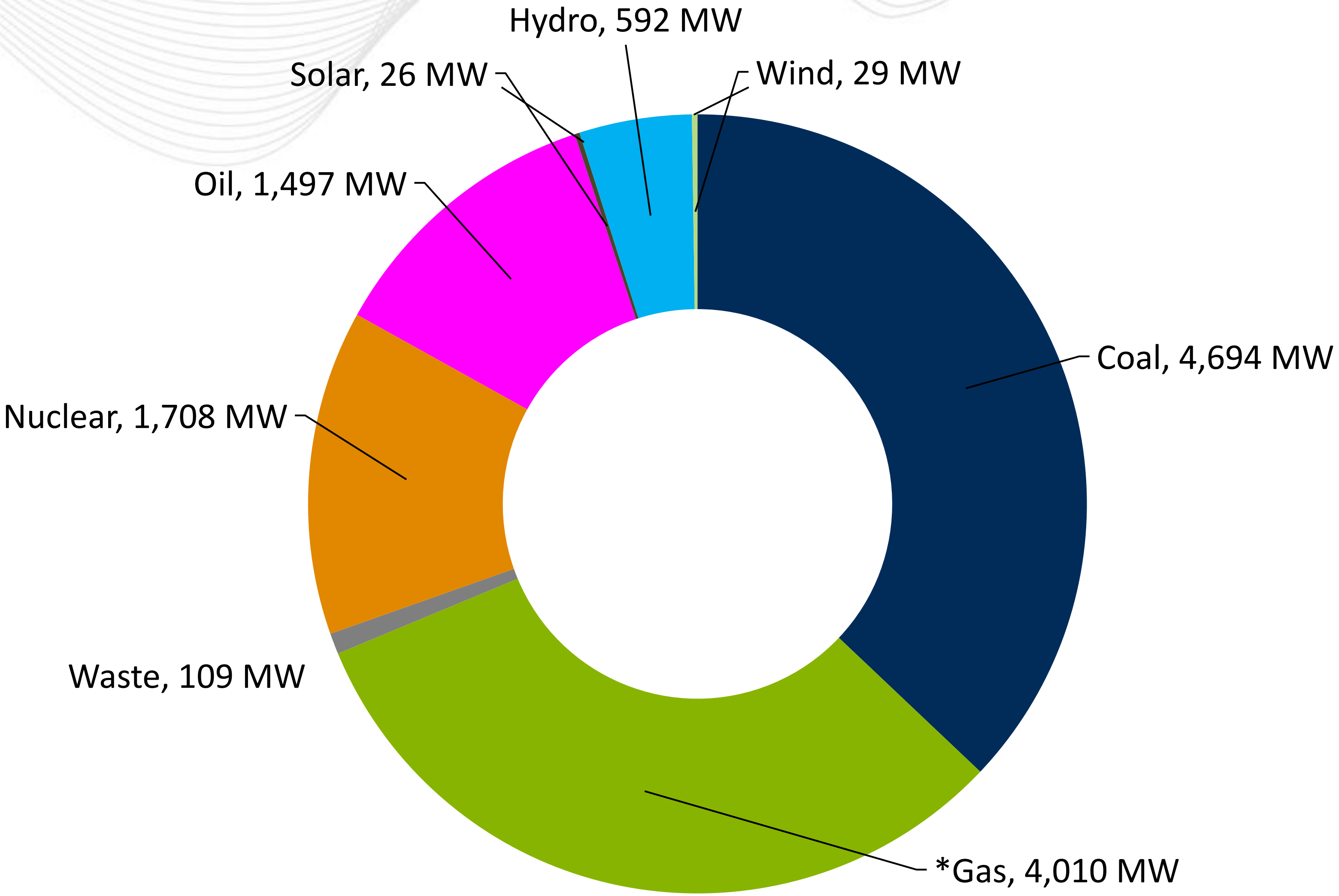
(Washington, D.C. does not have any installed capacity; MW submitted to PJM, December 31, 2017)

Summary:

Natural gas represents approximately 31.5 percent of the total installed capacity in Maryland while coal represents approximately 37.1 percent.

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

* Gas Contains	
Natural Gas	3,993.7 MW
Other Gas	16.2 MW



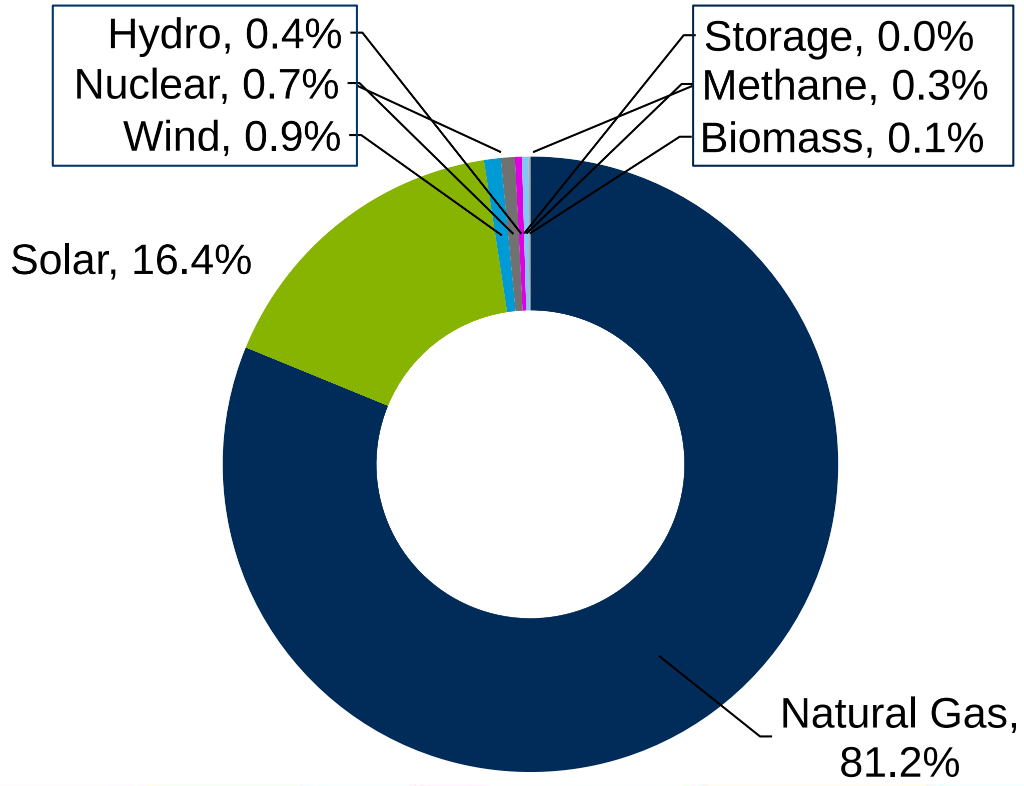
Maryland – Interconnection Requests

(Washington, D.C. does not have any interconnection requests; Requested Capacity Rights, December 31, 2017)

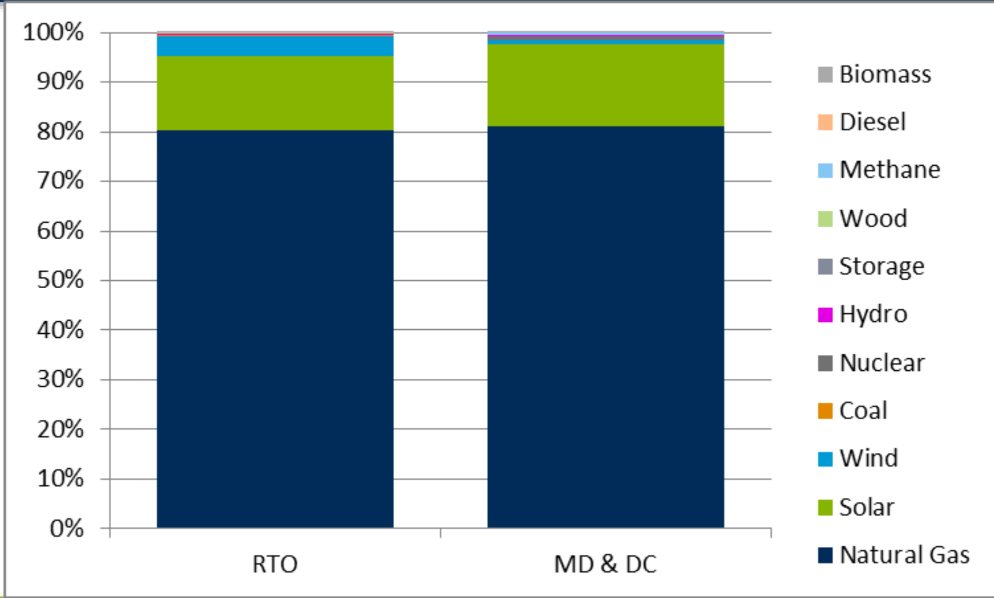
Fuel Source	Capacity, MW	Nameplate Capability, MW
Natural Gas	3,359.4	3,567.4
Solar	678.1	1,413.1
Wind	36.4	279.1
Nuclear	30.3	30.3
Hydro	15.0	15.4
Methane	14.3	15.6
Biomass	4.0	4.0
Storage	-	1.1
Total	**4,137.4**	**5,325.9**

Natural gas represents approximately 81 percent of new interconnection requests in Maryland.

Total MW Capacity by Fuel Type



Fuel as a Percentage of Projects in Queue



Maryland – Interconnection Requests

(Washington, D.C. does not have any interconnection requests; As of December 31, 2017)

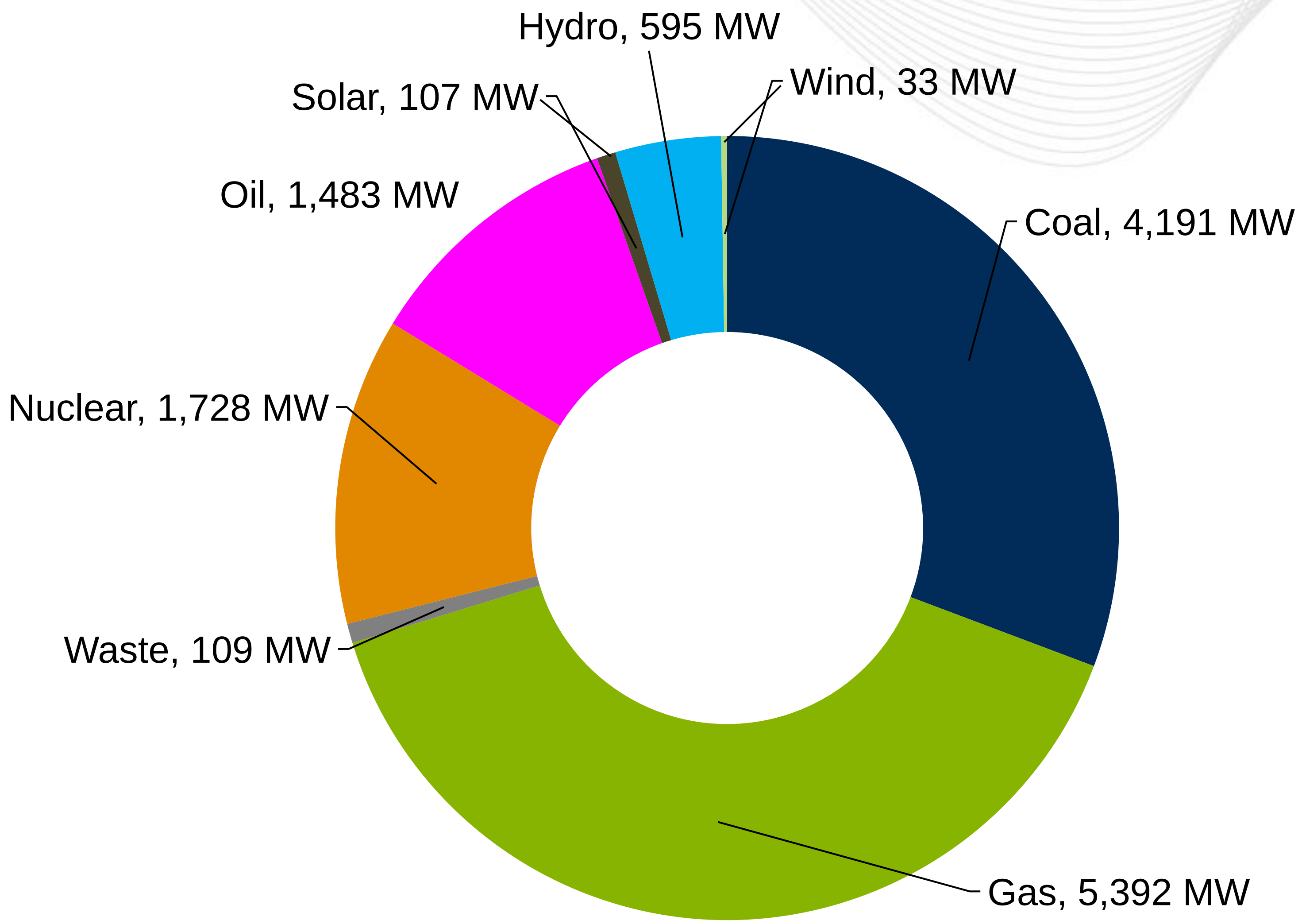
	Complete				In Queue						Grand Total	
	In Service		Withdrawn*		Active		Suspended**		Under Construction**			
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Non-Renewable	1,718	31	36,474	76	713	6	952	3	1,724	27	41,582	143
Coal	10	1									10	1
Diesel	-	1	5	1							5	2
Natural Gas	1,703	26	31,295	58	683	3	952	3	1,724	7	36,358	97
Nuclear		1	4,955	4	30	2					4,985	7
Oil	5	2	2	1							7	3
Other			157	5							157	5
Storage			60	7	-	1			-	20	60	28
Renewable	144	24	1,122	148	540	37	98	17	109	16	2,014	242
Biomass			199	10	4	1					203	11
Hydro	60	2	73	3	15	1			-	1	148	7
Methane	22	9	4	3	12	2			2	1	40	15
Solar	30	9	679	125	509	33	89	16	80	12	1,387	195
Wind	33	4	167	7			9	1	27	2	236	14
Grand Total	**1,863**	**55**	**37,596**	**224**	**1,254**	**43**	**1,050**	**20**	**1,833**	**43**	**43,596**	**385**

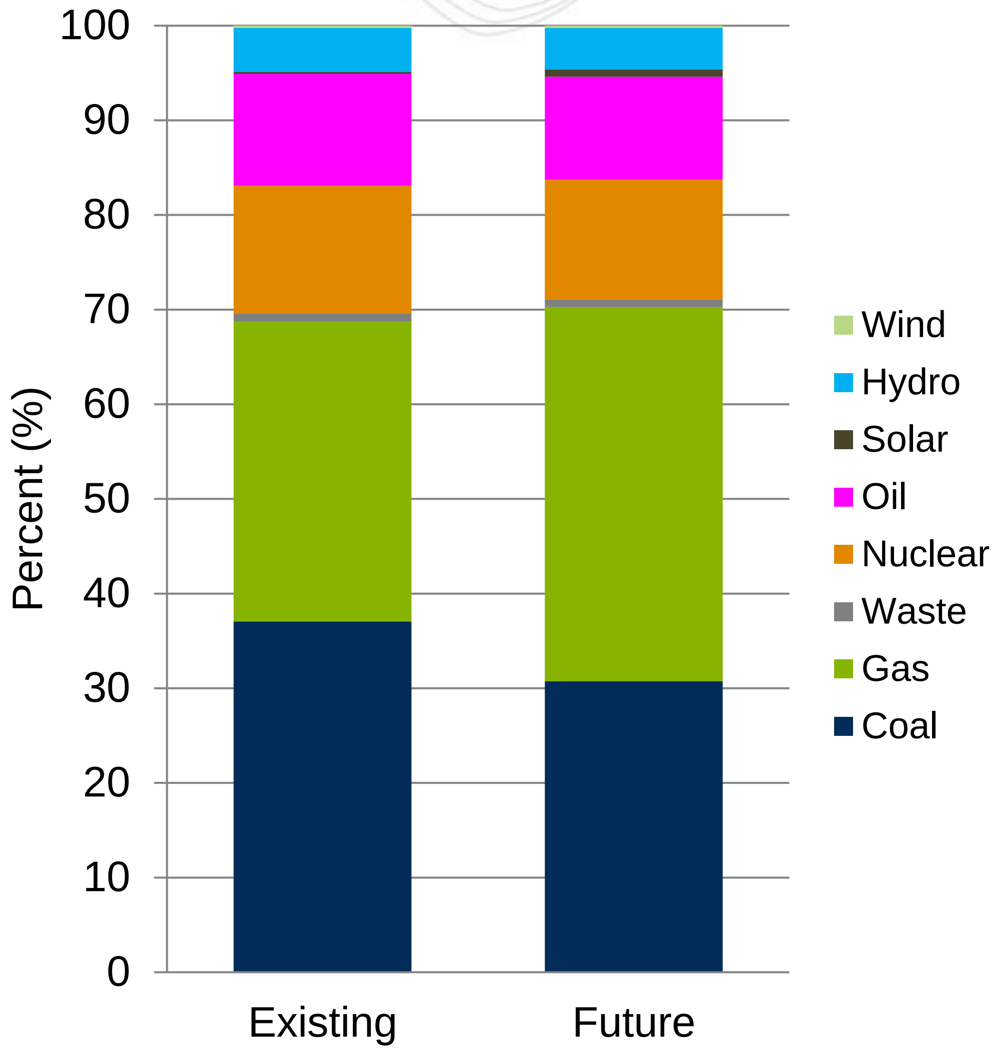
*May have executed final agreement

** Executed final agreement (ISA / WMPA)

Maryland – 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.





Maryland – Progression History Interconnection Requests

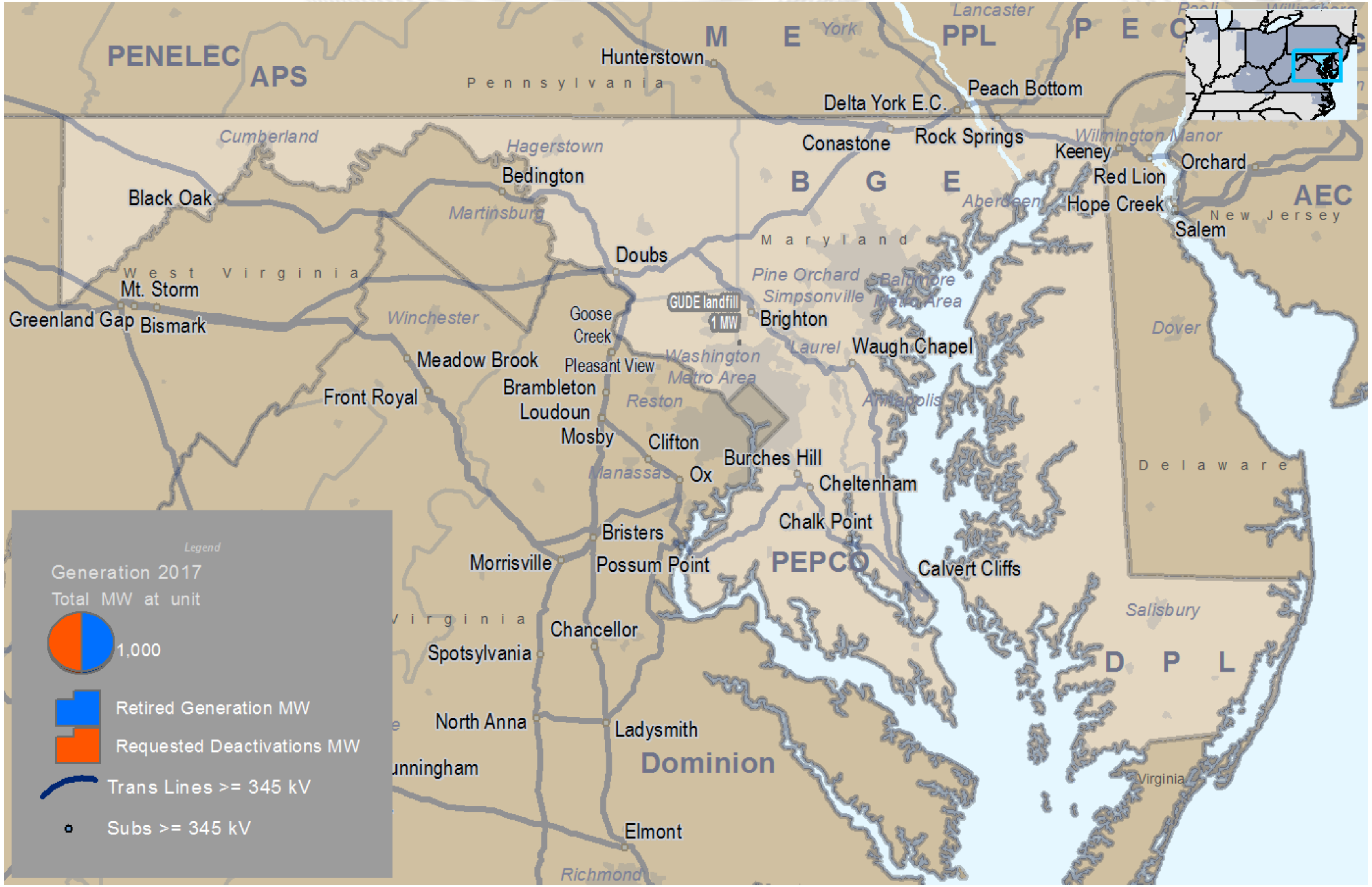
Projects under construction, suspended, in service, or withdrawn – As of December 31, 2017

Projects that withdrew after a final agreement

	Number of Projects	Capacity, MW	Nameplate Capability, MW
ISA	17	4,621	4,755
WMPA	8	35	54

8.4% of requested capacity megawatt and **17.4%** of projects reaches commercial operation

Maryland – Actual Generation Deactivations in 2017



Maryland – 2017 Generation Deactivations

(Capacity, As of December 31, 2017)

Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
GUDE Landfill	0.8	PEPCO	11	8/24/2017

Summary:

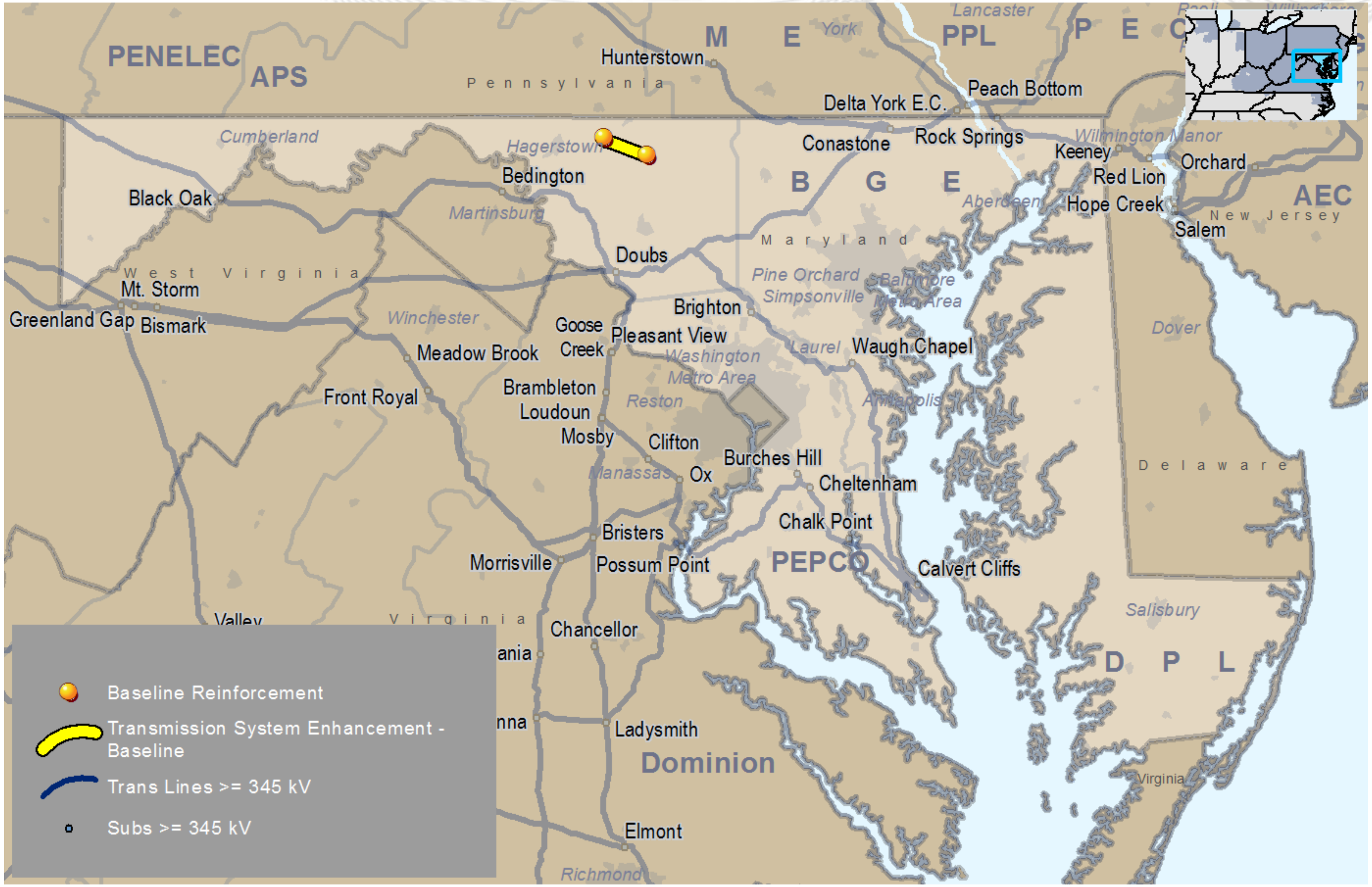
- One unit in Maryland deactivated in 2017.
- 10 generating units totaling 2,084 MW of capacity deactivated in PJM in 2017.
- Maryland did not receive any deactivation notifications in 2017.

Planning

Transmission Infrastructure Analysis

Maryland – RTEP Baseline Projects

(No baseline projects were planned in Washington, D,C in the 2017 RTEP; Greater than $5 million)



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

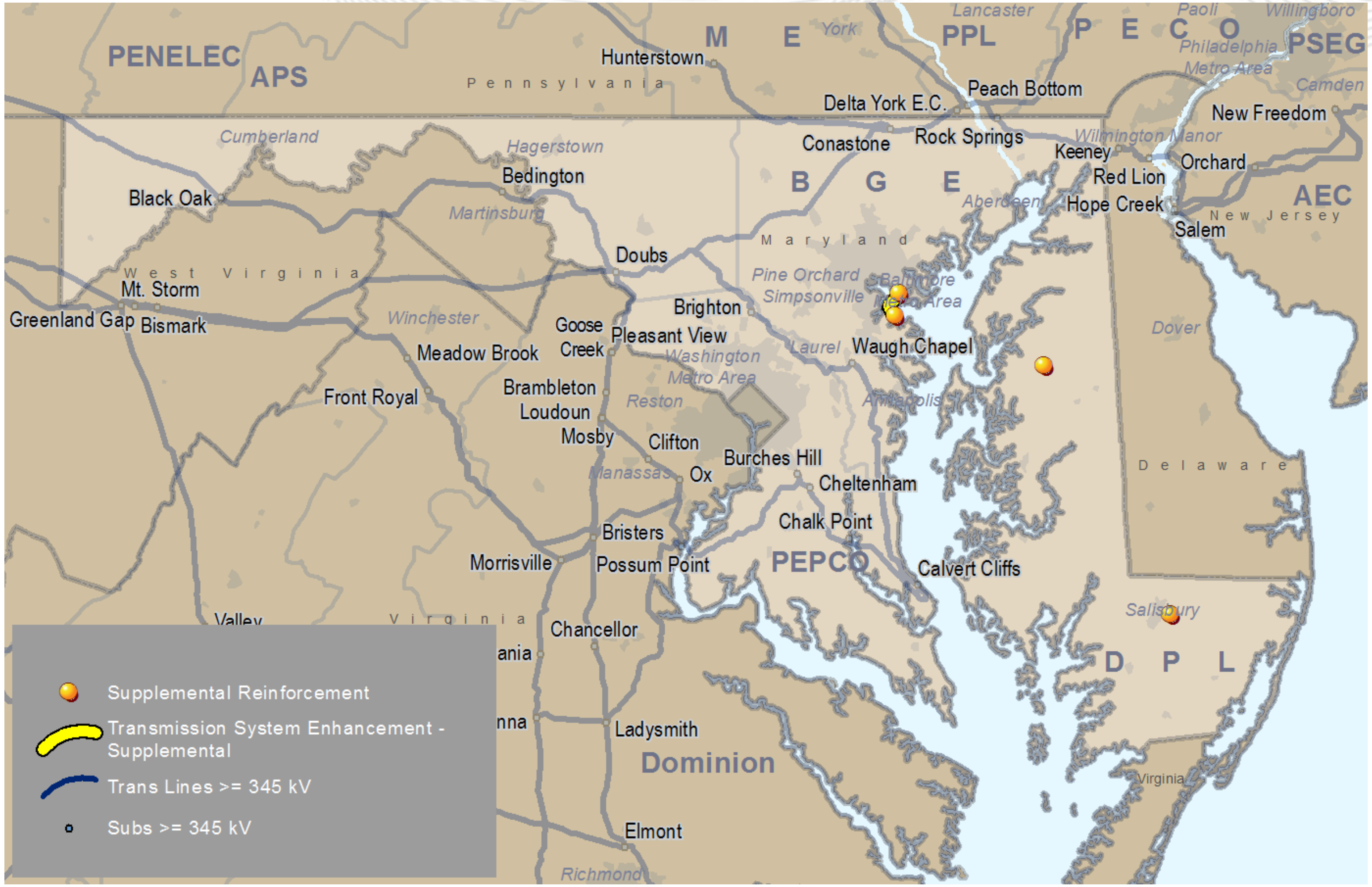
Maryland – RTEP Baseline Projects

(No baseline projects were planned in Washington, D,C in the 2017 RTEP; Greater than $5 million)

Project ID	Project	Project Driver	Required In Service Date	Project Cost ($M)	TO Zone(s)	2017 TEAC Review
b2970	Install one new 230 kV breaker at Catoctin substation.	Baseline Load Growth Deliverability & Reliability	6/1/2020	$ 13.3	APS	11/2/2017
	Ringgold - Catoctin Solution					
	Install two new 230 kV positions at Ringgold for 230/138 kV transformers.					
	Install new 230 / 138 kV transformer at Catoctin substation. Convert Ringgold-Catoctin 138 kV Line to 230 kV operation.					
	Install new 230 kV position for Ringgold – Catoctin 230 kV line.					

Maryland – TO Supplemental Projects

(No supplemental projects were planned in Washington, D,C in the 2017 RTEP; Greater than $5 million)



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.

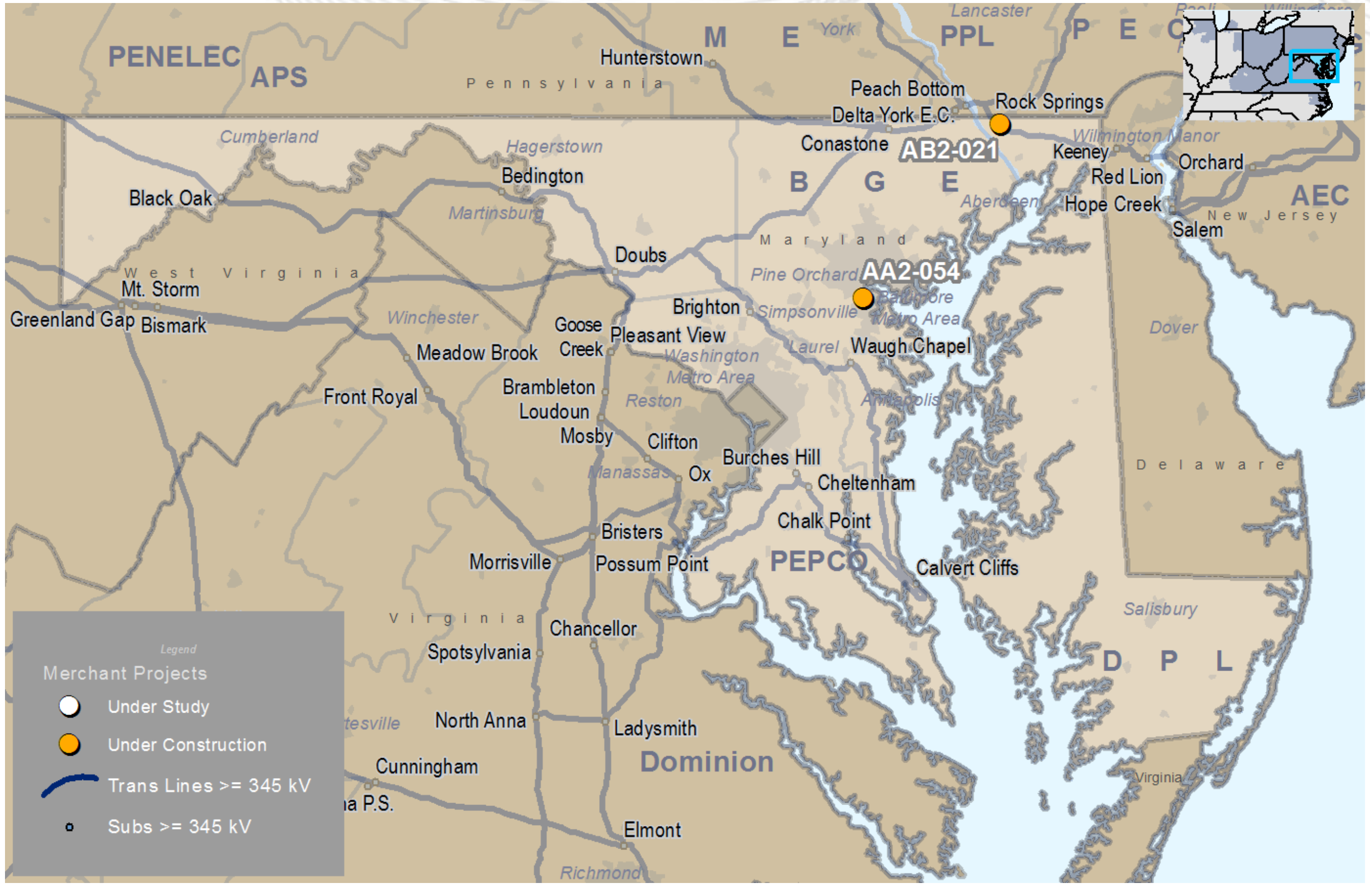
Maryland – TO Supplemental Projects

(No supplemental projects were planned in Washington, D,C in the 2017 RTEP; Greater than $5 million)

Project ID	Description	Required Date	Project Cost ($M)	TO Zone(s)	2017 TEAC Date
s1261	Construct a new 138/25 kV Carville Substation with one new 138/25 kV 37.6 MVA transformer	12/31/2018	$ 5.4	DPL	1/5/2017
s1263	Construct a new Beaglin 69/25 kV Substation and tie into circuit 6726 (North Salisbury - Mt. Hermon)	4/29/2020	$ 11.5	DPL	1/5/2017
s1267	Replace underground submarine cables portion of the Brandon Shores - Riverside 230 kV circuits #2344 and #2345 with overhead conductors on towers	12/31/2022	$ 203.0	BGE	1/5/2017

Maryland – Merchant Transmission Project Requests

(No merchant transmission projects were planned in Washington, D,C in the 2017 RTEP)

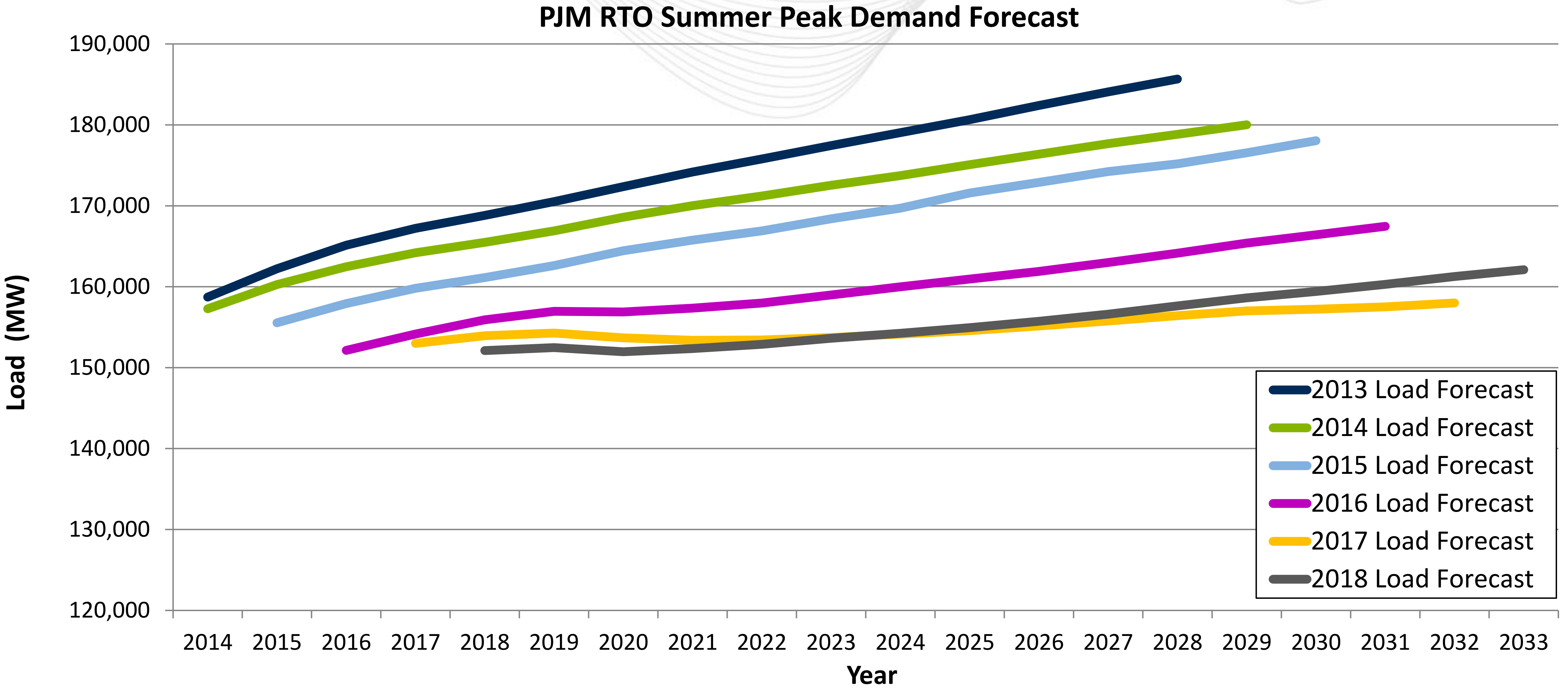


Queue	Project Name	MFO	Status	In Service Date	TO
AA2-054	Pumphrey 230kV	155	Under Construction	6/7/2017	BGE

Planning
Load Forecast

PJM Annual Load Forecasts

(January 2018)



District of Columbia – 2018 Load Forecast Report

	Summer Peak (MW)			Winter Peak (MW)		
Transmission Owner	**2018**	**2028**	**Growth Rate (%)**	**2017/18**	**2027/28**	**Growth Rate (%)**
Potomac Electric Power Company*	2,039	2,031	0.0%	1,641	1,687	0.3%
PJM RTO	152,108	157,635	0.4%	131,463	136,702	0.4%

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

Maryland – 2018 Load Forecast Report

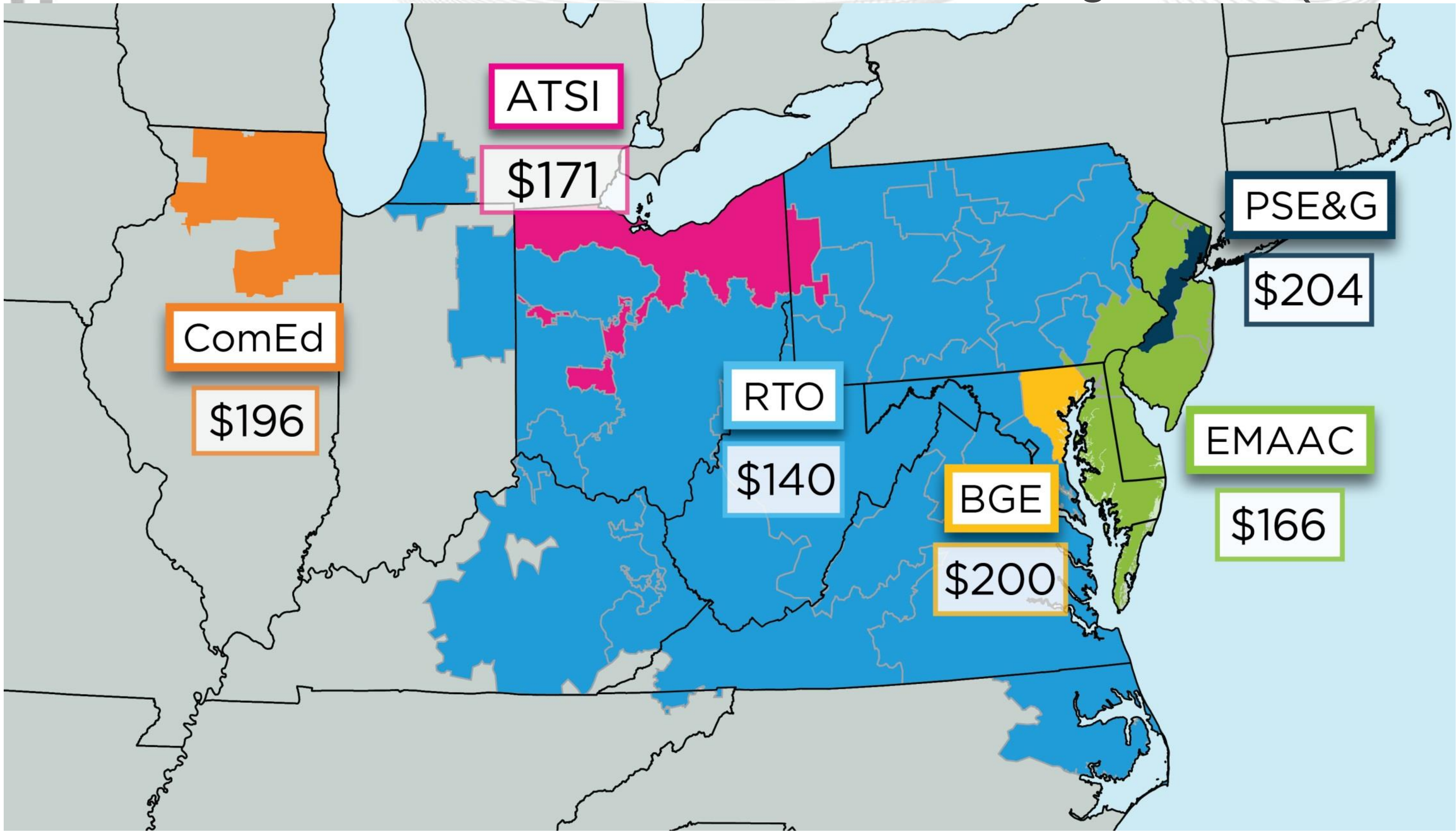
	Summer Peak (MW)			Winter Peak (MW)		
Transmission Owner	**2018**	**2028**	**Growth Rate (%)**	**2017/18**	**2027/28**	**Growth Rate (%)**
Allegheny Power *	1,335	1,430	0.7%	1,376	1,493	0.8%
Baltimore Gas and Electric Company	6,848	6,744	-0.2%	5,883	5,956	0.1%
Delmarva Power and Light *	1,177	1,202	0.2%	1,181	1,228	0.4%
Potomac Electric Power Company *	4,454	4,435	0.0%	3,742	3,847	0.3%
PJM RTO	152,108	157,635	0.4%	131,463	136,702	0.4%

* PJM notes that APS, Delmarva and Pepco serve load other than in Maryland. The Summer peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by each of those transmission owners solely in Maryland. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load located in DC over the past five years.

Markets

Capacity Market Results

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



Maryland - Cleared Resources in 2021/22 Auction

(May 23, 2018)

	Cleared MW (Unforced Capacity)	Change from 2020/21 Auction
Generation	11,670	(115)
Demand Response	790	246
Energy Efficiency	203	22
Total	12,663	153

RTO Locational Clearing Price
$140

EMAAC Locational Clearing Price
$166

BGE Locational Clearing Price
$200

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.

Washington, D.C. - Cleared Resources in 2021/22 Auction

(May 23, 2018)

	Cleared MW (Unforced Capacity)	Change from 2020/21 Auction
Generation	-	-
Demand Response	104	19
Energy Efficiency	31	4
Total	135	23

RTO Locational Clearing Price
$140

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.

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

Maryland – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

		Unforced Capacity
Generation	Offered MW	13,372
	Cleared MW	11,670
Demand Response	Offered MW	980
	Cleared MW	790
Energy Efficiency	Offered MW	209
	Cleared MW	203
Total Offered MW		14,561
Total Cleared MW		12,663

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.

Washington, D.C. – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

		Unforced Capacity
Generation	Offered MW	-
	Cleared MW	-
Demand Response	Offered MW	136
	Cleared MW	104
Energy Efficiency	Offered MW	32
	Cleared MW	31
Total Offered MW		168
Total Cleared MW		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.

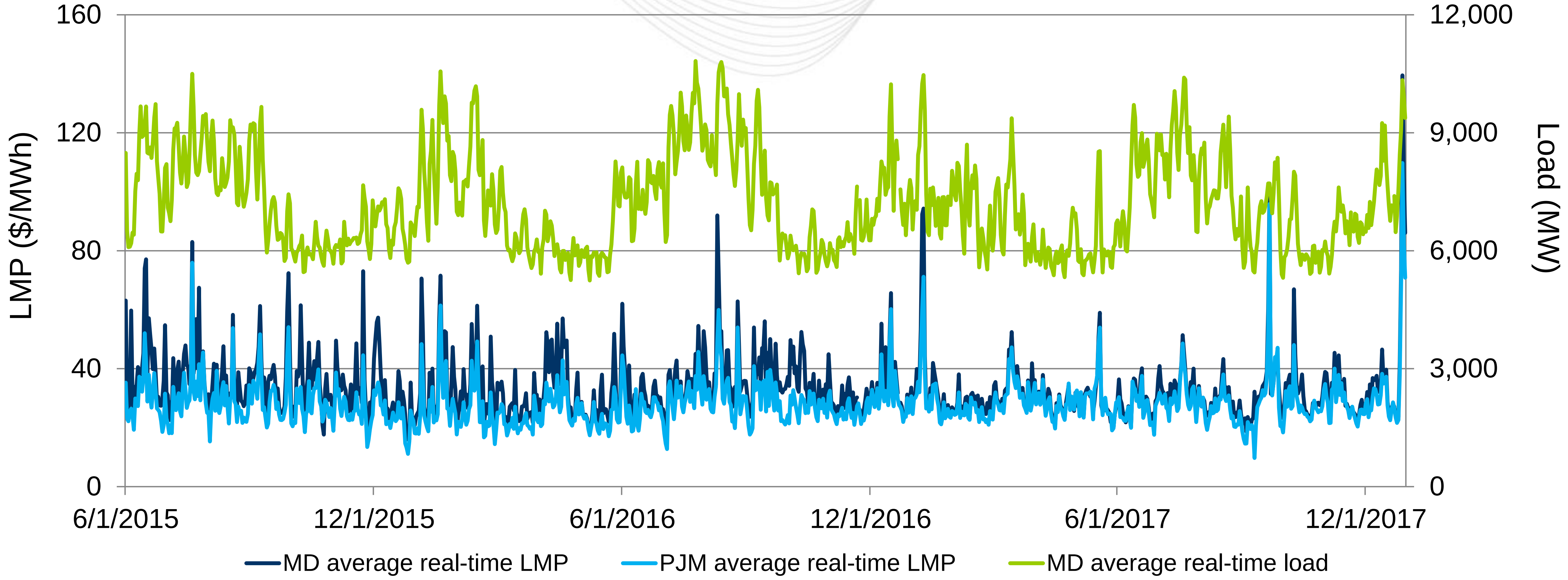
Markets

Market Analysis

Maryland – Average Daily Load and LMP

(June 1, 2015 - December 31, 2017)

Maryland's hourly LMPs generally aligned with the PJM average.

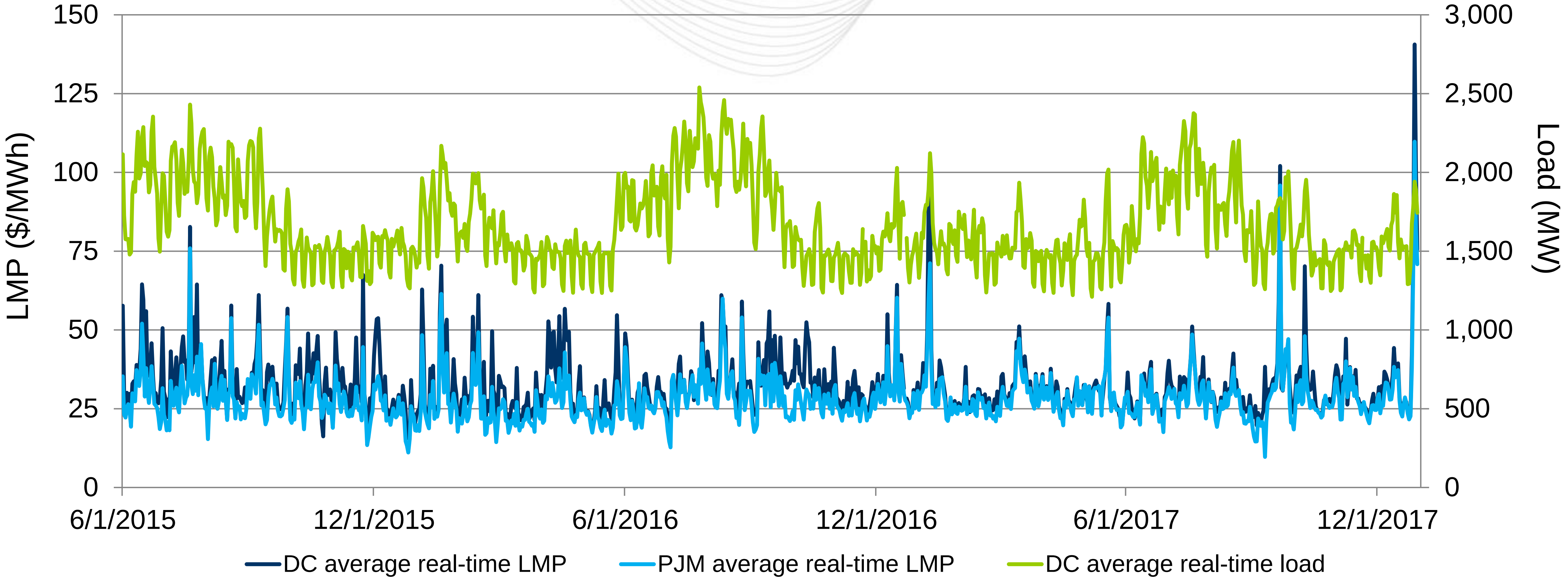


Note: The price spike on 9/21/2017 reflects the PJM shortage pricing event. The price spike starting 12/28/2017 reflects the beginning of the Cold Snap.

Washington, D.C. – Average Daily Load and LMP

(June 1, 2015 - December 31, 2017)

Washington, D.C.'s hourly LMPs generally aligned with the PJM average.

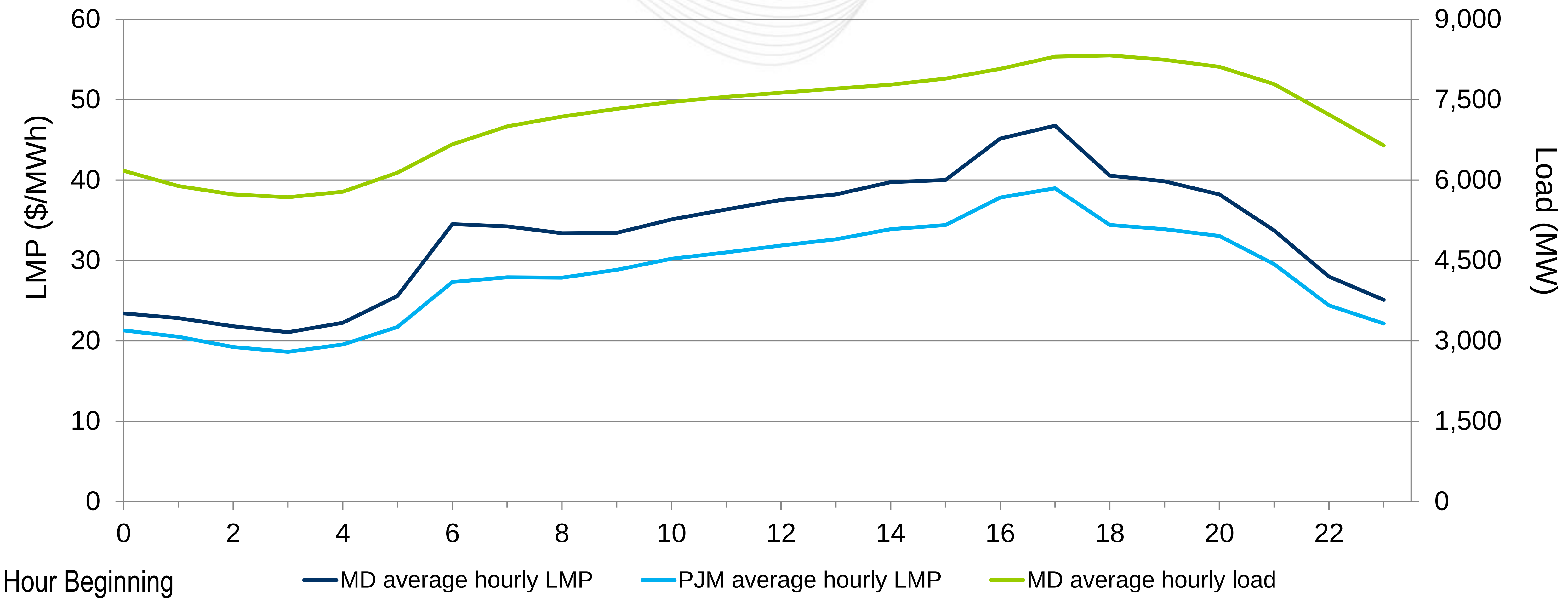


Note: The price spike on 9/21/2017 reflects the PJM shortage pricing event. The price spike starting 12/28/2017 reflects the beginning of the Cold Snap.

Maryland – Hourly Average LMP and Load

(June 1, 2015 – December 31, 2017)

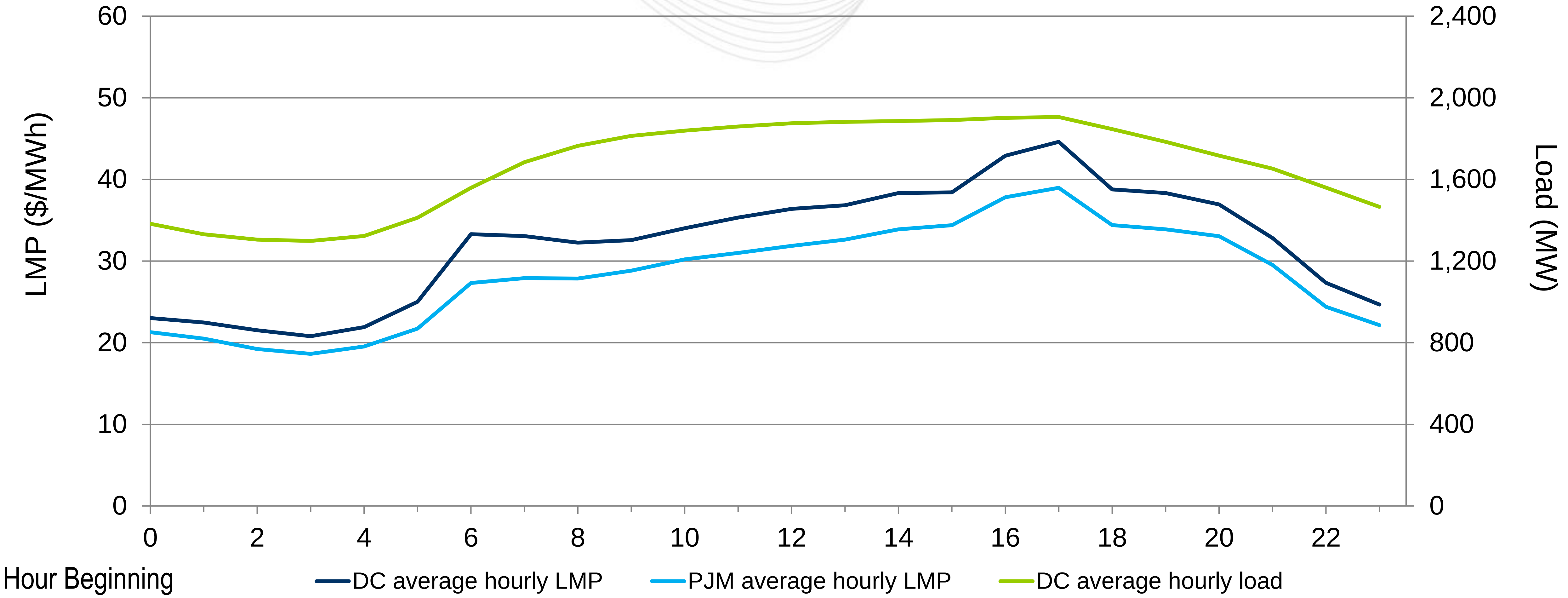
Maryland's hourly LMPs were above the PJM average.



Washington, D.C. – Hourly Average LMP and Load

(June 1, 2015 – December 31, 2017)

Washington, D.C.'s hourly LMPs were above the PJM average.

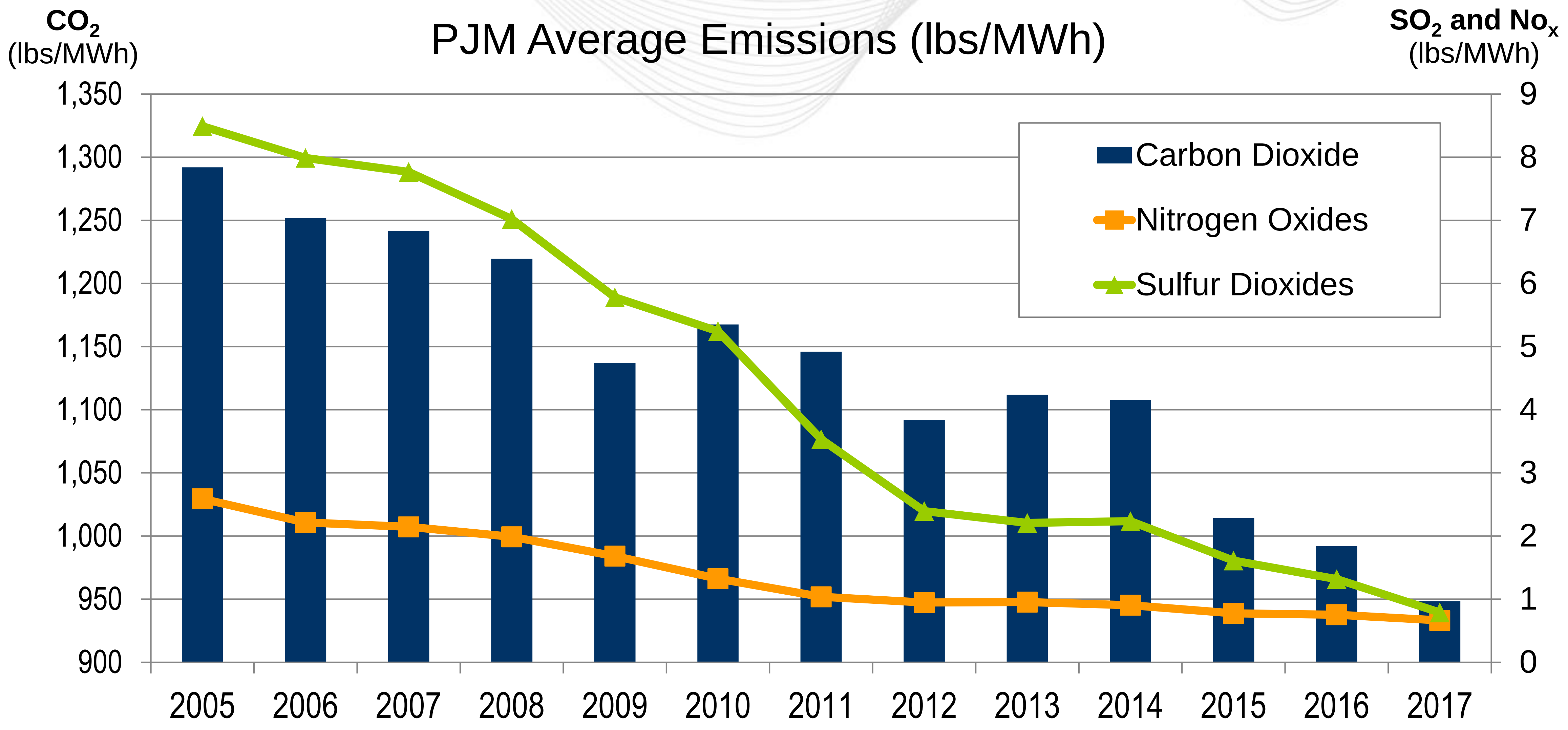


Operations

Emissions Data

PJM - Average Emissions (lbs/MWh)

(February 1, 2018)



Maryland - Average Emissions (lbs/MWh)

(February 1, 2018)