



# 2018 Maryland and District of Columbia Infrastructure Report

(January 1, 2018 – December 31, 2018)

May 2019

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- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

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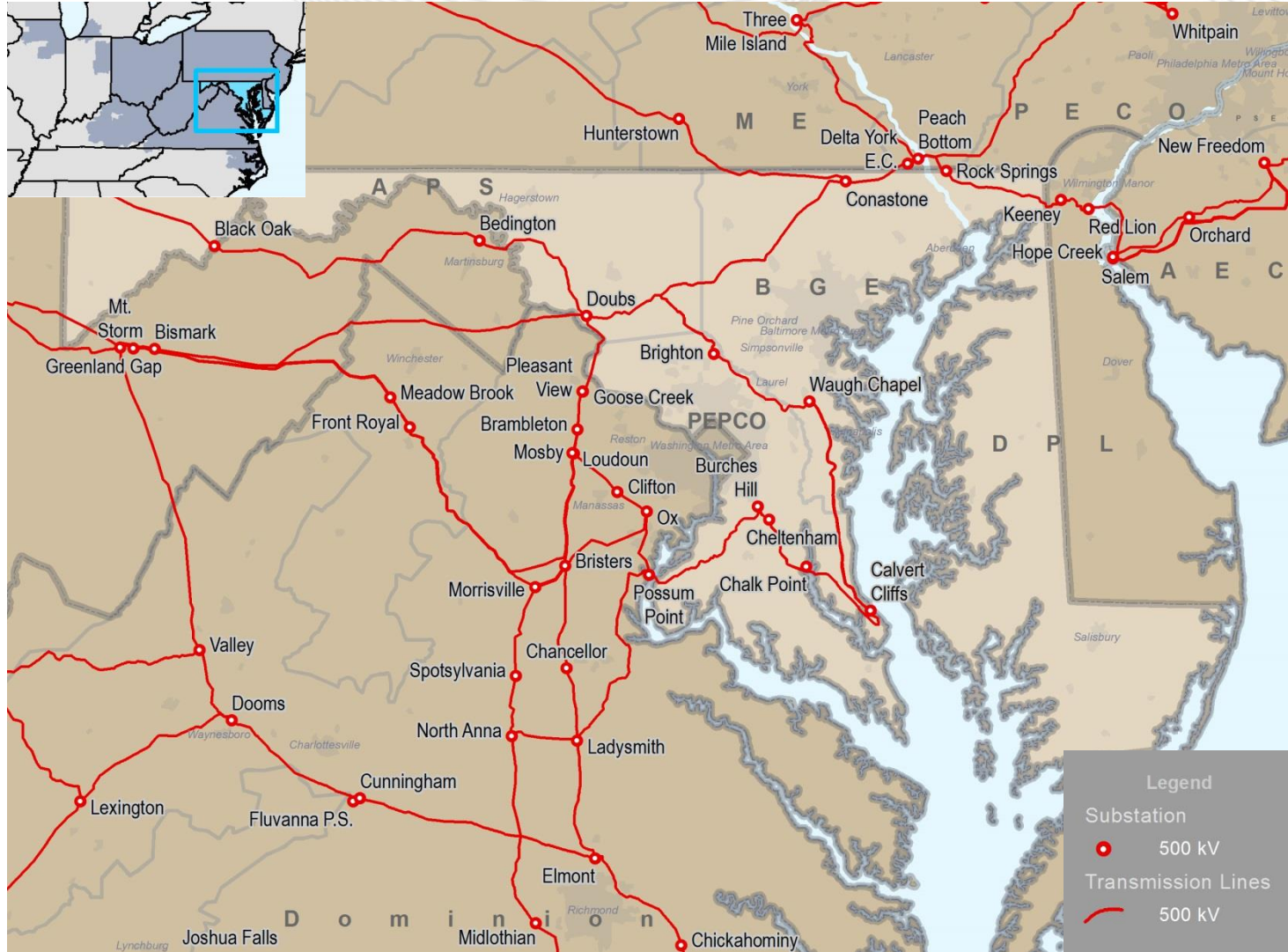
- **Existing Capacity:** Natural gas represents approximately 40.8 percent of the total installed capacity in Maryland and Washington, D.C. while coal represents approximately 30.8 percent. This parallels PJM where natural gas and coal are at 40.2 and 30.7 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents approximately 61.7 percent of new interconnection requests in Maryland.
- **Deactivations:** 386 MW of capacity within Maryland gave a notification of deactivation in 2018.
- **RTEP 2018:** Maryland RTEP 2018 projects total more than \$498 million in investment. Approximately 89.6 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least \$5 million.
- **Load Forecast:** Maryland and Washington, D.C. load growth is relatively flat, averaging between -0.1 and 0.8 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

- **2021/22 Capacity Market:** Maryland and Washington, D.C. cleared 291 MW more Demand Response and Energy Efficiency resources than in the prior auction.
- **1/1/18 – 12/31/18 Performance:** Maryland and Washington, D.C.'s average locational marginal prices were consistently above PJM average LMPs. Imported resources represented 36.2 percent of generation produced in Maryland while nuclear averaged 23.0 percent. 100 percent of generation in District Columbia is imported.
- **Emissions:** 2018 carbon dioxide emissions in Maryland are up from 2017; sulfur dioxides and nitrogen oxides have held flat since 2017.



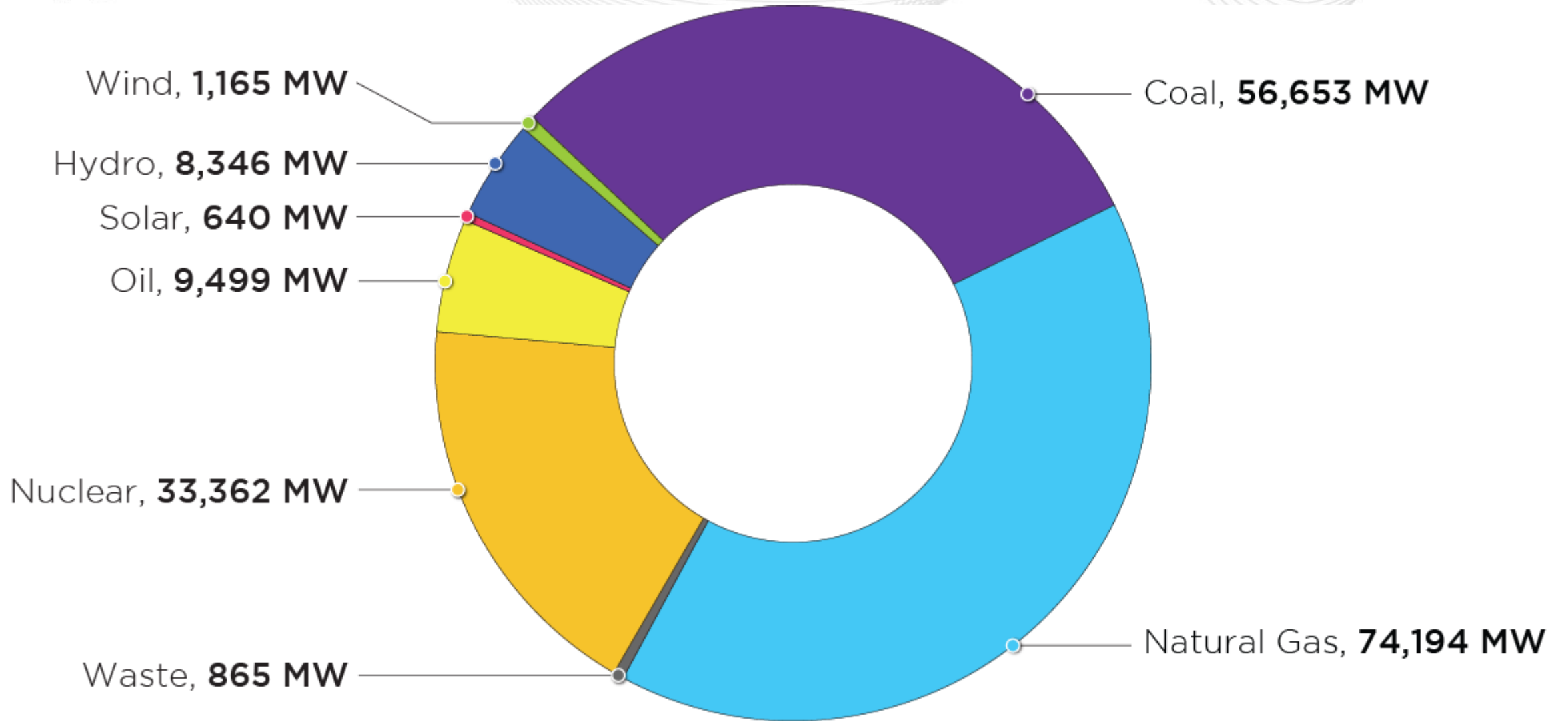
# PJM Service Area – Maryland and Washington, D.C.

(March 2019)



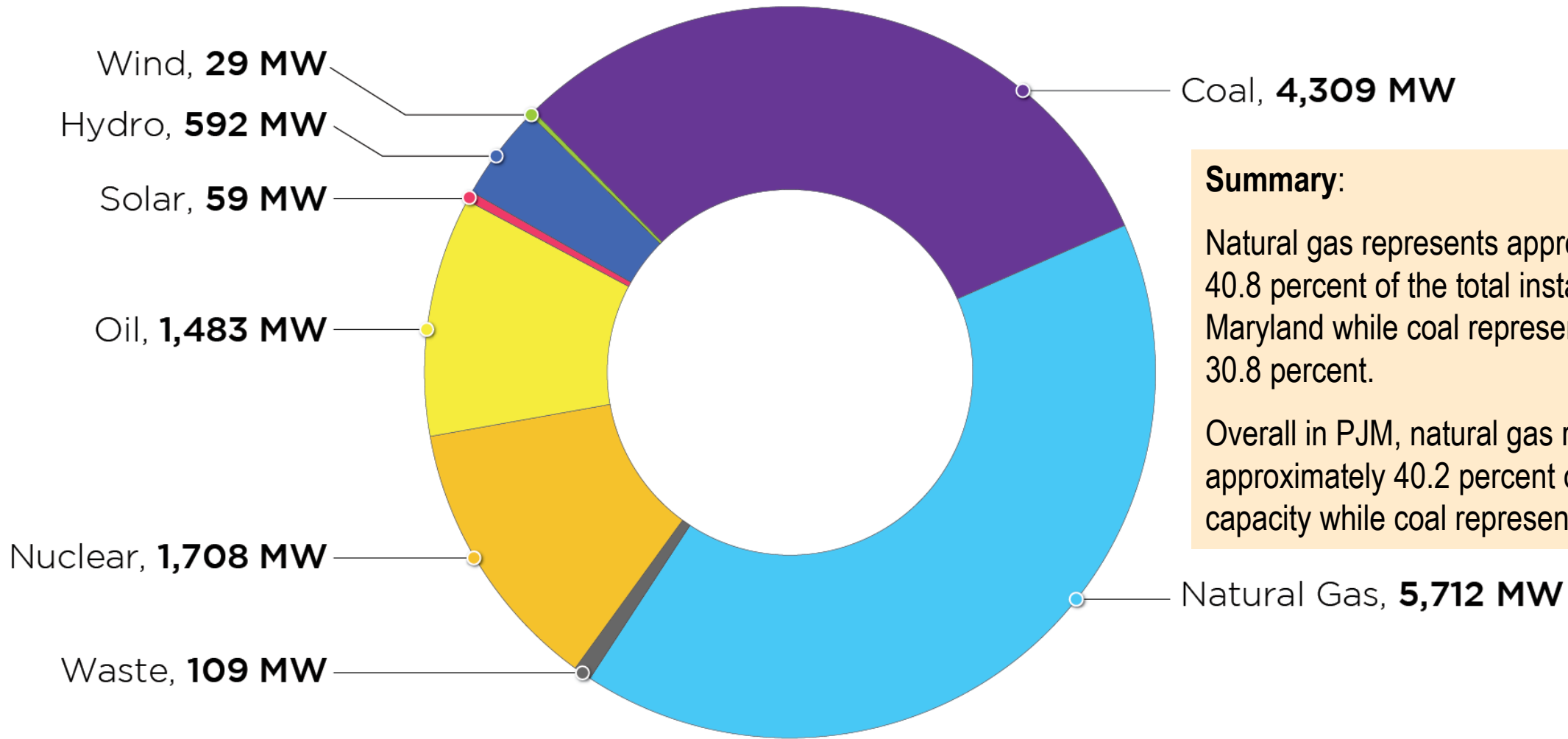
# Planning

## Generation Portfolio Analysis



# Maryland – Existing Installed Capacity

(Washington, D.C. does not have any installed capacity; MW submitted to PJM, December 31, 2018)



### Summary:

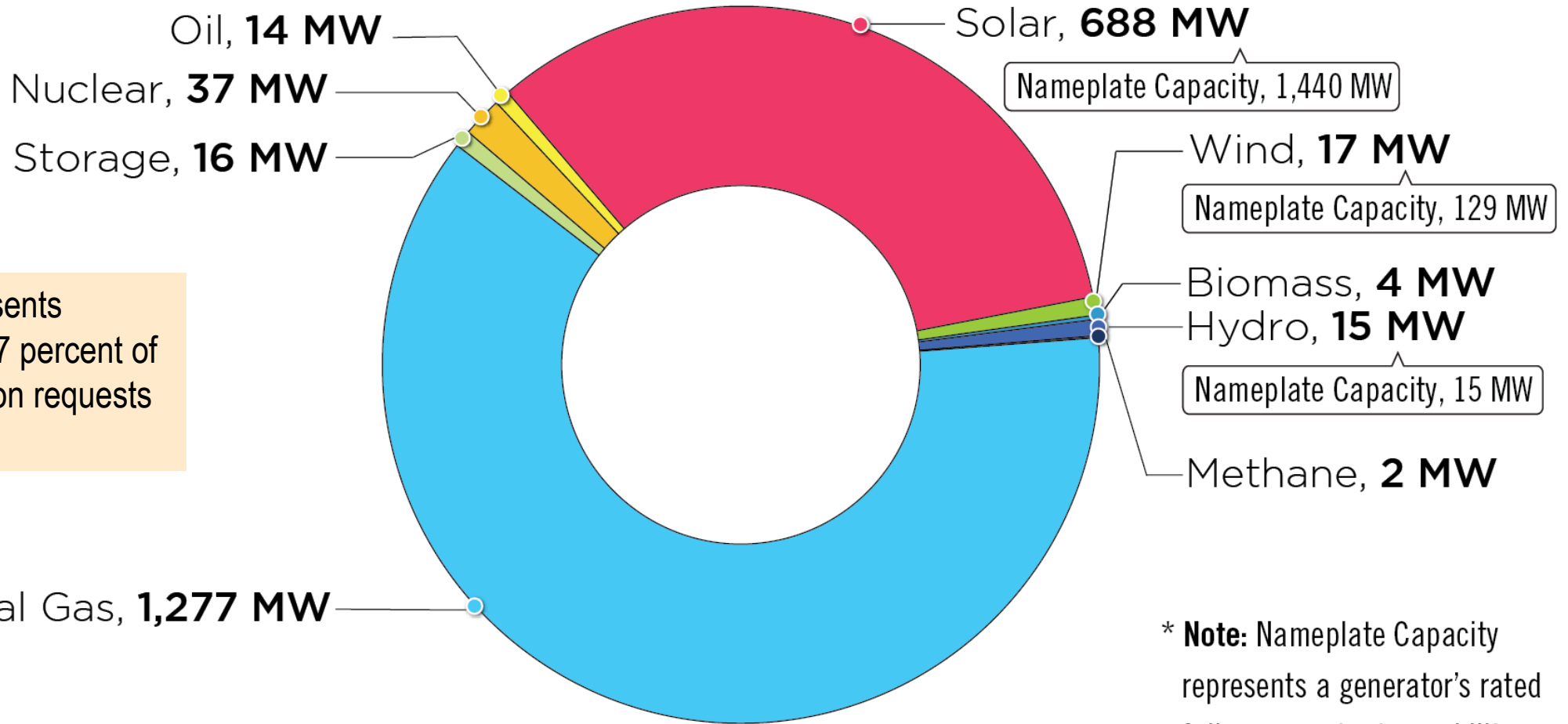
Natural gas represents approximately 40.8 percent of the total installed capacity in Maryland while coal represents approximately 30.8 percent.

Overall in PJM, natural gas represents approximately 40.2 percent of installed capacity while coal represents 30.7 percent.



# Maryland – Queued Capacity (MW) by Fuel Type

(as of December 31, 2018)

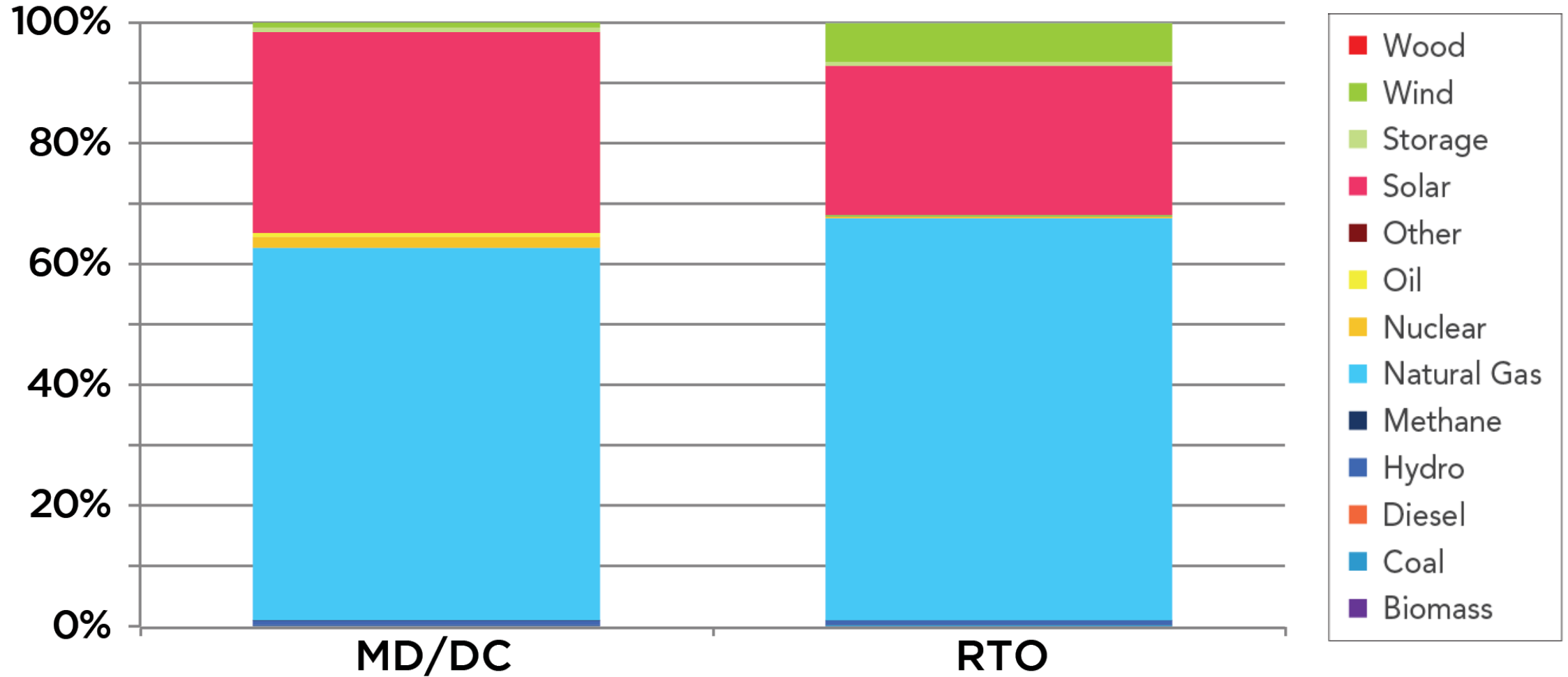


Natural gas represents approximately 61.7 percent of new interconnection requests in Maryland.

\* **Note:** Nameplate Capacity represents a generator's rated full power output capability.

# Maryland – Percentage of Projects in Queue by Fuel Type

(as of December 31, 2018)





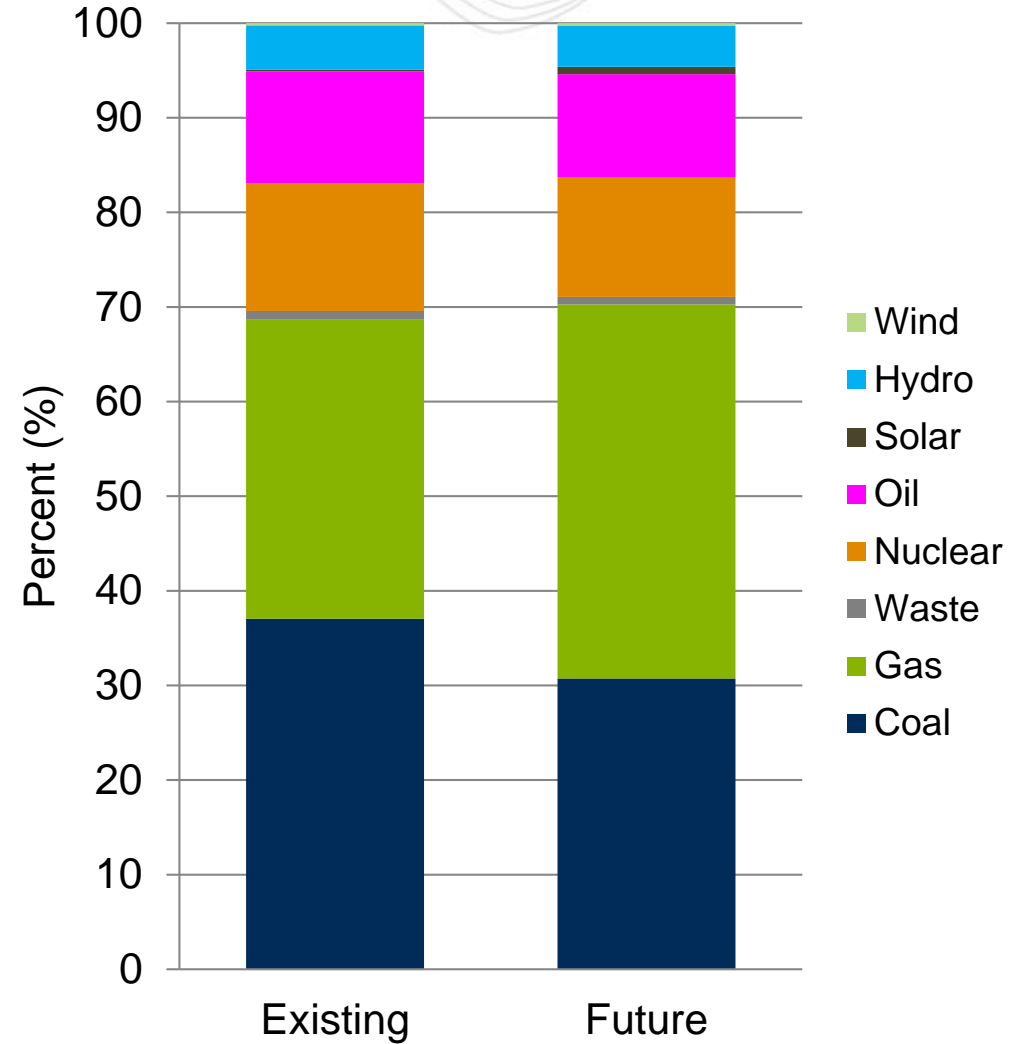
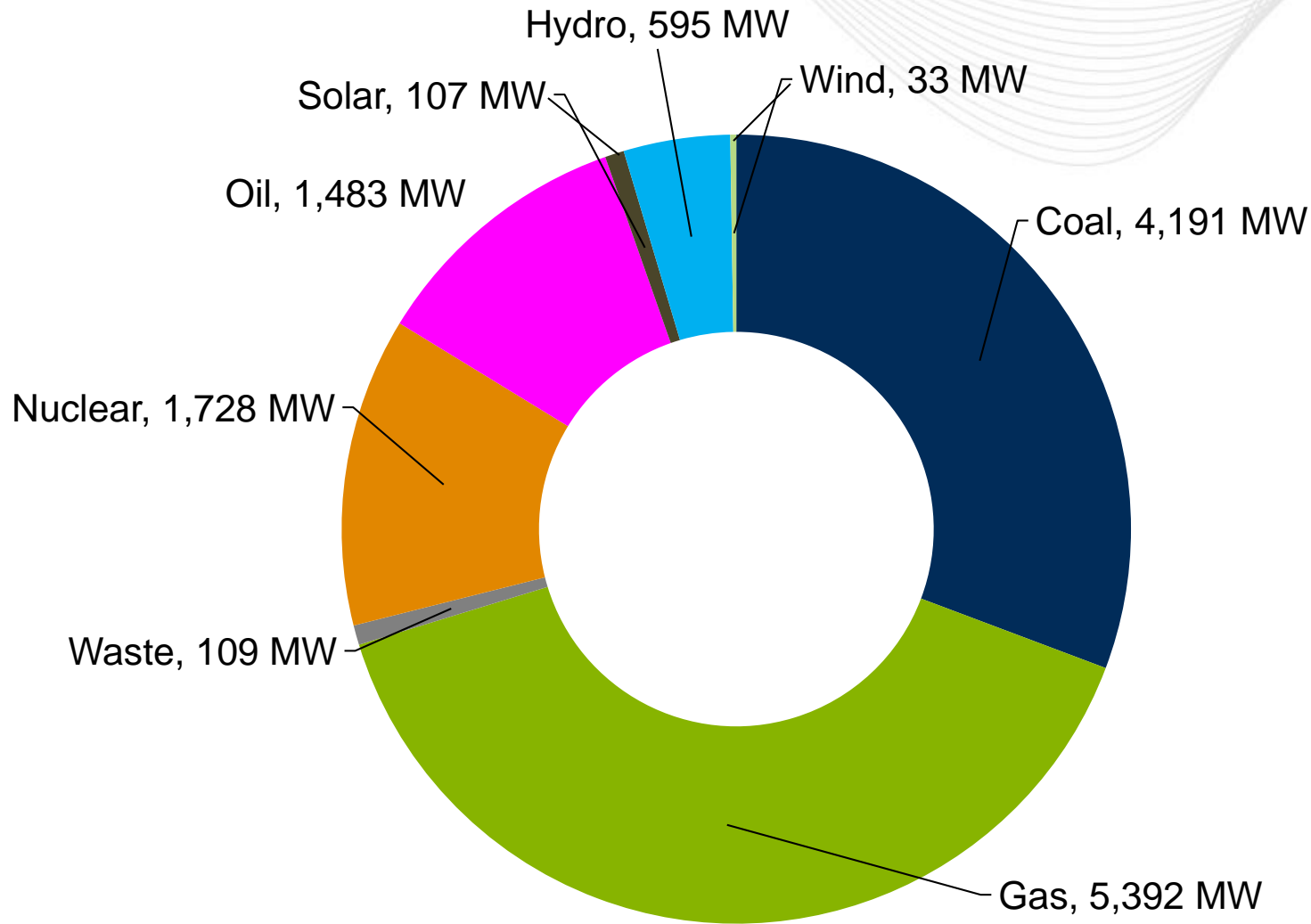
# Maryland – Interconnection Requests

(Unforced Capacity, As of December 31, 2018)

	Complete				In Queue						Grand Total	
	In Service		Withdrawn		Active		Suspended		Under Construction			
	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW
<b>Non-Renewable</b>	<b>35</b>	<b>3,764.7</b>	<b>80</b>	<b>36,478.5</b>	<b>9</b>	<b>348.0</b>	<b>3</b>	<b>952.0</b>	<b>23</b>	<b>44.5</b>	<b>150</b>	<b>41,587.7</b>
Coal	1	10.0	0	0.0	0	0.0	0	0.0	0	0.0	1	10.0
Diesel	1	0.0	1	5.0	0	0.0	0	0.0	0	0.0	2	5.0
Natural Gas	30	3,749.7	59	31,299.5	4	280.6	3	952.0	3	44.5	99	36,326.3
Nuclear	1	0.0	4	4,955.0	3	37.4	0	0.0	0	0.0	8	4,992.4
Oil	2	5.0	1	2.0	1	14.0	0	0.0	0	0.0	4	21.0
Other	0	0.0	5	157.0	0	0.0	0	0.0	0	0.0	5	157.0
Storage	0	0.0	10	60.0	1	16.0	0	0.0	20	0.0	31	76.0
<b>Renewable</b>	<b>25</b>	<b>144.5</b>	<b>167</b>	<b>1,278.3</b>	<b>37</b>	<b>520.9</b>	<b>18</b>	<b>131.9</b>	<b>11</b>	<b>73.0</b>	<b>258</b>	<b>2,148.6</b>
Biomass	0	0.0	10	198.6	1	4.0	0	0.0	0	0.0	11	202.6
Hydro	3	60	3	73.4	1	15.0	0	0.0	0	0.0	7	148.4
Methane	9	21.5	5	16.3	0	0.0	0	0.0	1	2.0	15	39.8
Solar	9	30.5	140	733.5	35	501.9	17	122.8	9	63.2	210	1,451.9
Wind	4	32.5	9	256.5	0	0.0	1	9.1	1	7.8	15	305.9
<b>Grand Total</b>	<b>60</b>	<b>3,909.2</b>	<b>247</b>	<b>37,756.8</b>	<b>46</b>	<b>868.9</b>	<b>21</b>	<b>1,083.9</b>	<b>34</b>	<b>117.5</b>	<b>408</b>	<b>43,736.3</b>

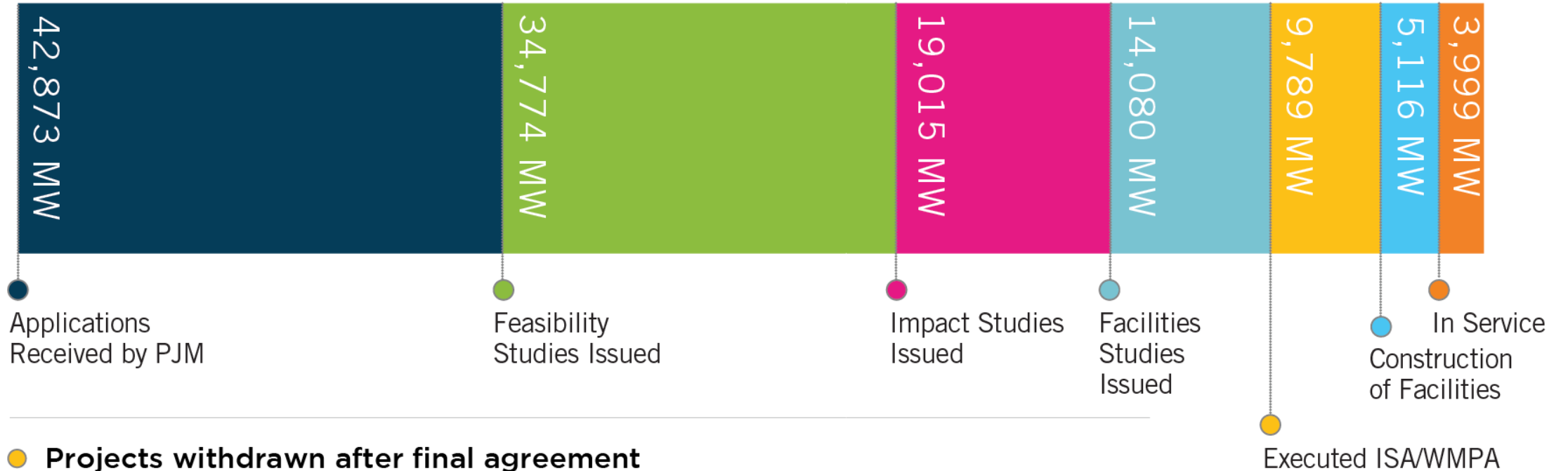
# Maryland – Future Capacity Mix

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, 2018)



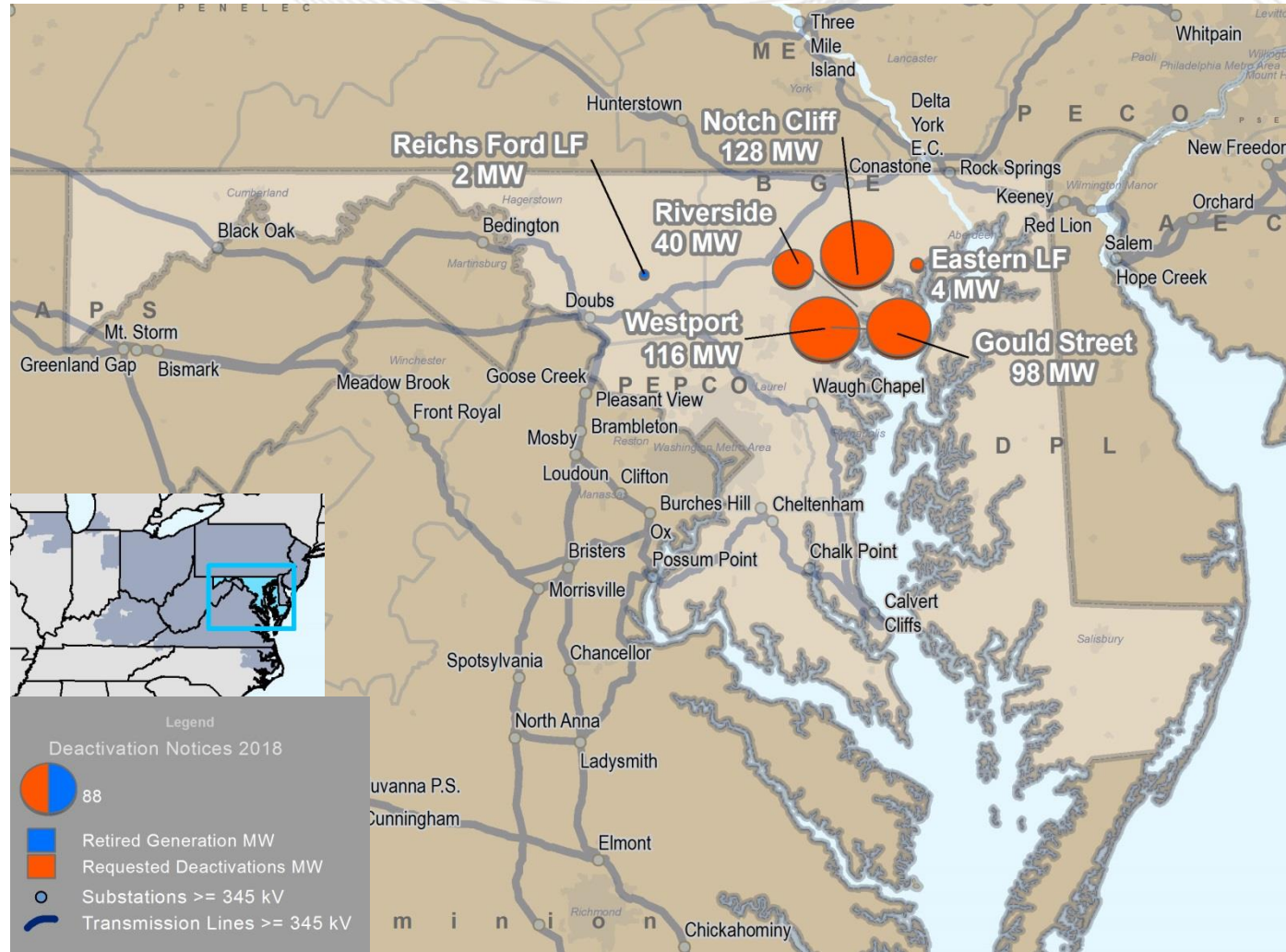
**Projects withdrawn after final agreement**

- 19 Interconnection Service Agreements – 4,642 MW (Nameplate Capacity, 4,911 MW)
- 14 Wholesale Market Participation Agreements – 55 MW (Nameplate Capacity, 94 MW)

**Percentage of planned capacity and projects reached commercial operation**

- 9.3 % requested capacity megawatt
- 17.4 % requested projects

# Maryland – Actual Generation Deactivations and Deactivation Notifications Received in 2018





# Maryland – Actual Generation Deactivations and Deactivation Notifications Received in 2018

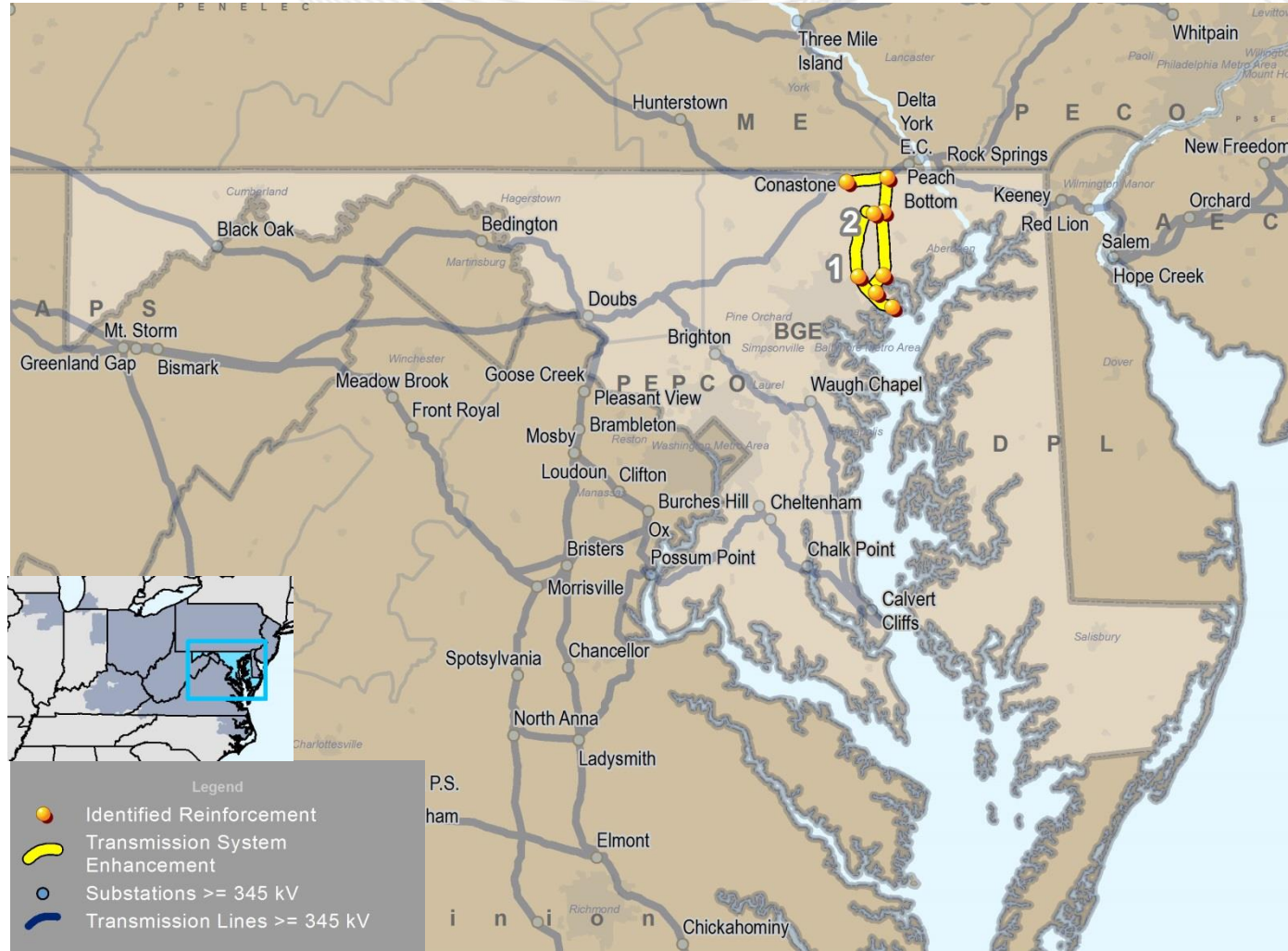
Unit	Capacity (MW)	TO Zone	Age (Years)	Projected/Actual Deactivation Date
Westport 5	116	BGE	49	6/1/2020
Gould Street	98	BGE	66	6/1/2020
Riverside 7	20	BGE	48	3/14/2019
Riverside 8	20	BGE	48	6/1/2020
Notch Cliff 1	16	BGE	49	6/1/2020
Notch Cliff 2	16	BGE	49	6/1/2020
Notch Cliff 3	16	BGE	49	6/1/2020
Notch Cliff 4	16	BGE	49	6/1/2020
Notch Cliff 5	16	BGE	49	6/1/2020
Notch Cliff 6	16	BGE	49	6/1/2020
Notch Cliff 7	16	BGE	49	6/1/2020
Notch Cliff 8	16	BGE	49	6/1/2020
Eastern Landfill	4	BGE	12	6/1/2020
Reichs Ford Road Landfill	2	APS	9	5/31/2018

# Planning

## Transmission Infrastructure Analysis



(No baseline projects were planned in Washington, D.C. in the 2018 RTEP; Greater than \$10 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 2018 RTEP; Greater than \$5 million)

Map ID	Project	Sub ID	Description	Required In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review	Congestion Relief-Economic	Generator Deactivation
1	b2816		Reconnect the Crane-Windy Edge 110591 and 110592 115 kV circuits into the Northeast Substation with the addition of a new 115 kV three-breaker bay.	6/1/2018	\$12	BGE	12/14/2017		X
		.1	Modify the Crane-Windy Edge 110591 and 110592 115 kV circuits by terminating Windy Edge Circuits 110591 and 110592 into Northeast Substation with the addition of new 115 kV breaker positions at Northeast substation.	6/1/2018		BGE	12/14/2017		X
		.2	Modify the Crane-Windy Edge 110591 and 110592 115 kV circuits by terminating Crane Circuits 110591 and 110592 into Northeast Substation with the addition of new 115 kV breaker positions at Northeast substation.	6/1/2018		BGE	12/14/2017		X
2	b2992	.1	Reconductor the Conastone-Graceton 230 kV 2323 and 2324 circuits. Replace seven disconnect switches at Conastone Substation.	3/1/2021	\$39.6	BGE	2/14/2018	X	
		.2	Add bundle conductor on the Graceton-Bagley-Raphael Road 2305 and 2313 230 kV circuits.	3/1/2021		BGE	2/14/2018	X	
		.3	Replace short segment of substation conductor on the Windy Edge-Glenarm 115 kV circuit.	3/1/2021		BGE	2/14/2018	X	
		.4	Reconductor the Raphael Road-Northeast 2315 and 2337 230 kV circuits.	3/1/2021		BGE	2/14/2018	X	



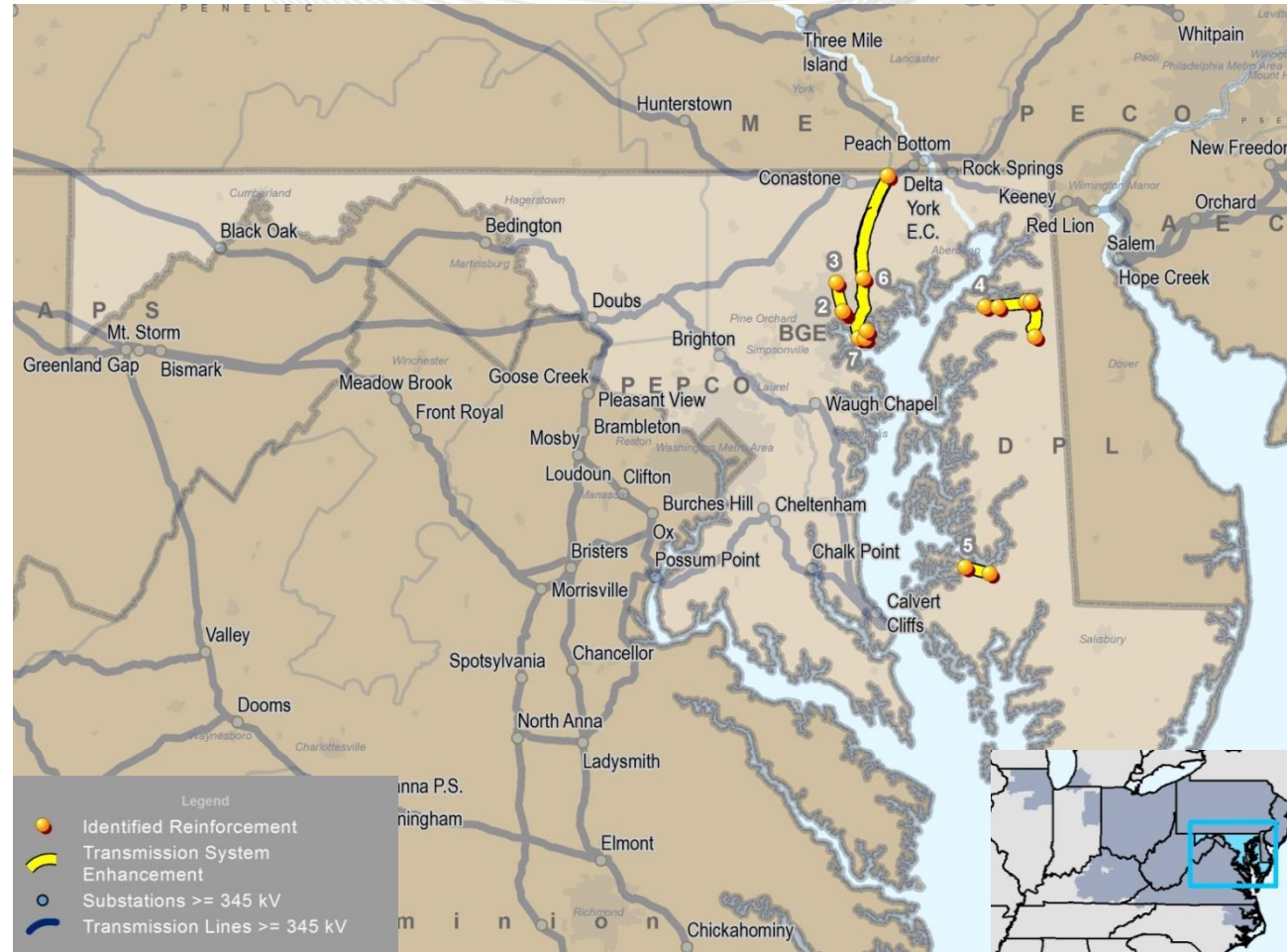
# Maryland and Washington, D.C. – RTEP Network Projects

(Greater than \$5 million)

Maryland and Washington, D.C. had no network project upgrades in 2018.

# Maryland – TO Supplemental Projects

(No supplemental projects were planned in Washington, D.C. in the 2018 RTEP; Greater than \$10 million)



Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with the following PJM criteria: system reliability, operational performance or economic criteria, pursuant to a determination by the Office of the Interconnection and is not a state public policy project.



# Maryland – TO Supplemental Projects

(No supplemental projects were planned in Washington, D.C. in the 2018 RTEP; Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
1	s1532	Reconfigure the Calvert Cliff 500 kV switchyard, including the addition of four breakers in a new 500 kV bay. Two additional breakers will be installed for the current plant service transformers.	9/30/2020	\$59.8	BGE	2/8/2018
2	s1631	Create a new Loch Raven 115/13 kV substation.	6/1/2024	\$130	BGE	3/23/2018
		Build a new Loch Raven 115/13 kV substation. Supply substation with underground 115 kV cables from Erdman Substation.	6/1/2024		BGE	3/23/2018
		New Loch Raven substation, install 115 kV breakers and perform high side bus work to supply the distribution station.	6/1/2024		BGE	3/23/2018
		At Erdman 115 kV substation, expand to a gas insulated substation, breaker-and-a-half configuration to connect new circuits that supply Loch Raven.	6/1/2024		BGE	3/23/2018
3	s1632	Network East Towson substation to Loch Raven Substation with underground 115 kV cross-linked polyethylene cables.	6/1/2024	\$93	BGE	3/23/2018
		Build a 115 kV circuit between East Towson and Loch Raven stations with underground 115 kV cross-linked polyethylene cables.	6/1/2024		BGE	3/23/2018
		Install 115 kV circuit breakers and equipment at East Towson and Summerfield substation to accommodate transmission network.	6/1/2024		BGE	3/23/2018
4	s1636	Rebuild line between Church and Chestertown substations. All structures, conductor and static wire will be replaced with new steel poles and conductor.	12/31/2022	\$35	DPL	3/23/2018
		Rebuild the Church-Massey REA 69 kV circuit.	12/31/2022		DPL	3/23/2018
		Rebuild Massey REA-Lynch 69 kV circuit.	12/31/2022		DPL	3/23/2018
		Rebuild Lynch-Chestertown 69 kV circuit.	12/31/2022		DPL	3/23/2018



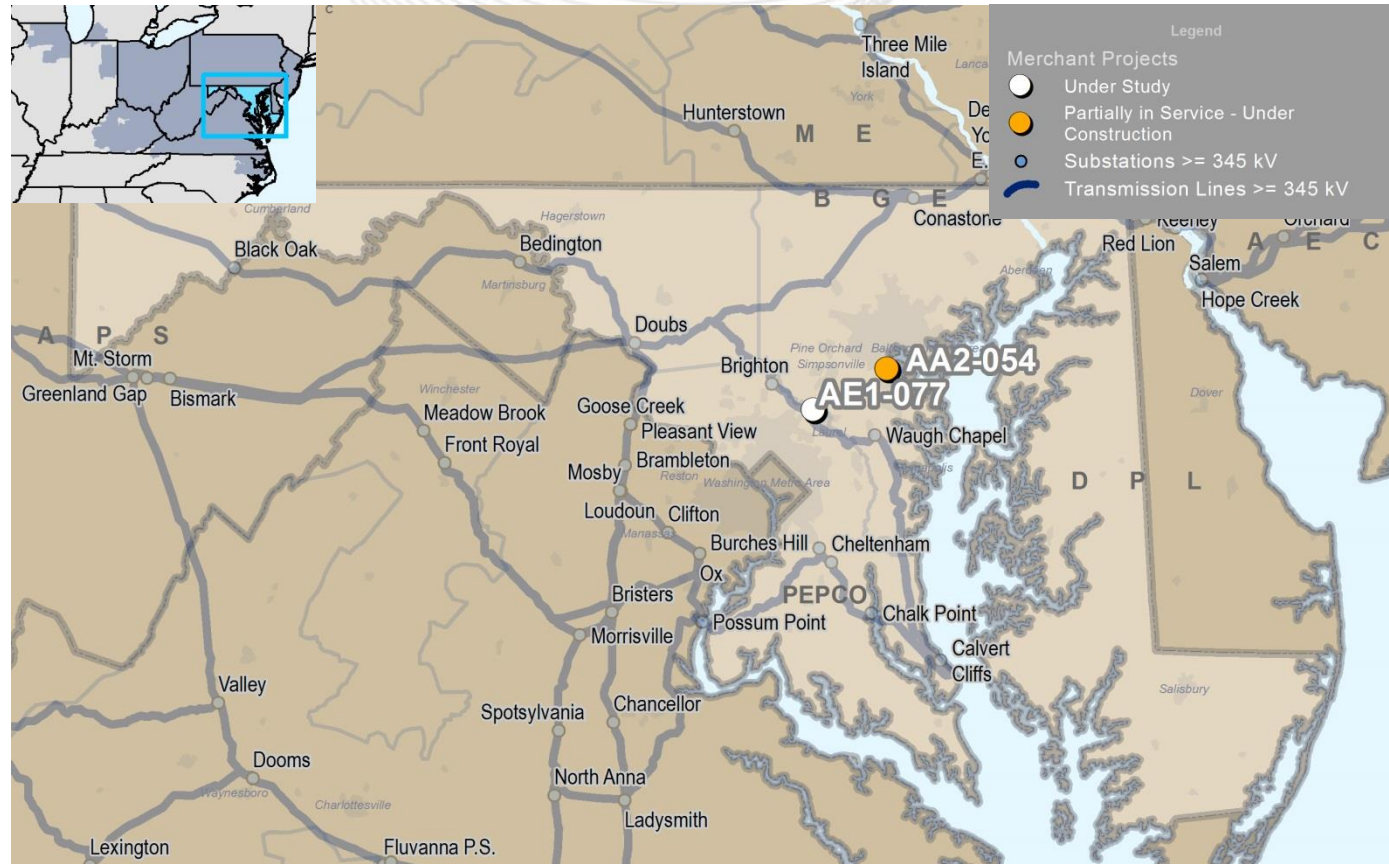
# Maryland – TO Supplemental Projects (cont.)

(No supplemental projects were planned in Washington, D.C. in the 2018 RTEP; Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
5	s1639	Rebuild line 6719 between East New Market and Cambridge substations. All structures, conductor, and static wire will be replaced with new poles, conductor, and optical ground wire.	5/31/2021	\$17.9	DPL	3/23/2018
6	s1670	Rebuild both Five Forks-Windy Edge 115 kV circuits using steel monopole, double circuit construction.	12/31/2022	\$60	BGE	5/25/2018
7	s1671	Build new 115 kV station to supply 34 kV and 13 kV distribution station. Provide diverse overhead transmission supplies from Riverside and Windy Edge substations to new 115 kV station.	12/1/2026	\$45	BGE	5/25/2018
		Build new 115 kV ring bus station, Fitzell, and install two 115/34 kV and two 115/13 kV transformers.	12/1/2026		BGE	5/25/2018
		Extend the existing Windy Edge-Riverside 115 kV double circuit to the new station.	12/1/2026		BGE	5/25/2018
		Rebuild and extend the existing Riverside-North Point-Finishing Mill 115 kV double circuit to the new station.	12/1/2026		BGE	5/25/2018
	s1790	Construct a new 3-breaker 69 kV Ring Bus tying into the West Cambridge - Vienna 69 kV line	4/9/2019	\$6.1	DPL	12/7/2018

# Maryland – Merchant Transmission Project Requests

(No merchant transmission projects were planned in Washington, D.C. in the 2018 RTEP)



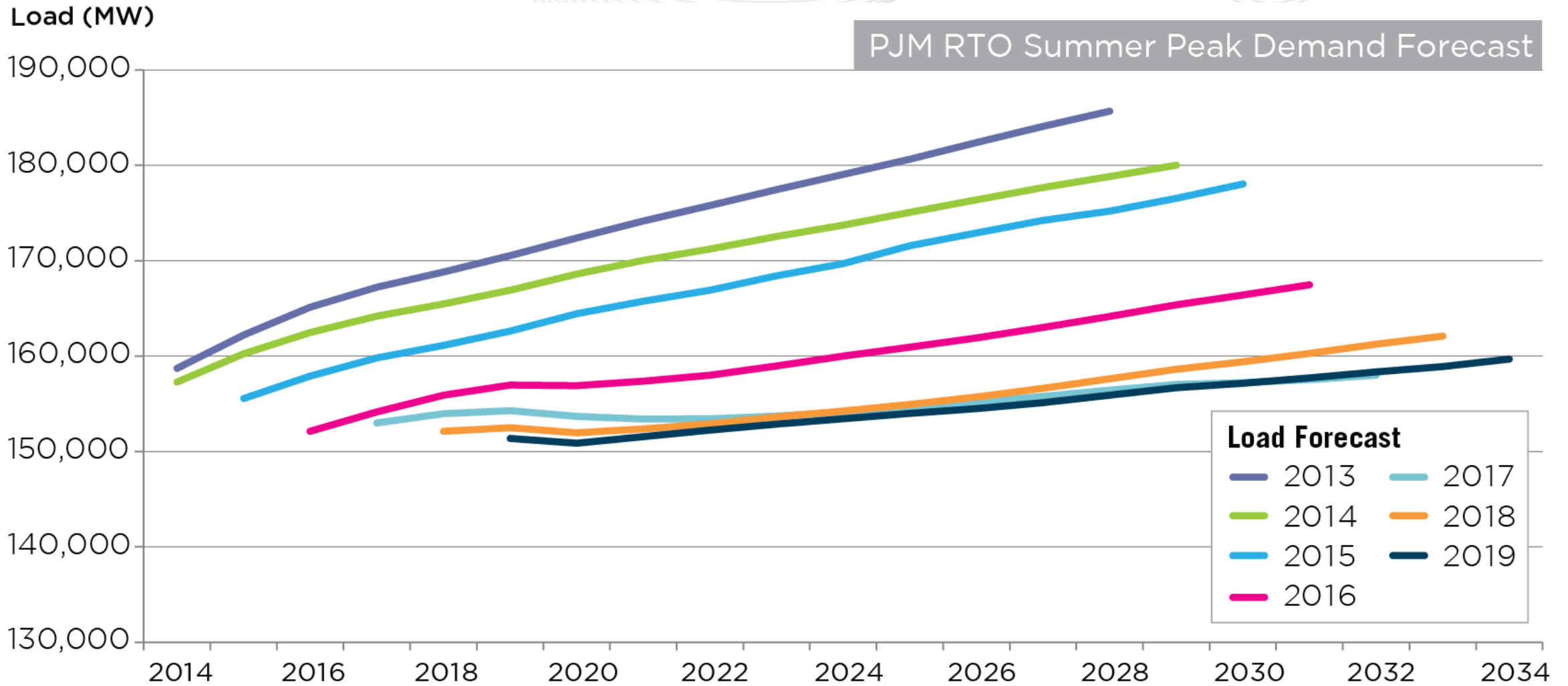
Queue	Project Name	Maximum Output (MW)	Status	Projected In-Service Date	TO Zone
AA2-054	Pumphrey 230 kV	155	Partially in Service - Under Construction	6/7/2017	BGE
AE1-077	Sandy Springs-High Ridge 230 kV	100	Active	6/1/2020	BGE

# Planning

## Load Forecast



## PJM RTO Summer Peak Demand Forecast





# District of Columbia – 2019 Load Forecast Report

Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2019	2029	Growth Rate (%)	2018/19	2028/29	Growth Rate (%)
Potomac Electric Power Company*	2,065	2,048	-0.1%	1,681	1,708	0.2%
PJM RTO	151,358	156,689	0.3%	131,082	136,178	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 – 2019 Load Forecast Report

Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2019	2029	Growth Rate (%)	2018/19	2028/29	Growth Rate (%)
Allegheny Power *	1,306	1,396	0.7%	1,391	1,501	0.8%
Baltimore Gas and Electric Company	6,697	6,663	-0.1%	5,872	5,907	0.1%
Delmarva Power and Light *	1,168	1,177	0.1%	1,202	1,247	0.4%
Potomac Electric Power Company *	4,401	4,365	-0.1%	3,725	3,787	0.2%
PJM RTO	151,358	156,689	0.3%	131,082	136,178	0.4%

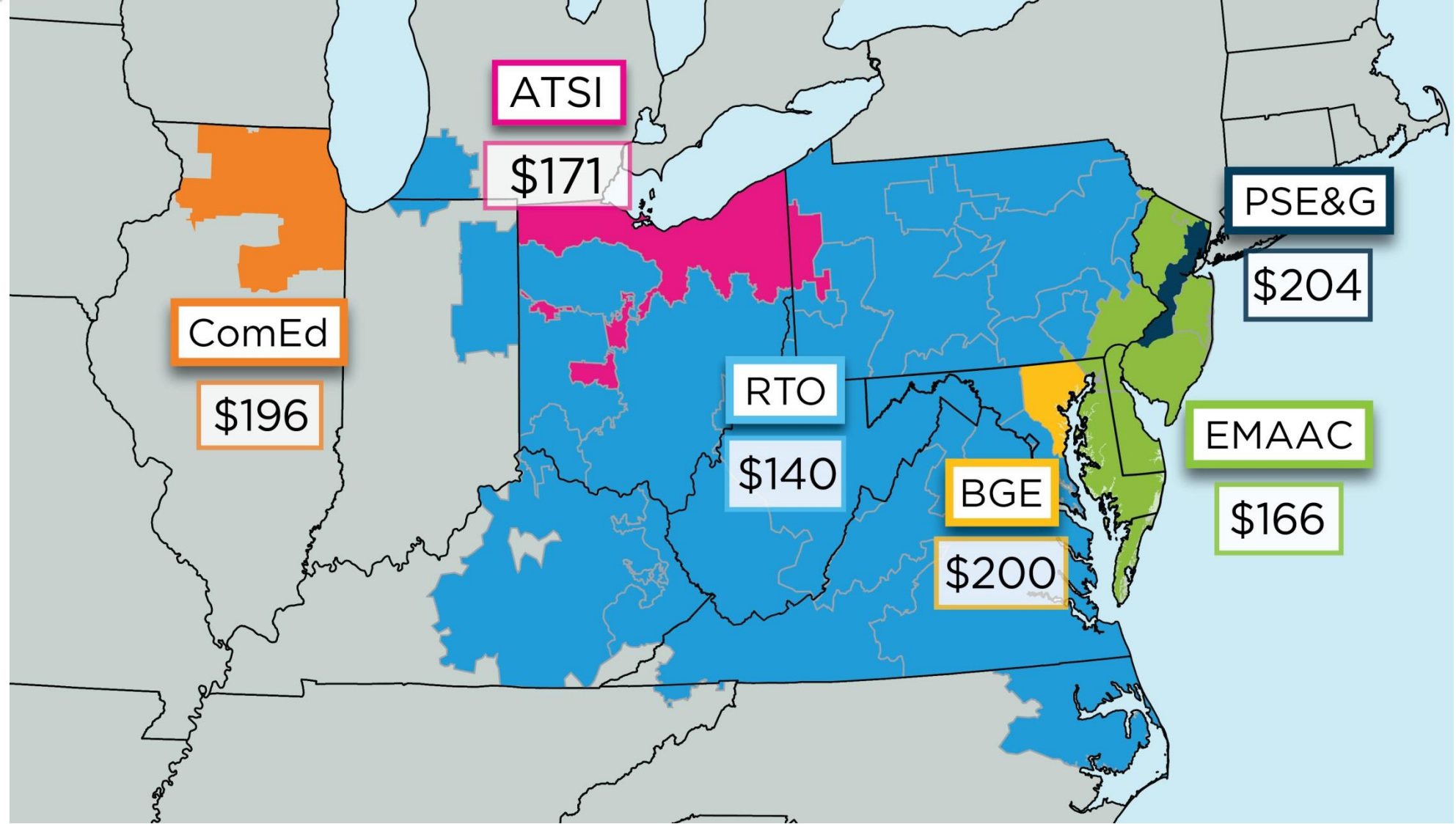
\* PJM notes that APS, Delmarva and Pepco serve load other than in Maryland. The Summer peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by each of those transmission owners solely in Maryland. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load located in Maryland 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
<b>Total</b>	<b>12,663</b>	<b>153</b>

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
<b>Total</b>	<b>135</b>	<b>23</b>

**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

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





# Maryland – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

		Unforced Capacity
<b>Generation</b>	Offered MW	13,372
	Cleared MW	11,670
<b>Demand Response</b>	Offered MW	980
	Cleared MW	790
<b>Energy Efficiency</b>	Offered MW	209
	Cleared MW	203
<b>Total Offered MW</b>		14,561
<b>Total Cleared MW</b>		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)

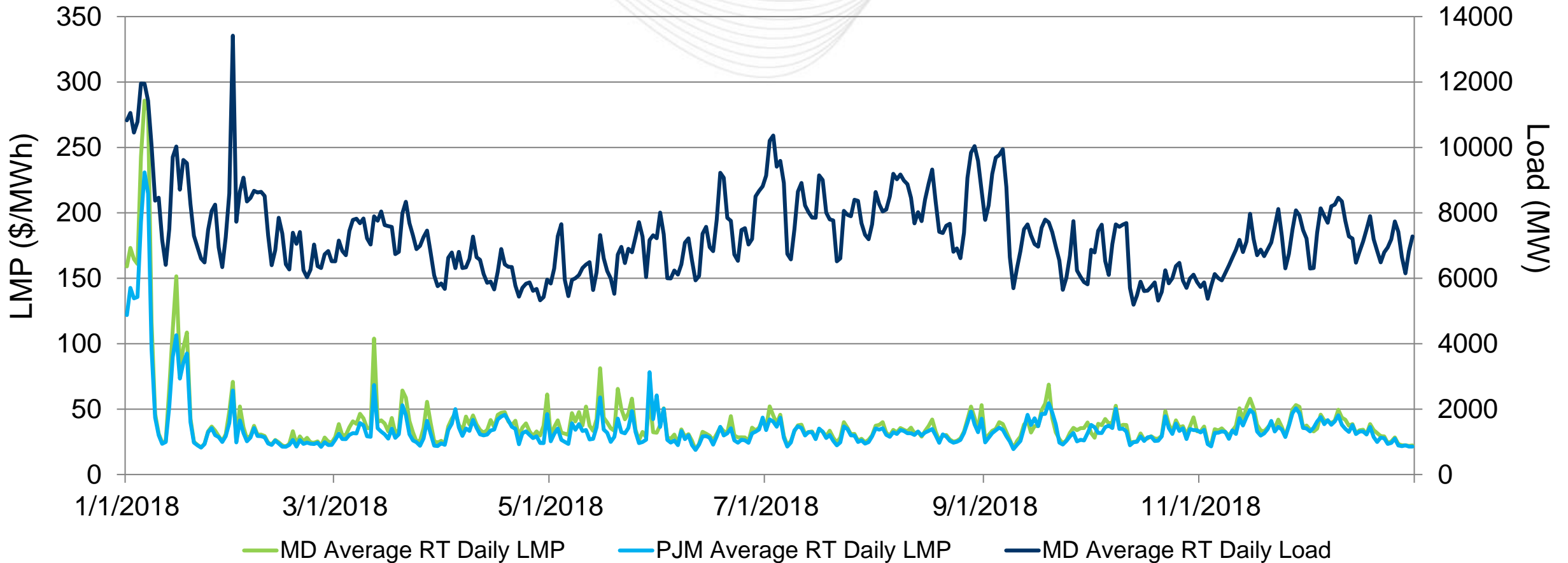
		Unforced Capacity
Generation	Offered MW	-
	Cleared MW	-
Demand Response	Offered MW	136
	Cleared MW	104
Energy Efficiency	Offered MW	32
	Cleared MW	31
<b>Total Offered MW</b>		<b>168</b>
<b>Total Cleared MW</b>		<b>135</b>

*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's average daily LMPs generally aligned with the PJM average daily LMP

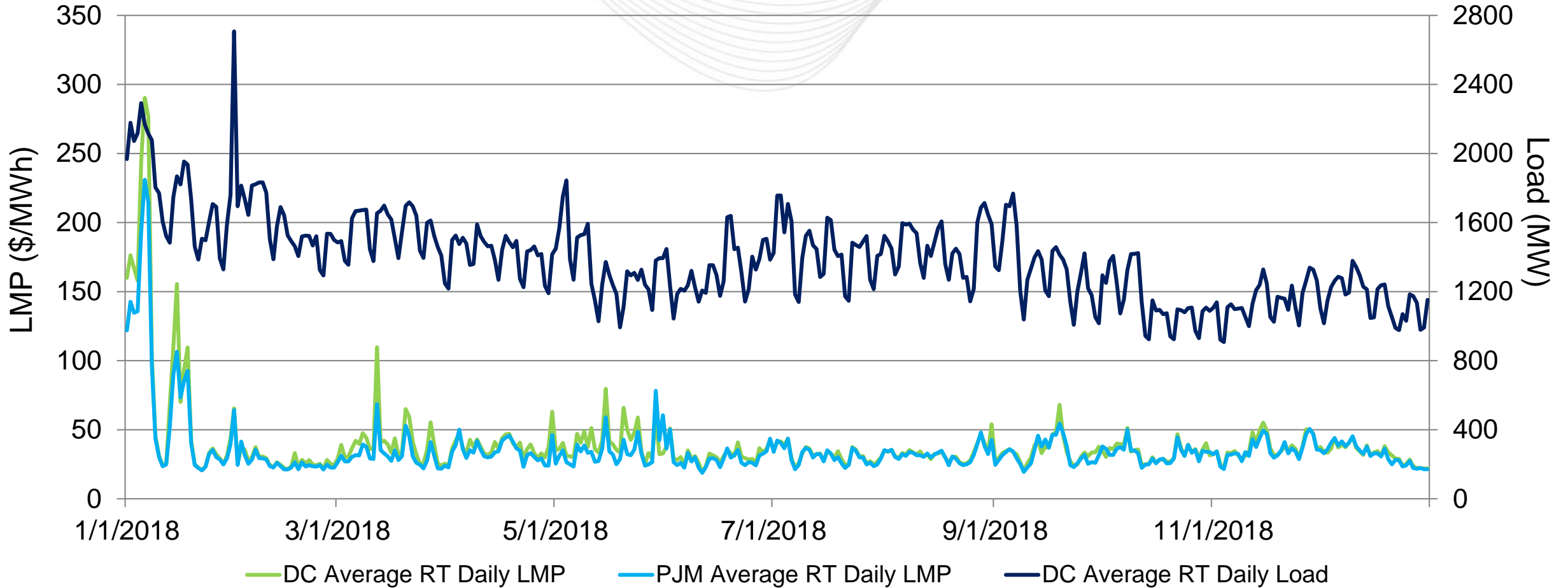


Note: The price spike in January reflects the Cold Snap that lasted from 12/28/17 to 1/7/2018.

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

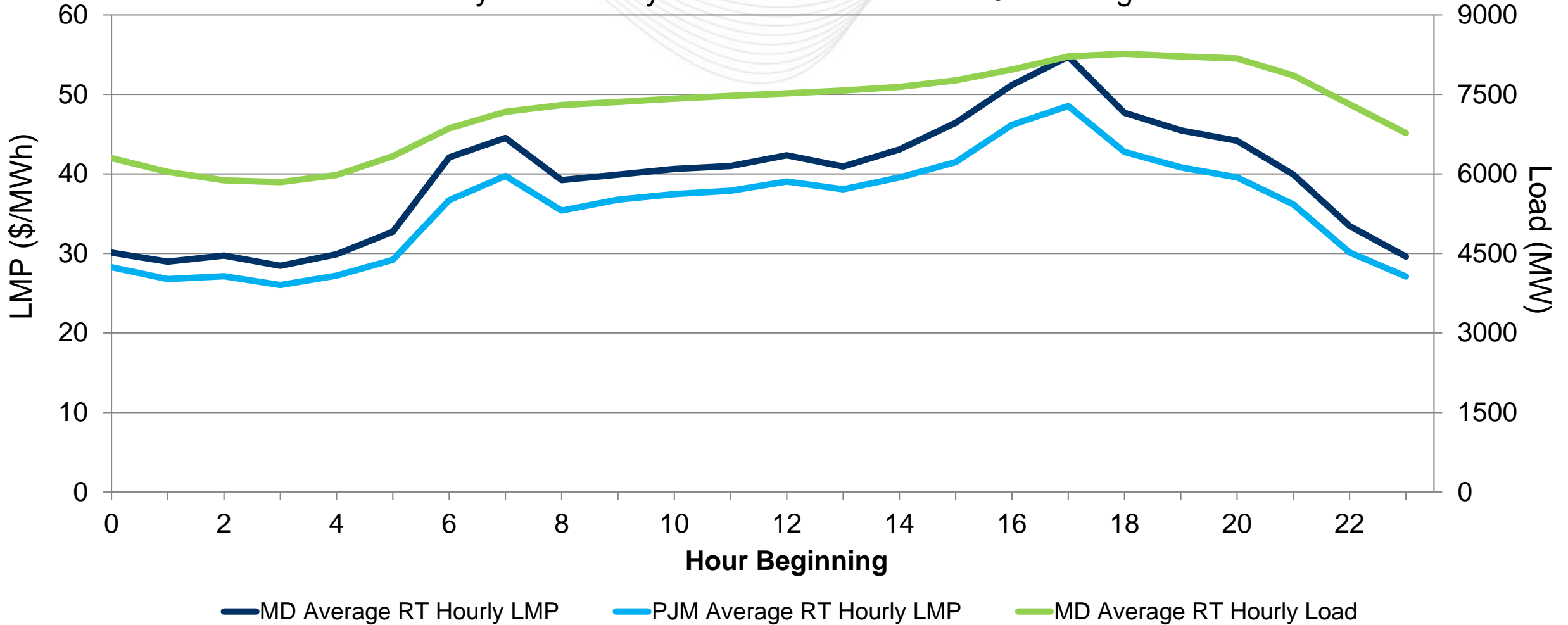
(January 1, 2018 – December 31, 2018)

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

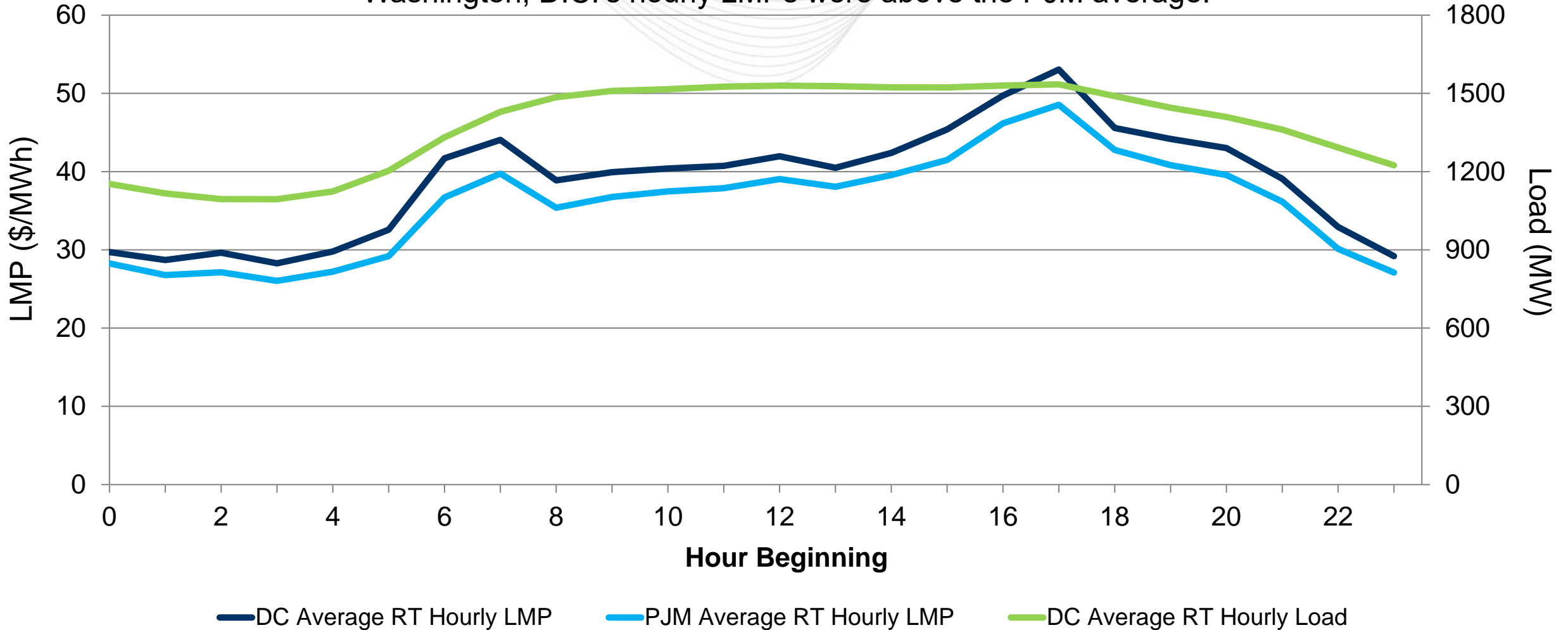


Note: The price spike in January reflects the Cold Snap that lasted from 12/28/17 to 1/7/2018.

Maryland's hourly LMPs were above the PJM average



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



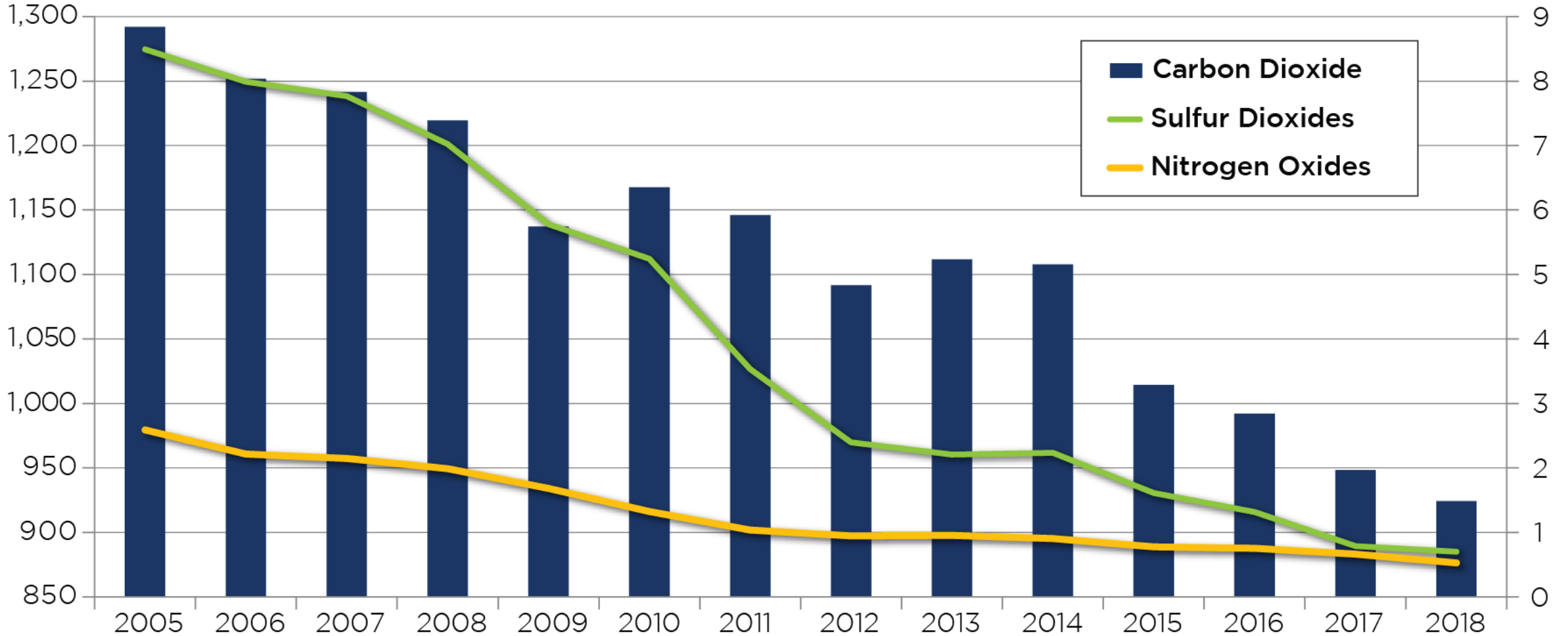
# Operations Emissions Data

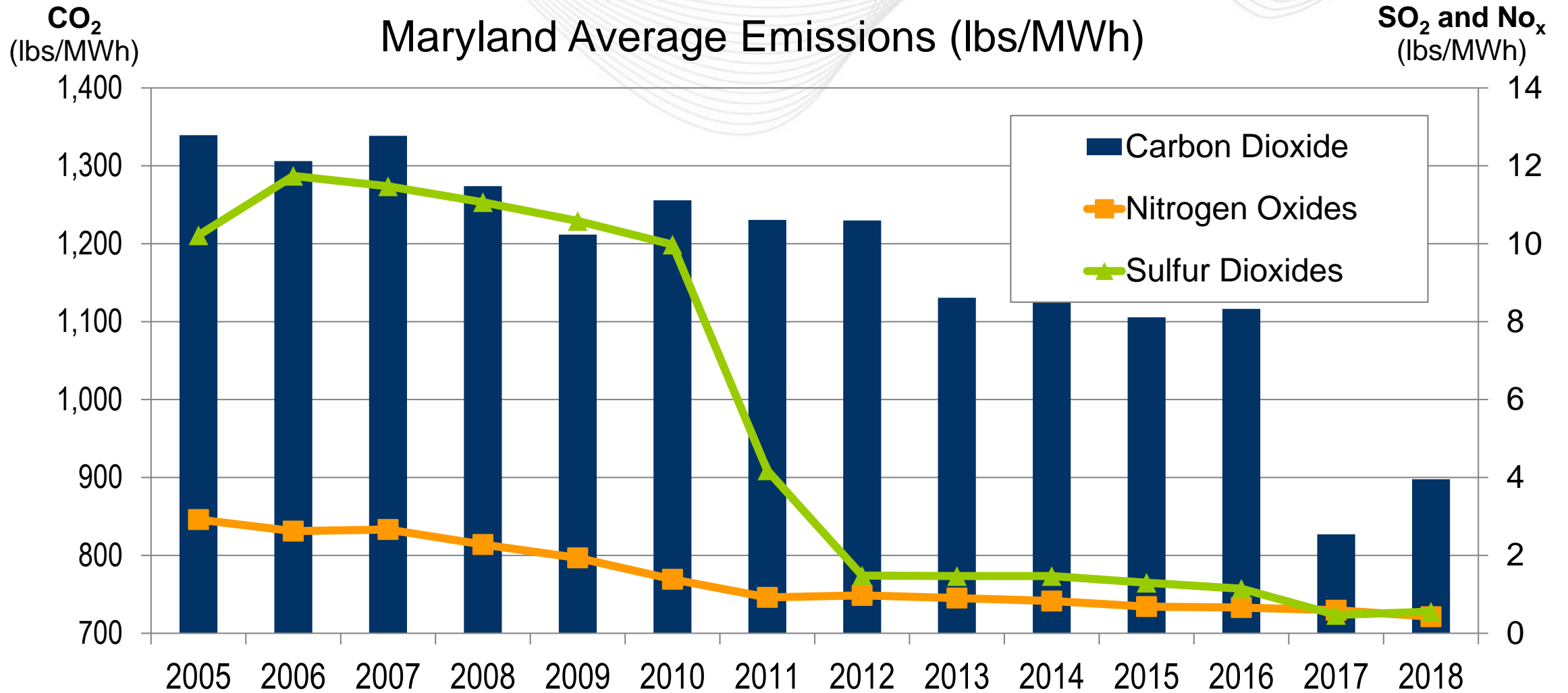


# 2005-2018 PJM Average Emissions

CO<sub>2</sub>  
lbs/MWh

SO<sub>2</sub> and NO<sub>x</sub>  
lbs/MWh





Please note that PJM has historically used \$5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to \$10 million. All RTEP projects with costs totaling at least \$5 million are still included in this state report.

For a complete list of all RTEP projects, including those below the RTEP threshold of \$10 million, please visit the “RTEP Upgrades & Status – Transmission Construction Status” page on [pjm.com](https://www.pjm.com).

<https://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx>