



2019 West Virginia State Infrastructure Report

(January 1, 2019 – December 31, 2019)

May 2020
(updated July 2020)

1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

2. Markets

- Market Analysis

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- Emissions Data

- **Existing Capacity:** Coal represents approximately 89.7 percent of the total installed capacity in the West Virginia service territory while natural gas represents approximately 7.8 percent. In PJM natural gas and coal account respectively for 42.4 and 28.7 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents 85 percent of new interconnection requests in West Virginia, while solar represents approximately 10.8 percent of new requests.
- **Deactivations:** 50 MW in West Virginia gave notification of deactivation in 2019.
- **RTEP 2019:** West Virginia's 2019 RTEP projects total approximately \$136.3 million in investment. Approximately 36 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least \$5 million.

- **Load Forecast:** West Virginia's load is projected to grow between 0.7 and 0.9 percent annually over the next ten years. Comparatively, the overall PJM RTO projected load growth rate is 0.6 percent.
- **2022/23 Capacity Market:** No Base Residual Auction was conducted in 2019. For the most recent auction results, please see the 2018 West Virginia State Infrastructure Report.
- **1/1/19 – 12/31/19 Market Performance:** West Virginia's average hourly LMPs aligned with PJM average hourly LMPs.
- **Emissions:** 2019 carbon dioxide emissions are slightly down from 2018, while sulfur dioxide and nitrogen oxide emissions have remained flat from 2018.

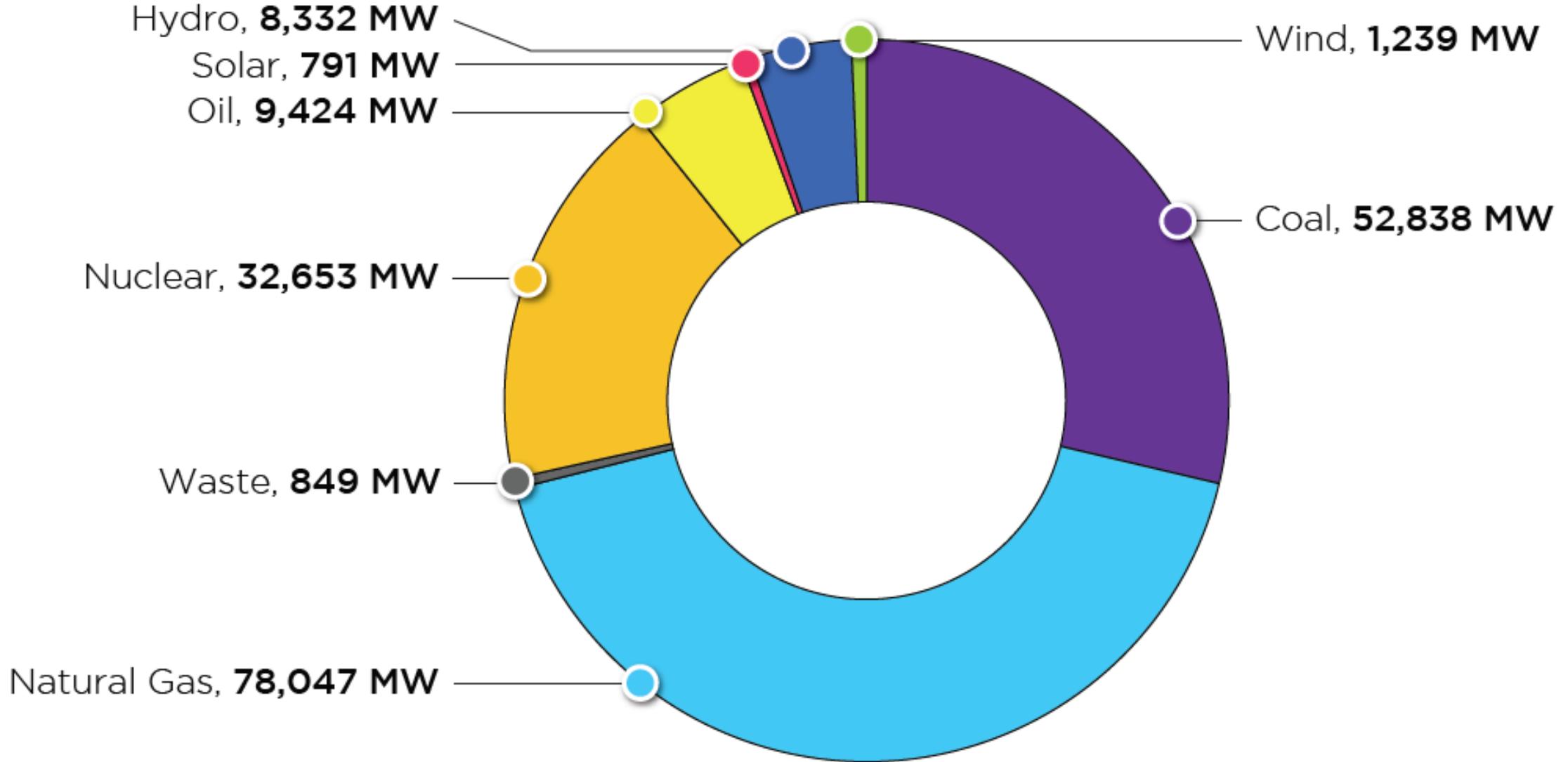
Planning

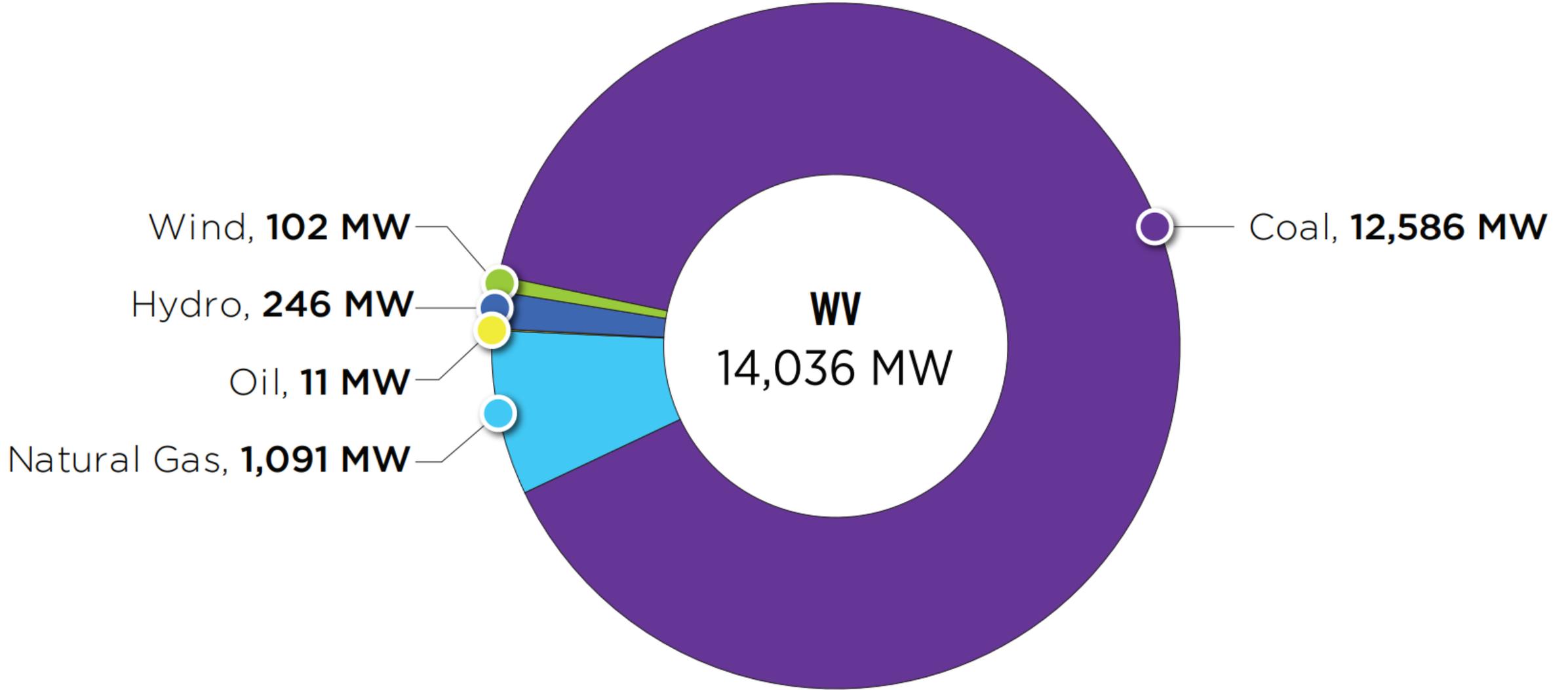
Generation Portfolio Analysis



PJM – Existing Installed Capacity

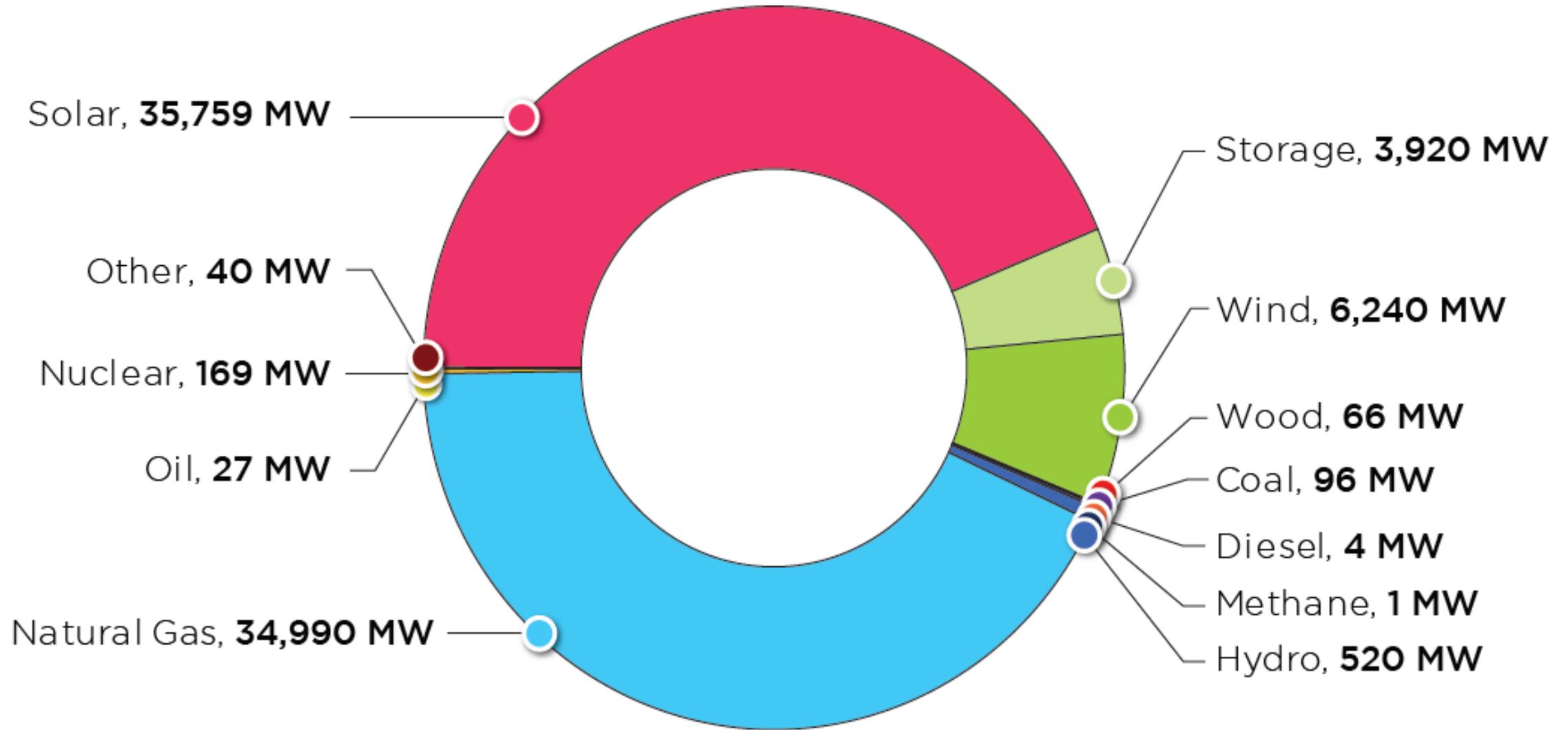
(CIRs – as of Dec. 31, 2019)





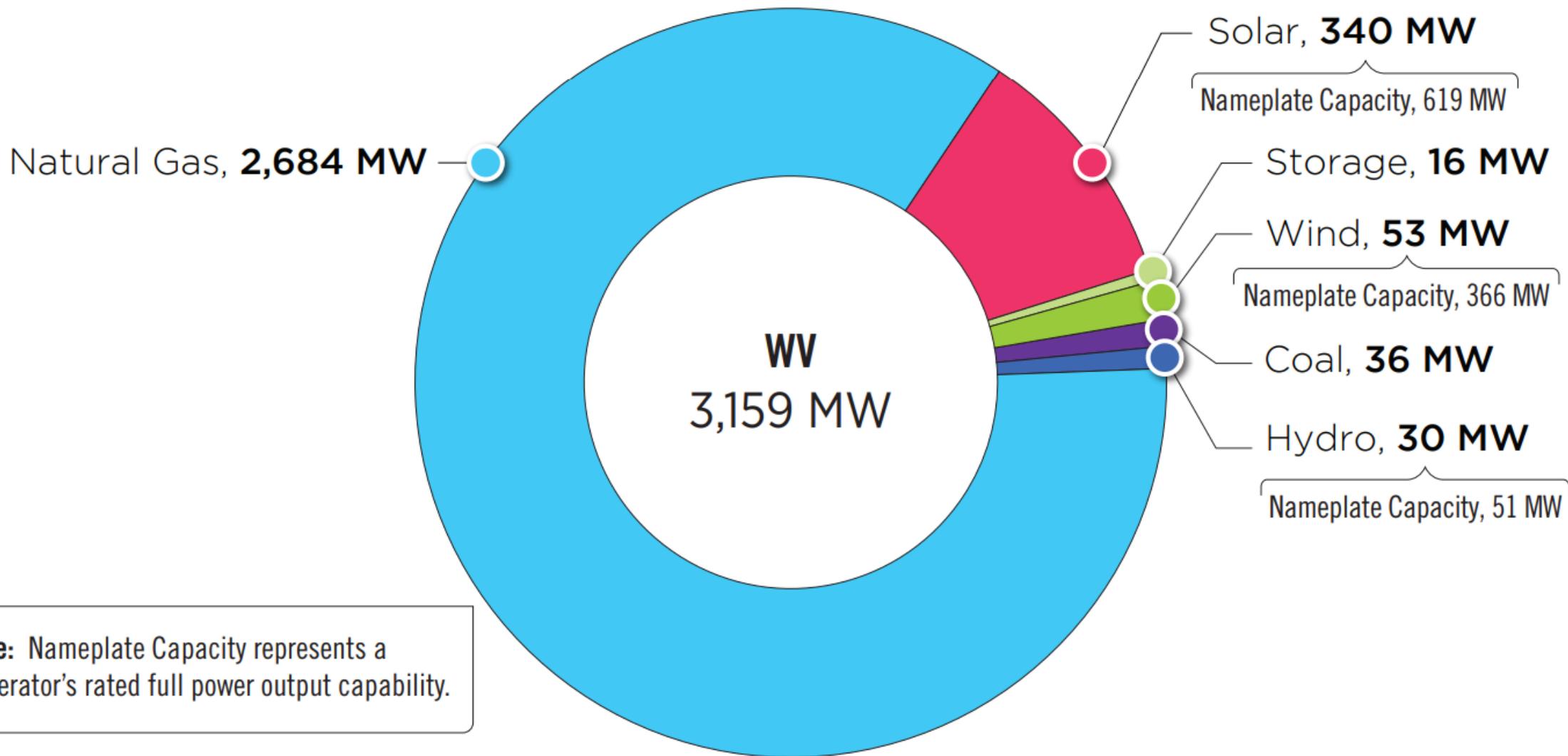
PJM – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2019)



West Virginia – Queued Capacity (MW) by Fuel Type

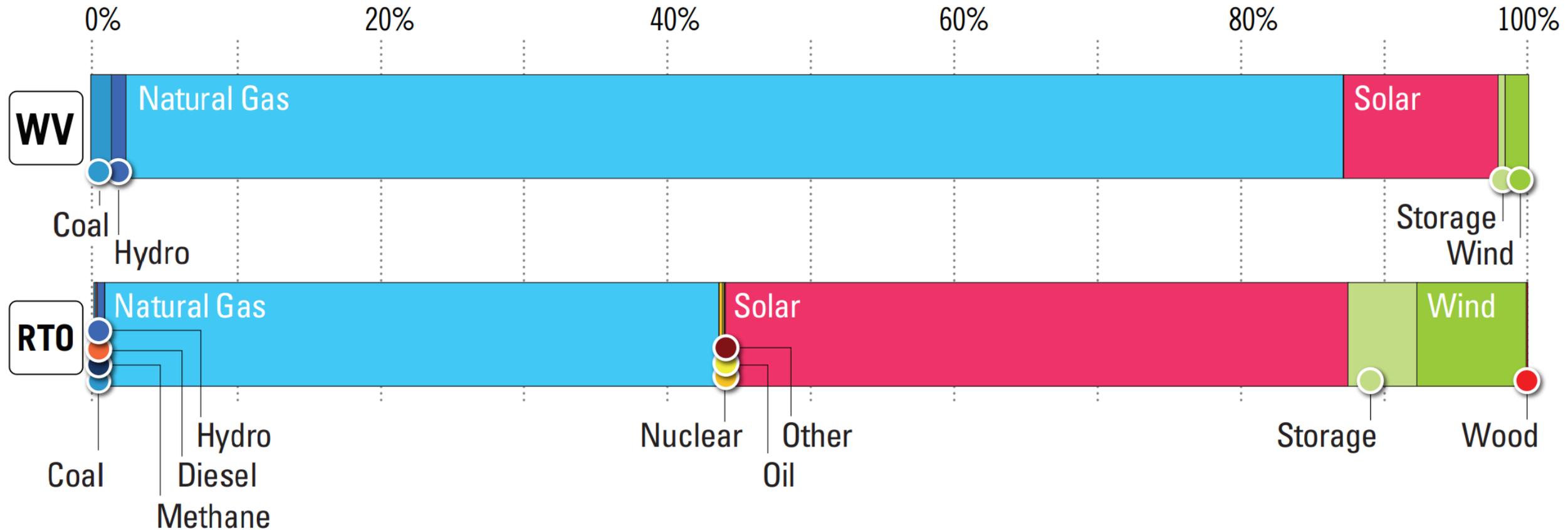
(Requested CIRs – as of Dec. 31, 2019)



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

West Virginia – Percentage of MW in Queue by Fuel Type

(Dec. 31, 2019)



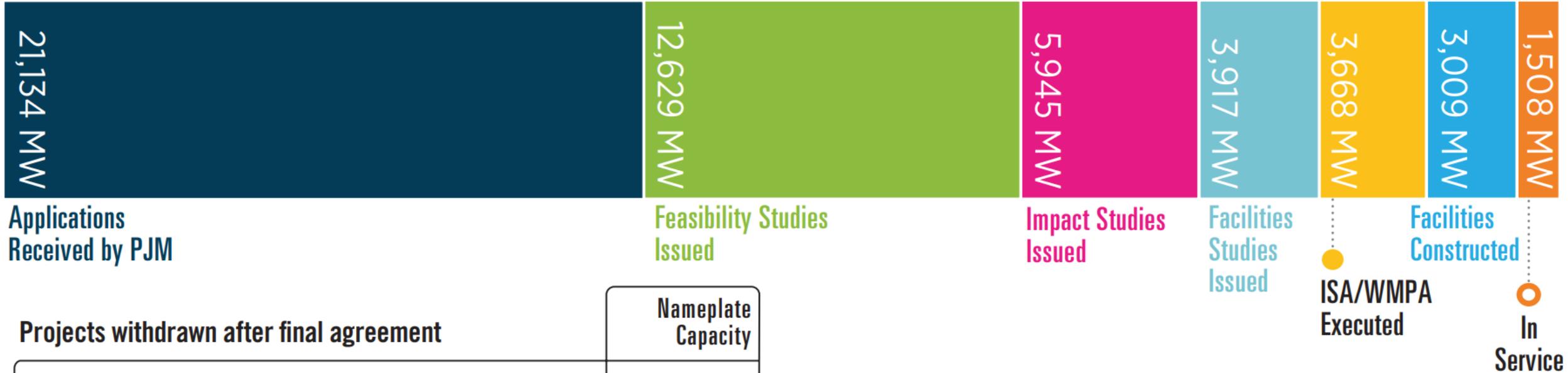


West Virginia – Interconnection Requests

(Unforced Capacity – as of Dec. 31, 2019)

		In Queue						Complete				Grand Total	
		Active		Suspended		Under Construction		In Service		Withdrawn			
		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)
Non-Renewable	Coal	0	0	0	0	1	36.0	10	861.0	7	2,023.0	18	2,920.0
	Natural Gas	3	1,254.0	3	600.0	3	830.0	5	391.7	39	15,310.8	53	18,386.5
	Other	0	0	0	0	0	0	0	0	2	66.0	2	66.0
	Storage	2	10.0	2	5.8	0	0	2	0.0	2	18.0	8	33.8
Renewable	Biomass	0	0	0	0	0	0	0	0	2	48.0	2	48.0
	Hydro	1	30.0	0	0	0	0	5	59.2	12	208.8	18	298.0
	Methane	0	0	0	0	0	0	3	5.6	3	13.8	6	19.4
	Solar	8	340.1	0	0	0	0	0	0	4	44.2	12	384.3
	Wind	2	23.5	1	22.1	2	7.3	8	190.2	25	392.7	38	635.8
Grand Total		16	1,657.6	6	627.9	6	873.3	33	1,507.7	96	18,125.3	157	22,791.8

Note: The "Under Construction" column includes both "Engineering and Procurement" and "Under Construction" project statuses.



Projects withdrawn after final agreement			Nameplate Capacity
8	Interconnection Service Agreements	647 MW	971 MW
2	Wholesale Market Participation Agreements	6 MW	11 MW

Percentage of planned capacity and projects that have reached commercial operation	<div style="border: 2px solid orange; padding: 5px; display: inline-block;">7%</div>	Requested capacity megawatt
	<div style="border: 2px solid orange; padding: 5px; display: inline-block;">23%</div>	

This graphic shows the final state of generation submitted in all PJM queues that reached in-service operation, began construction, or was suspended or withdrawn as of Dec. 31, 2019.

West Virginia – Generation Deactivation Notifications Received in 2019



Unit	TO Zone	Fuel Type	Request Received to Deactivate	Pending/Actual Deactivation Date	Age (Years)	Capacity (MW)
MEA NUG (WVU)	APS	Coal	10/4/2019	12/30/2019	28	50.00

Planning

Transmission Infrastructure Analysis

Please note that PJM 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 included in this state report. However, only projects that are \$10 million and above are displayed on the project maps.

For a complete list of all RTEP projects, 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>



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



West Virginia – RTEP Baseline Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	b2996	Upgrade two existing 138 kV breakers (Rider 50 and No. 1/4 transformer breaker) at Glen Falls with 63 kA, 3000 A units.	5/31/2020	\$40.6	APS	6/17/2019
2	b3095	Rebuild 9.2 miles of Lakin-Racine Tap 69 kV line section to 69 kV standards, utilizing 795 26/7 ACSR conductor.	12/1/2022	\$23.9	AEP	11/29/2018
3	b3118	Chadwick-Tri-State No. 2 138 kV circuit will be reconfigured within the station to terminate into the newly established 138 kV bus No. 2 at Chadwick due to constructability aspects.	6/1/2022	\$16.9	AEP	2/20/2019
		Replace 20 kA 69 kV circuit breaker F at South Neal station with a new 3000A 40 kA 69 kV circuit breaker. Replace line risers towards Leach station.				
	b3079	Replace the Wylie Ridge 500/345 kV transformer #7.	6/1/2022	\$6.37	APS	11/8/2018

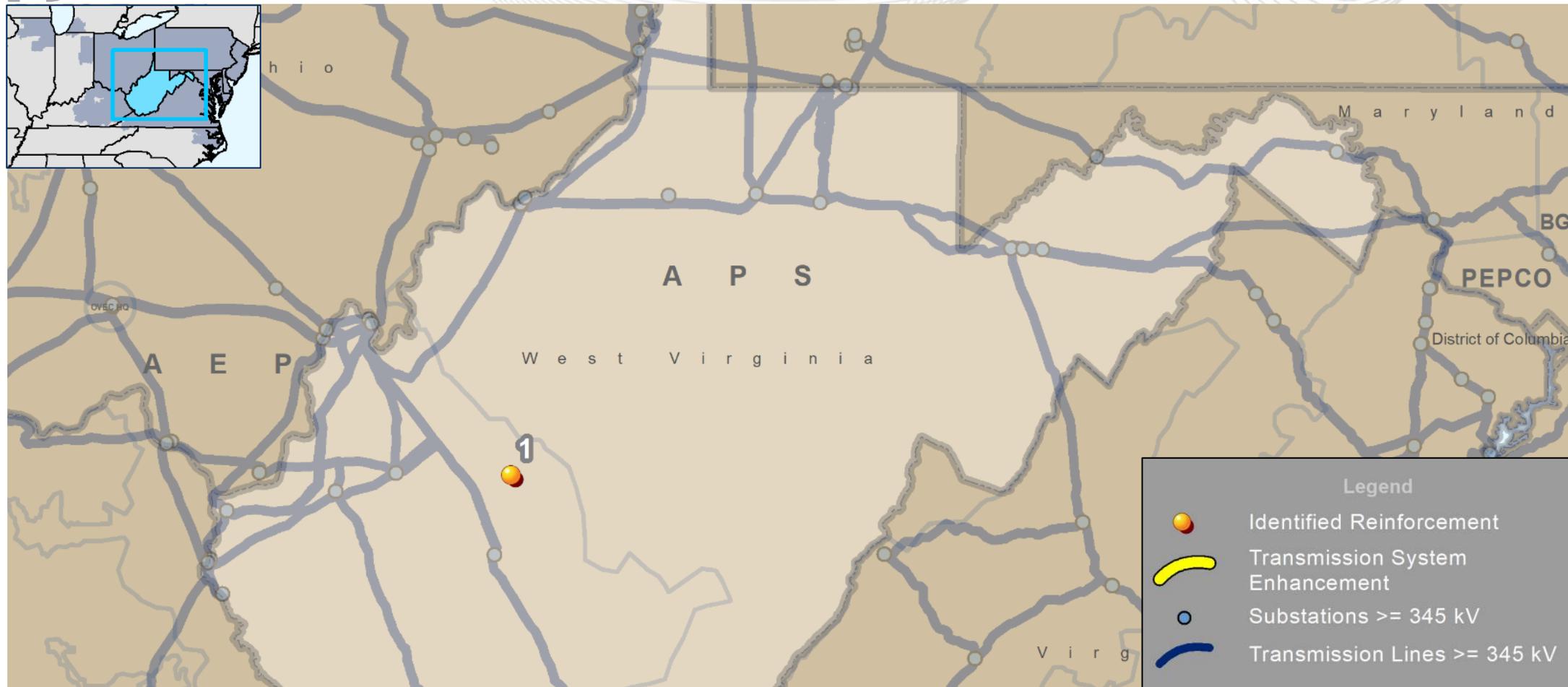


West Virginia – RTEP Network Projects

(Greater than \$5 million)

West Virginia had no network project upgrades in 2019.

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, as well as certain direct connection facilities required to interconnect proposed generation projects.



Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with PJM criteria and are not state public policy projects according to the PJM Operating Agreement. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.



West Virginia – TO Supplemental Projects

(Greater than \$5 million)

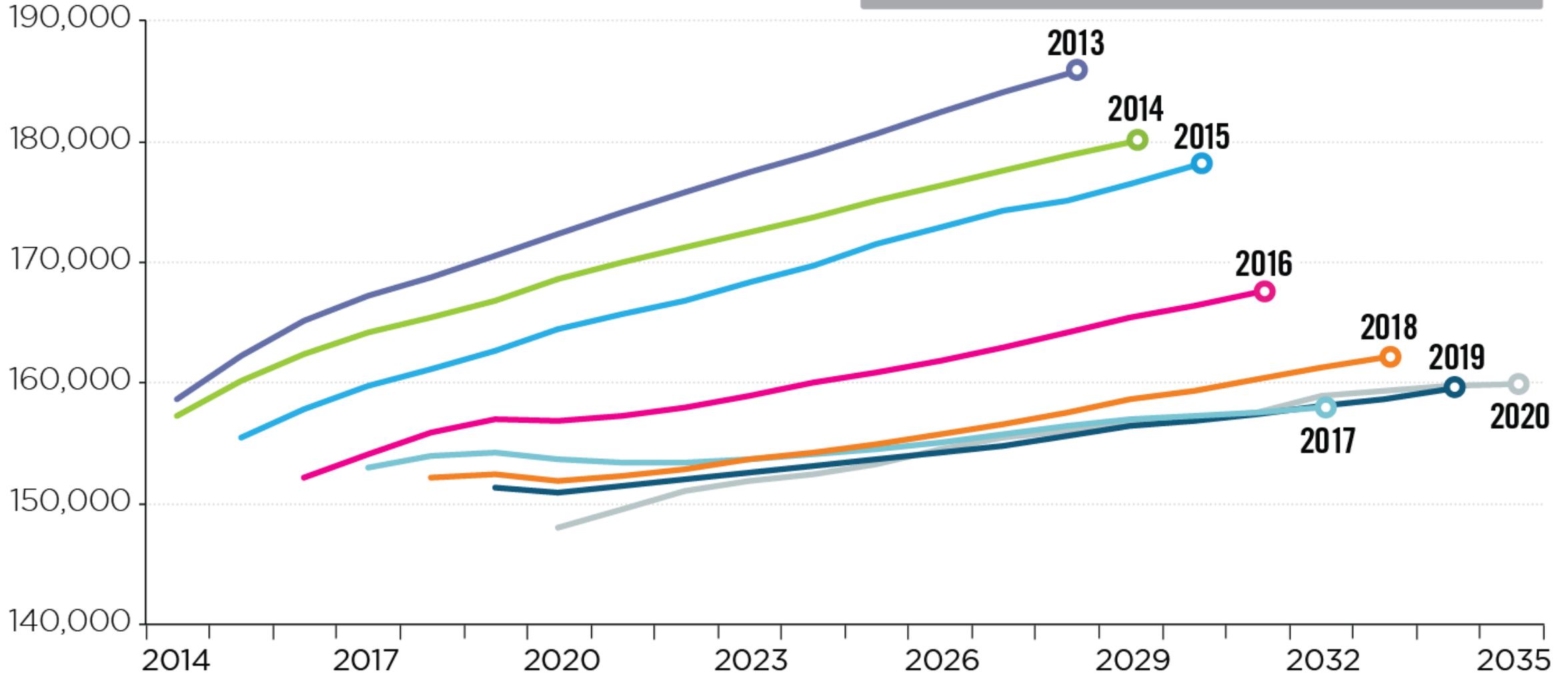
Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	s1996	Replace the Clendenin station with new Jarrett station. Install a new 138/46 kV 90 MVA transformer, with a high side circuit switcher. Install two 138 kV 40 kA circuit breakers and three 46 kV 40 kA circuit breakers. Install a 9.6 MVAR capacitor bank. Re-route the existing 138 kV and 46 kV transmission lines into the new station.	8/26/2021	\$21.3	AEP	5/20/2019
	s1994	Construct a new 138 kV double circuit in/out feed (~1.5 miles) from the Bradley – Tams Mtn. 138 kV Tap, to the new Mabscott Station. Tap the existing Bradley – Tams Mtn. 138 kV line. Install two new 138 kV MOABs at Mabscott Station.	11/1/2020	\$7.5	AEP	6/17/2019
	s1995	Replace existing 138/46 kV 30 MVA transformer No.1 at Mullensville substation with a new 138/46 kV 30 MVA transformer. Replace 46 kV circuit breaker A with a new 46 kV 3000 A 40 kA circuit breaker. Replace Gr. Sw. MOAB with a new 138 kV circuit switcher.	4/1/2020	\$5.4	AEP	4/23/2019
	s1997	Replace the existing 90 MVA 138/69/46 kV transformer No.1 at Huff Creek substation with a new 90 MVA 138/69/46 kV transformer. Replace existing 69 kV CB 'D' with a new 3000 A 40 kA 69 kV CB. Replace the existing 3000 A GR. TRF Bank with a new 3000 A GR. TRF Bank. Replace the relaying at the station.	4/1/2020	\$6.6	AEP	4/23/2019
	s2057	At Amos Station, replace eleven (1) 138 kV circuit breakers (A, A1, B, B1, B2, D, D1, D2, E, E1, E2) with new 138 kV 80 kA 3000 A circuit breakers.	12/30/2020	\$7.7	AEP	8/29/2019

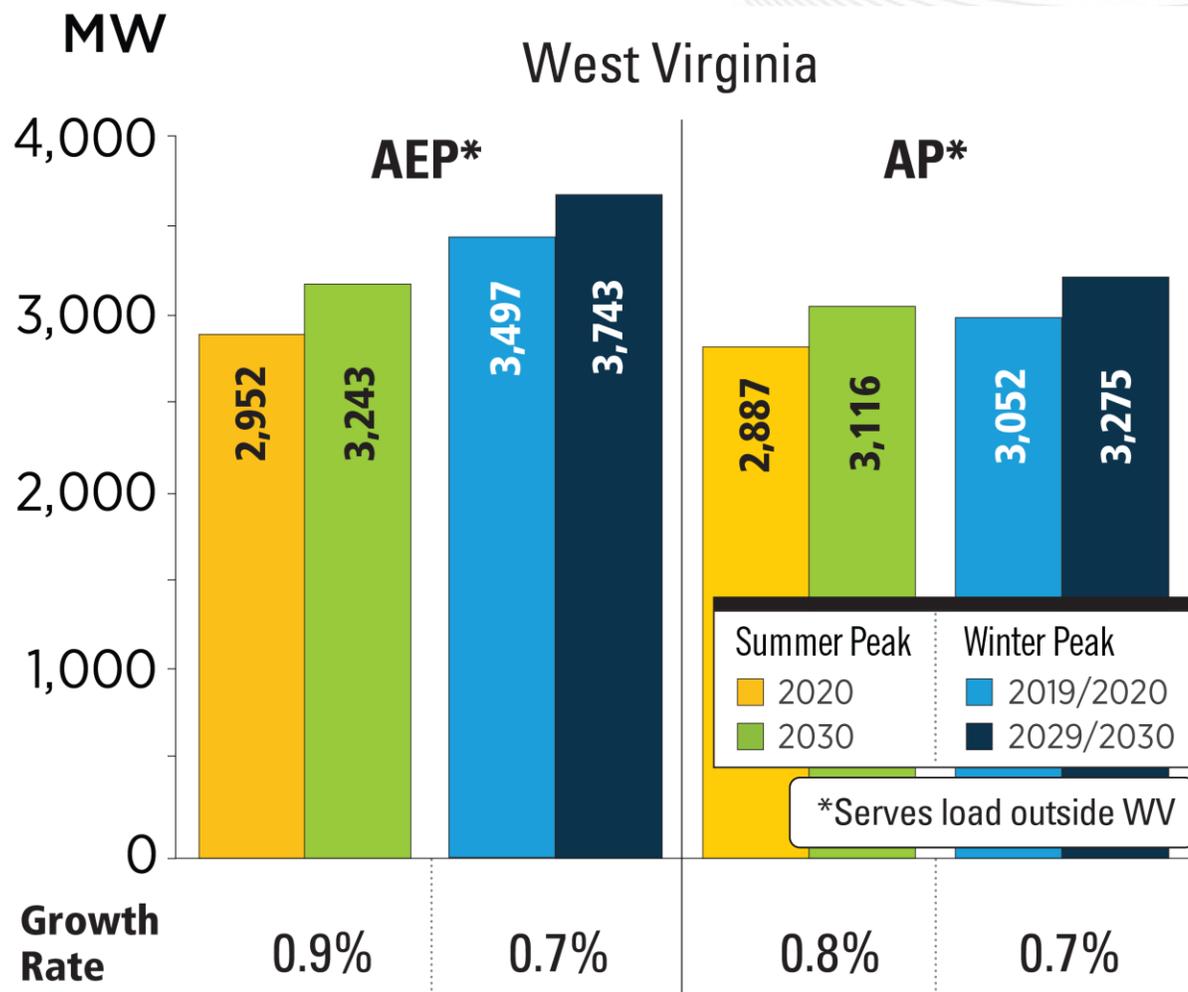
Planning

Load Forecast

PJM RTO Summer Peak Demand Forecast

Load (MW)





PJM RTO Summer Peak		PJM RTO Winter Peak	
2020	2030	2019/2020	2029/2030
148,092 MW	157,132 MW	131,287 MW	139,970 MW
Growth Rate 0.6%		Growth Rate 0.6%	

The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas over the past five years.

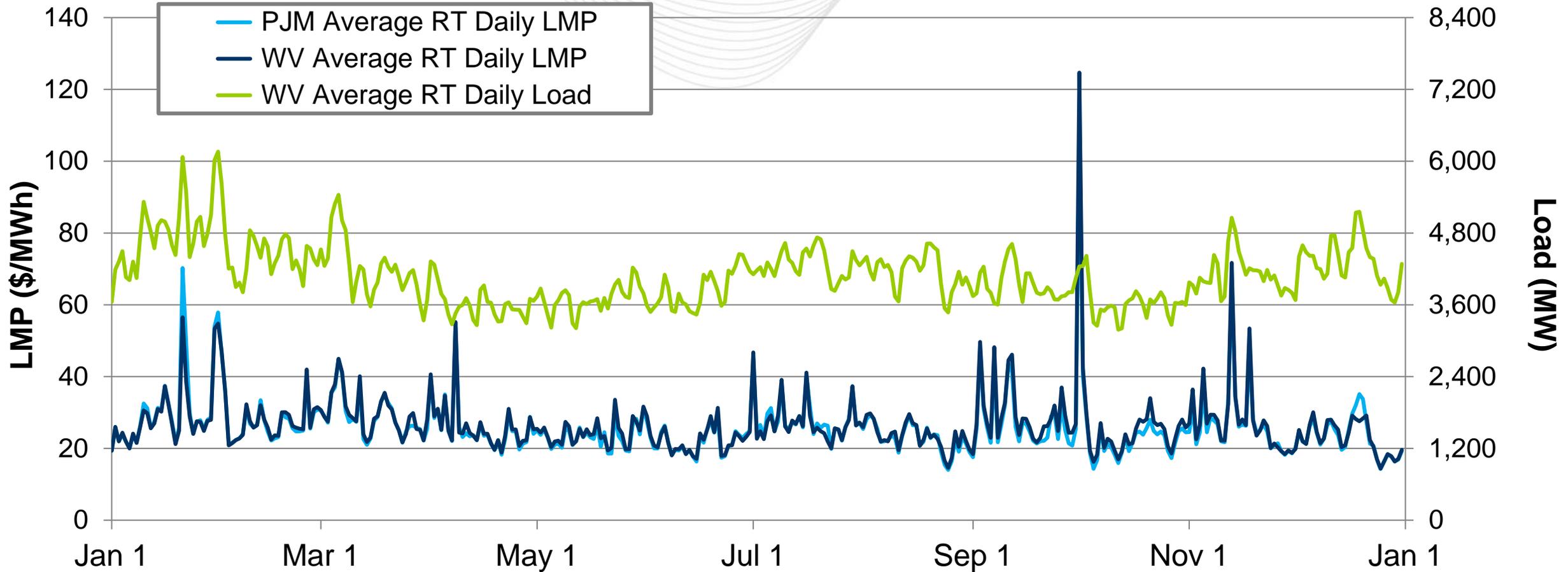
The Load Forecast was produced prior to COVID-19 and will be updated before the next Base Residual Auction to reflect changes in load patterns.

Markets

Market Analysis

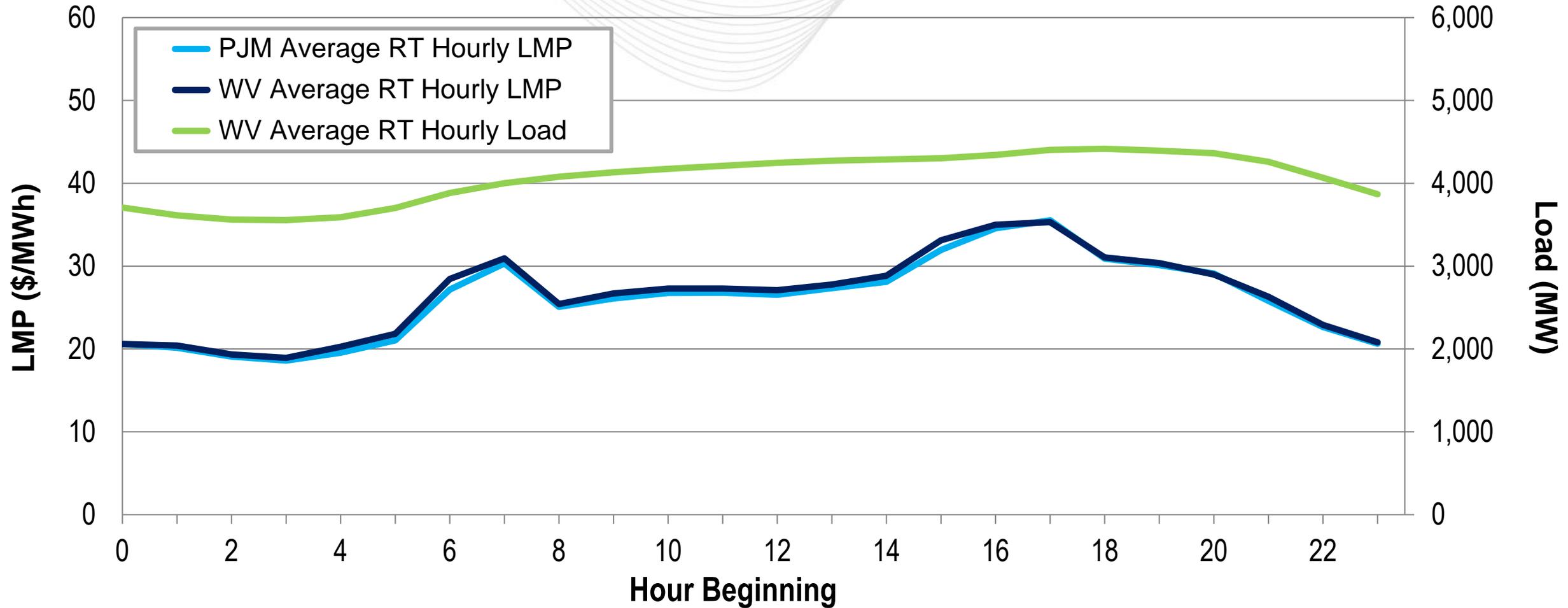
West Virginia – Average Daily Load and LMP

(Jan. 1, 2019 – Dec. 31, 2019)



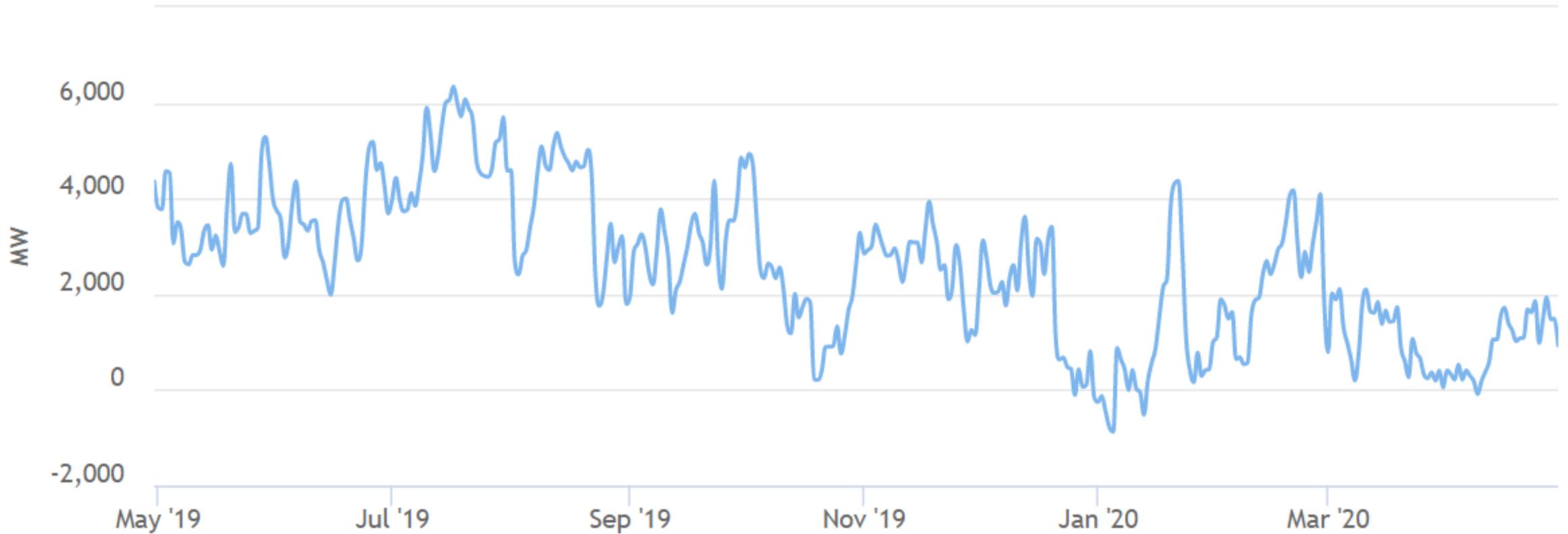
Note: The price spike in October reflects the Performance Assessment Interval event that occurred on October 2nd.

West Virginia's average hourly LMPs aligned with the PJM average hourly LMP.



West Virginia – Net Energy Import/Export Trend

(May 2019 – April 2020)

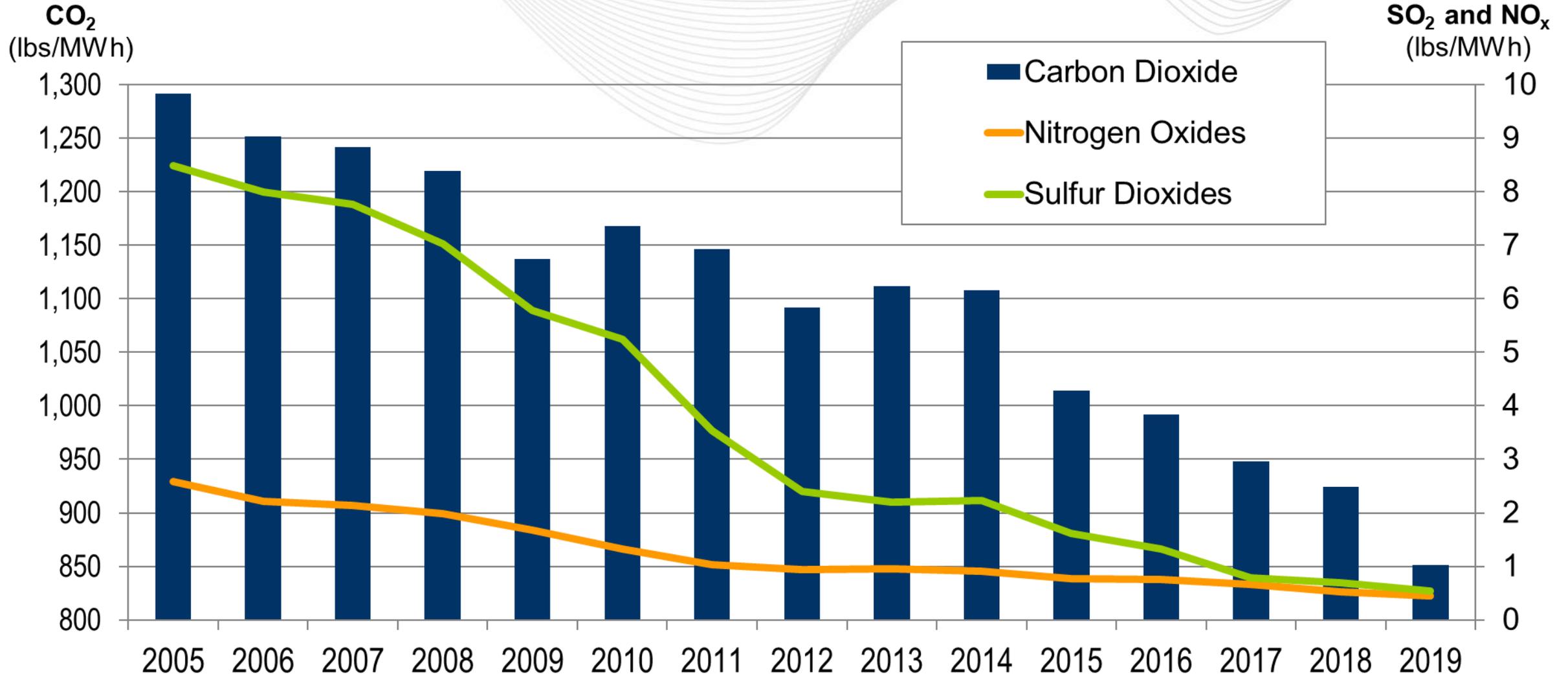


Positive values represent exports and negative values represent imports.

Operations Emissions Data



2005 – 2019 PJM Average Emissions





West Virginia – Average Emissions (lbs/MWh)

(Feb. 7, 2020)

CO₂
(lbs/MWh)

SO₂ and NO_x
(lbs/MWh)

