



2019 Pennsylvania 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

3. Operations

- Emissions Data

- **Existing Capacity:** Natural gas represents approximately 41.6 percent of the total installed capacity in the Pennsylvania service territory while coal represents approximately 22.5 percent. In PJM natural gas and coal are 42.4 and 28.7 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents 56.4 percent of new interconnection requests in Pennsylvania, while solar represents approximately 35.5 percent of new requests.
- **Deactivations:** 976.2 MW in Pennsylvania gave notification of deactivation in 2019.
- **RTEP 2019:** Pennsylvania's 2019 RTEP projects total approximately \$957.1 million in investment. Approximately 73.4 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least \$5 million.

- **Load Forecast:** Pennsylvania's load growth is projected to range between -0.7 and 1.0 percent annually over the next ten years, based on the service territory. 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 Pennsylvania State Infrastructure Report.
- **1/1/19 – 12/31/19 Market Performance:** Pennsylvania's average hourly LMPs were below PJM average hourly LMPs.
- **Emissions:** 2019 carbon dioxide, sulfur dioxide, and nitrogen oxide emissions all decreased from 2018 levels.



Legend

Substation

- 500 kV
- 345 kV

Transmission Lines

- 345 kV
- 500 kV
- HVDC

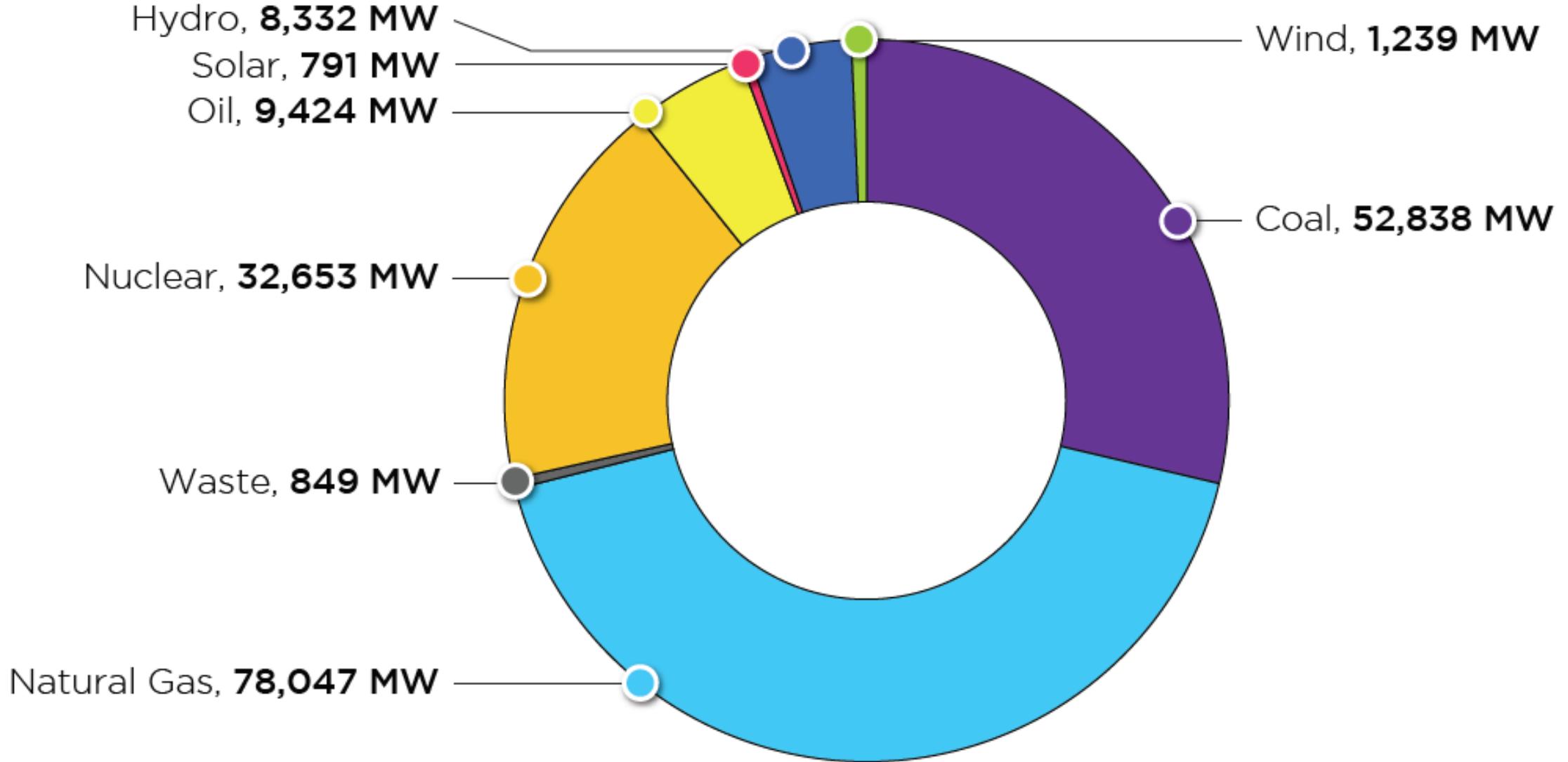
Planning

Generation Portfolio Analysis



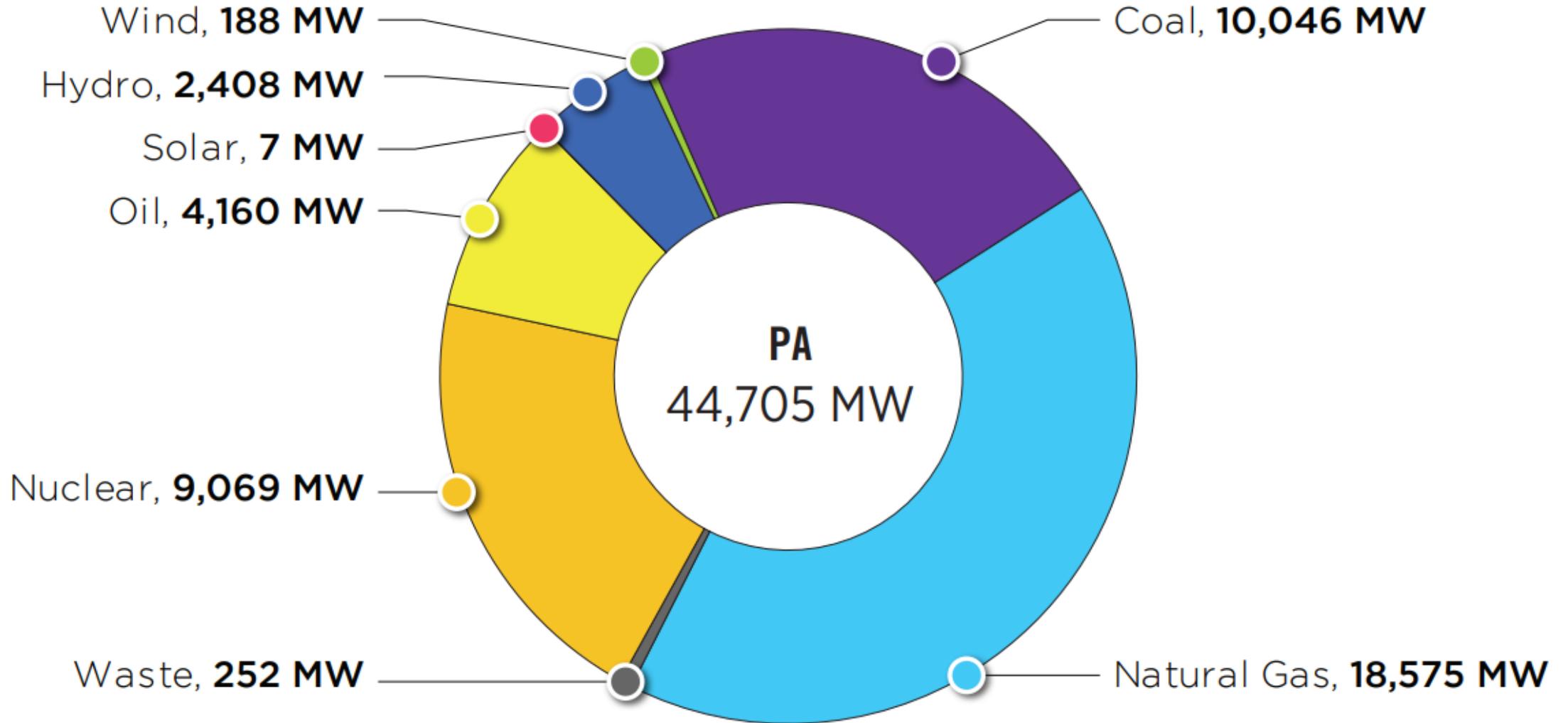
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



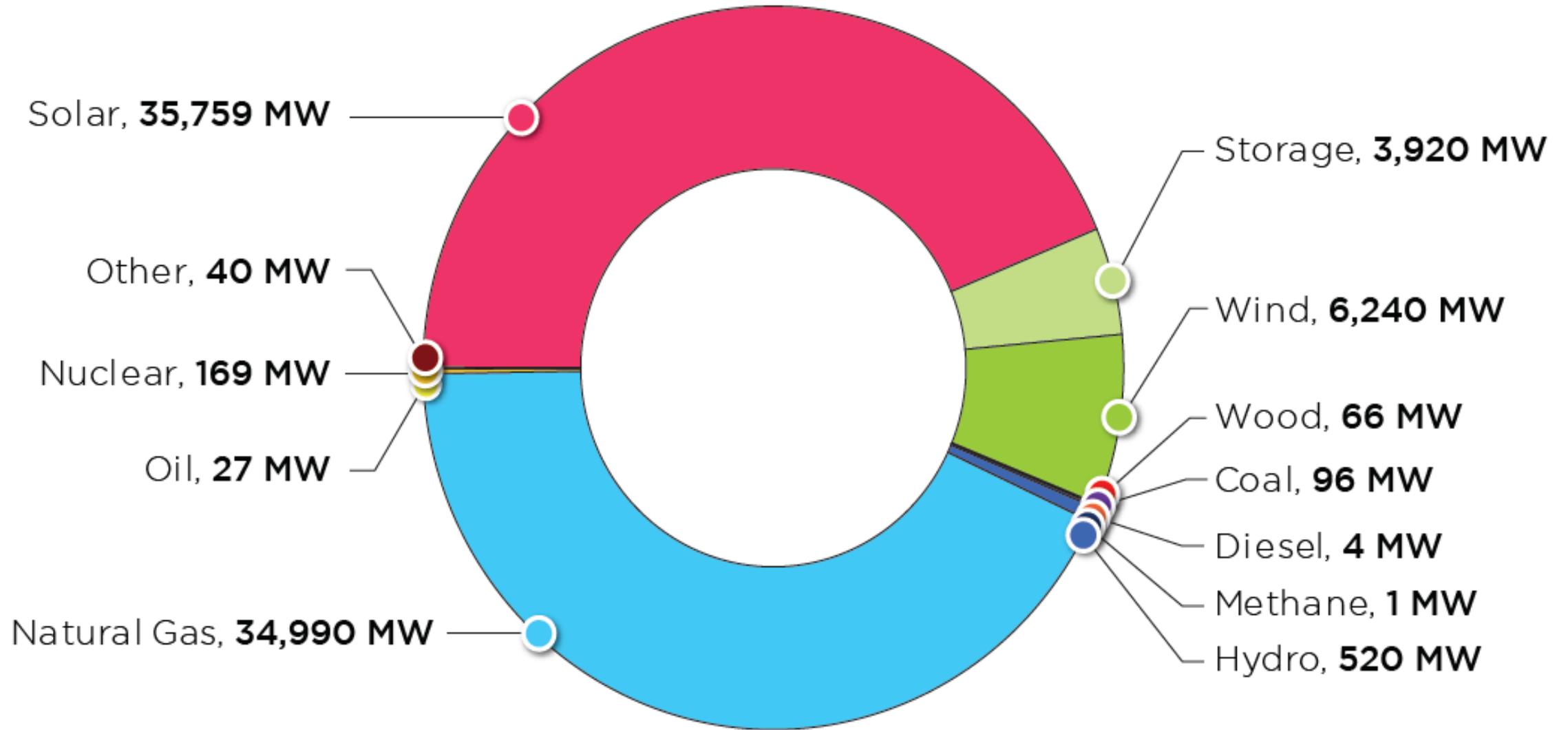
Pennsylvania – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



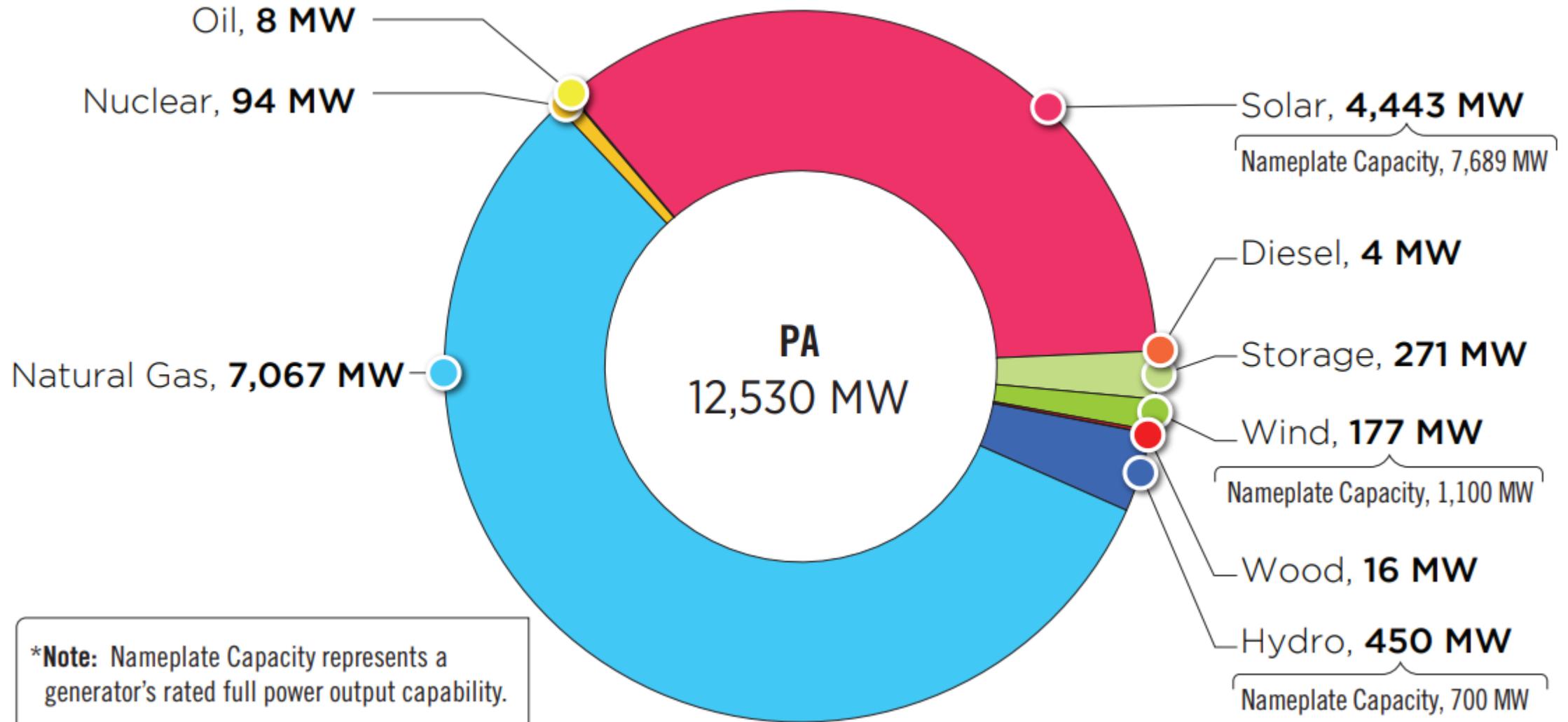
PJM – Queued Capacity (MW) by Fuel Type

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



Pennsylvania – Queued Capacity (MW) by Fuel Type

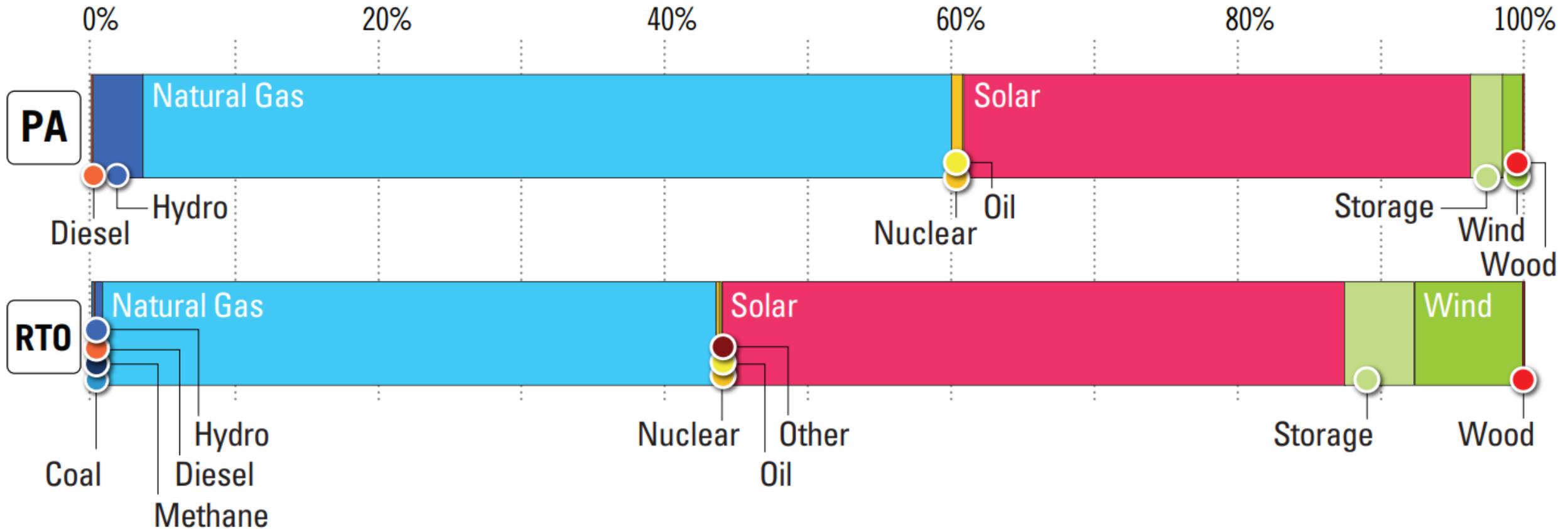
(Requested CIRs – as of Dec. 31, 2019)



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

Pennsylvania – Percentage of MW in Queue by Fuel Type

(Dec. 31, 2019)





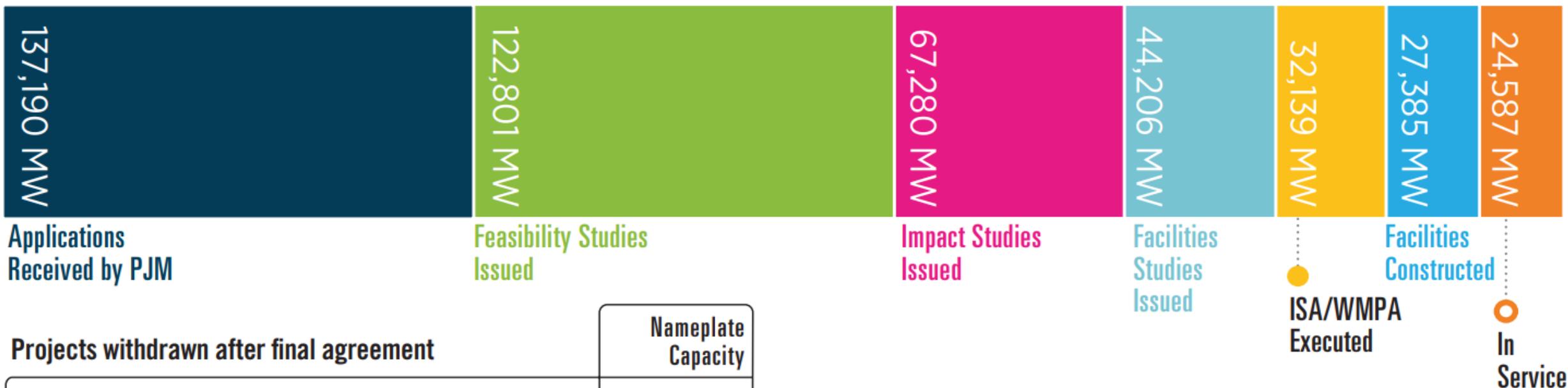
Pennsylvania – Interconnection Requests

(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	0.0	0	0	17	229.0	28	14,354.6	45	14,583.6
	Diesel	0	0	0	0.0	1	4.1	3	33.3	12	51.5	16	88.9
	Natural Gas	30	3,393.5	3	989.8	18	2,683.7	92	19,411.1	237	87,763.2	380	114,241.3
	Nuclear	4	50.0	0	0.0	1	44.0	15	2,581.8	8	1,681.0	28	4,356.8
	Oil	6	7.5	0	0.0	0	0.0	3	9.4	9	1,307.0	18	1,323.9
	Other	0	0	0	0.0	0	0.0	2	306.5	6	344.0	8	650.5
	Storage	13	270.8	1	0.0	1	0.0	5	0.0	27	282.1	47	552.9
Renewable	Biomass	0	0	0	0.0	0	0.0	2	15.4	4	36.5	6	51.9
	Hydro	2	450.0	0	0.0	0	0.0	12	480.8	16	438.6	30	1,369.4
	Methane	0	0	0	0.0	0	0.0	25	130.7	37	201.3	62	332.0
	Solar	158	4,377.0	3	22.0	10	44.3	4	11.9	123	1,629.4	298	6,084.7
	Wind	5	87.8	3	34.4	5	54.9	39	259.6	133	1,716.3	185	2,153.0
	Wood	0	0.0	1	16.0	0	0.0	0	0.0	0	0.0	1	16.0
Grand Total		218	8,636.6	11	1,062.2	36	2,831.0	219	23,469.5	640	109,805.5	1,124	145,804.9

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

Pennsylvania – Progression History of Interconnection Requests



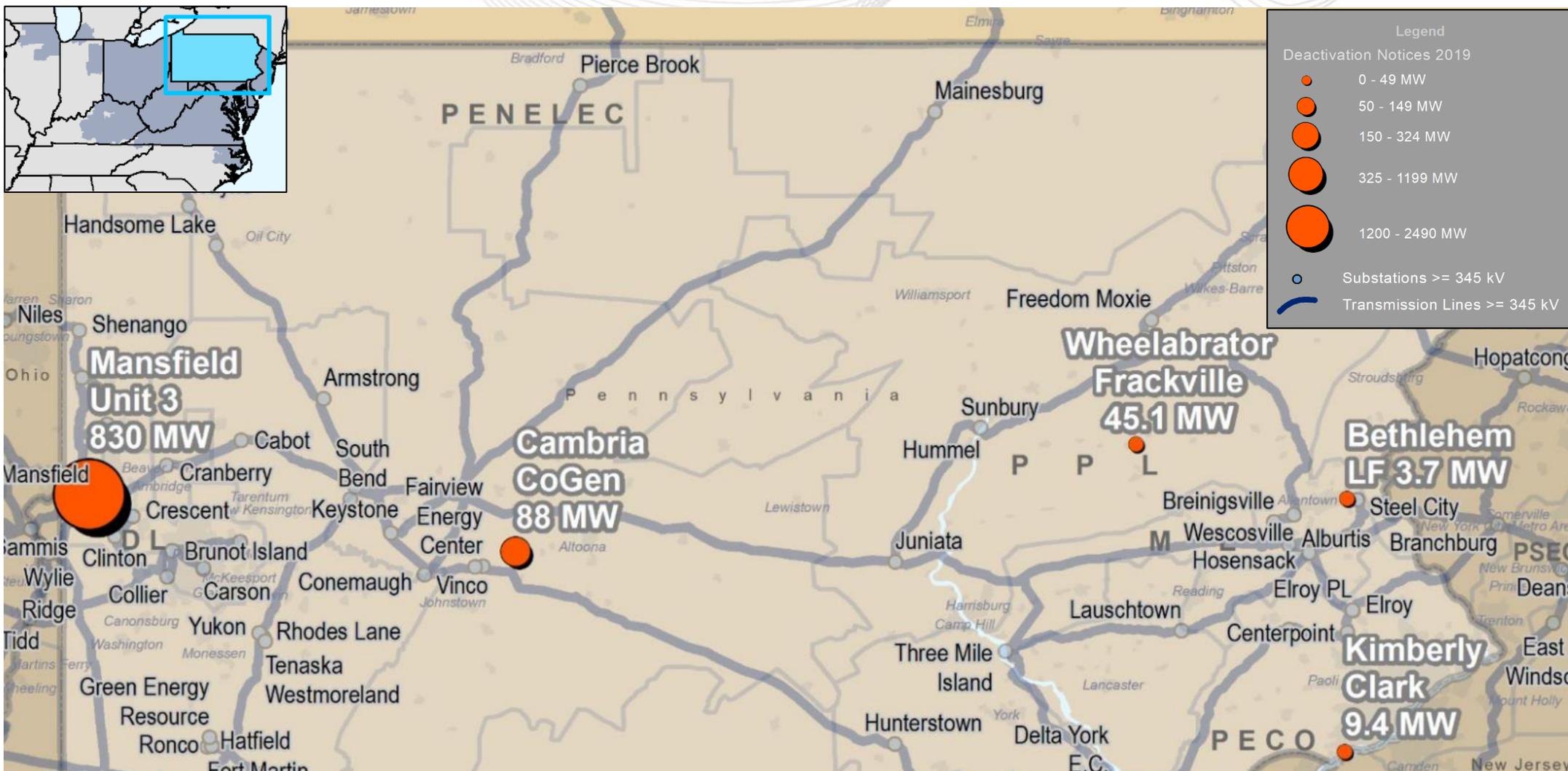
Projects withdrawn after final agreement

		Nameplate Capacity
50	Interconnection Service Agreements	5,972 MW
47	Wholesale Market Participation Agreements	287 MW
		7,661 MW
		400 MW

Percentage of planned capacity and projects that have reached commercial operation	18%	26%
	Requested capacity megawatt	Requested projects

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.

Pennsylvania – Generation Deactivation Notifications Received in 2019





Pennsylvania – Generation Deactivation Notifications Received in 2019

Unit	TO Zone	Fuel Type	Request Received to Deactivate	Pending/Actual Deactivation Date	Age (Years)	Capacity (MW)
Frackville Wheelabrator 1	PPL	Coal	9/3/2019	3/1/2020	31	45.1
Cambria CoGen	MAIT	Coal	3/7/2019	9/17/2019	28	88
Bethlehem Renewable Energy Generator (Landfill)	PPL	Methane	2/25/2019	8/31/2019	10	3.7
Kimberly Clark Generator	PECO	Coal	8/28/2019	9/4/2019	32	9.4
Mansfield 3	ATSI	Coal	8/9/2019	11/7/2019	38	830

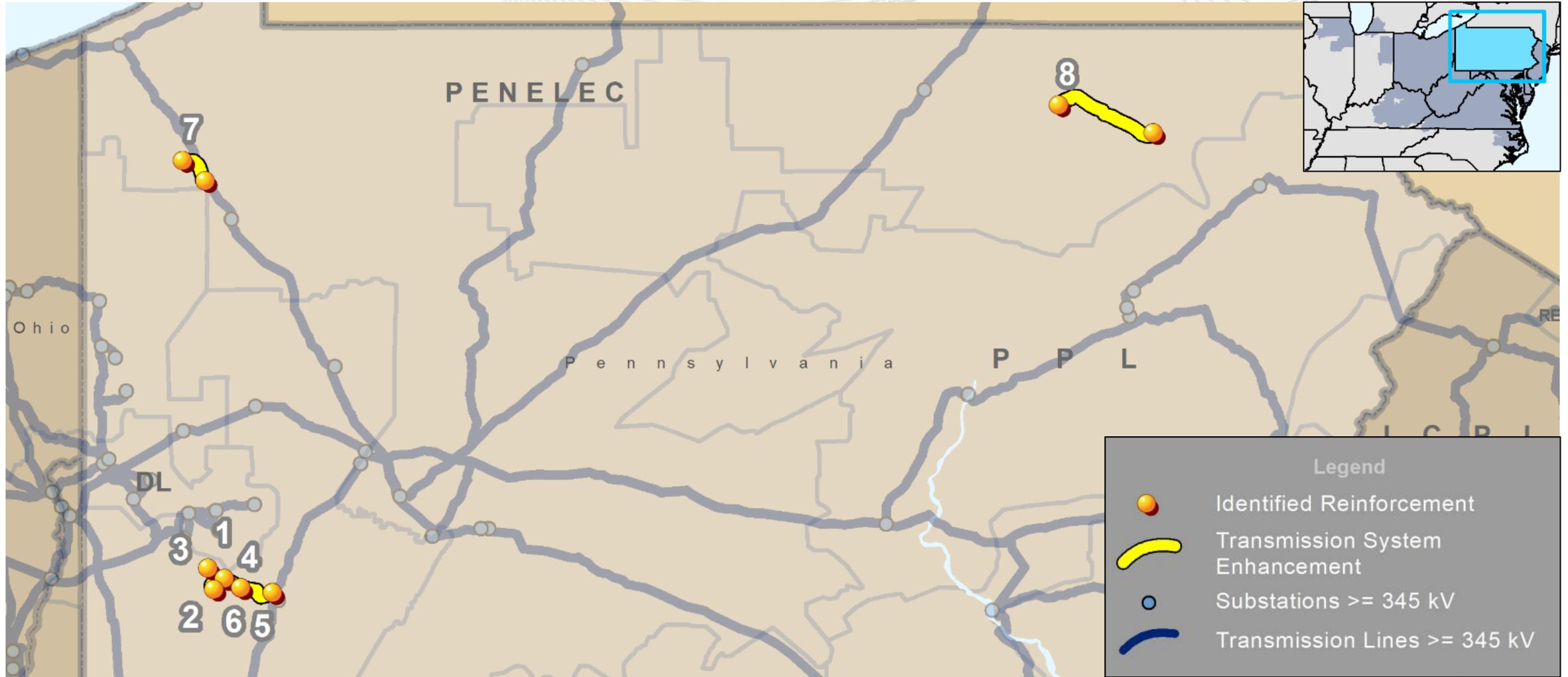
Planning

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.



Pennsylvania – RTEP Baseline Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	b3011	Replace the line terminal equipment and line breaker No. 85 at Dravosburg 138 kV substation in the Elwyn Z-70 line position/bay, with the breaker duty as 63 kA.	6/1/2021	\$28.5	DLCO	2/20/2019
2	b3012	Construct two new 138 kV ties with the single structure from Allegheny Power’s new substation to Duquesne’s new substation. The estimated line length is ~4.7 miles. The line is planned to use multiple ACSS conductors per phase.	6/1/2021	\$46.8	AP	6/7/2018
		Construct two new ties from a new First Energy substation to a new Duquesne substation by using two separate structures in the Duquesne portion.			DLCO	
		Construct a new Elrama-Route 51 138 kV line No. 3: reconductor 4.7 miles of the existing line, and construct 1.5 miles of a new line to the reconducted portion. Install a new line terminal at Allegheny Power’s Route 51 substation.	6/1/2020		AP	5/16/2019
		Establish the new tie line in place of the existing Elarama-Mitchell 138 kV line.	6/1/2021		DLCO	



Pennsylvania – RTEP Baseline Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
3	b3064	Expand Elrama 138 kV substation to loop in the existing USS Steel Clariton-Piney Fork 138 kV line.	6/1/2021	\$13.1	DLCO	11/8/2018
		Replace the West Mifflin 138 kV breakers Z-94, Z-74, Z14, and Z-13 with 63 kA breakers.				5/20/2019
4	b3070	Reconductor the Yukon-Route 51 138 kV No. 1 line (8 miles), replace the line drops, relays and line disconnect switch at Yukon 138 kV.	6/1/2022	\$10.0	AP	11/8/2018



Pennsylvania – RTEP Baseline Projects

(Greater than \$5 million)

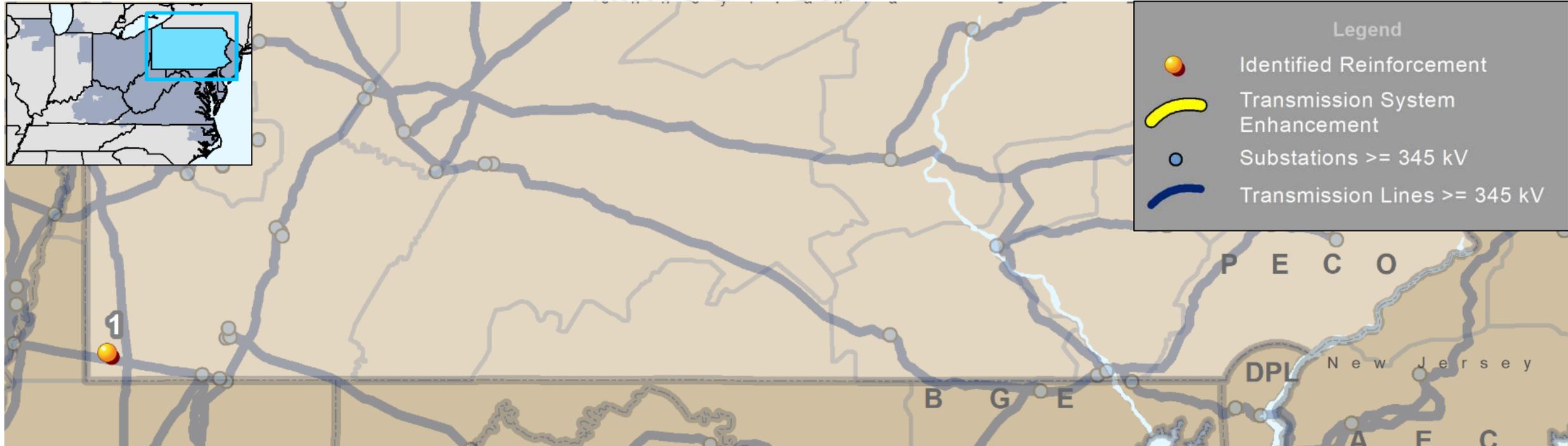
Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
5	b3071	Reconductor the Yukon-Route 51 138 kV No. 2 line (8 miles) and replace relays at Yukon 138 kV.	6/1/2022	\$10.0	AP	11/8/2018
6	b3072	Reconductor the Yukon-Route 51 138 kV No. 3 line (8 miles) and replace relays at Yukon 138 kV.	6/1/2022	\$10.0	AP	11/8/2018
7	b3077	Reconductor the Franklin Pike-Wayne 115 kV line (6.78 miles).	6/1/2022	\$15.0	PENELEC	11/8/2018
8	b3137	Rebuild 20 miles of the East Towanda-North Meshoppen 115 kV line.	6/1/2024	\$58.6	PENELEC	9/24/2019
	b2966	Reconductor the Yukon - Smithton - Shepler Hill Jct 138 kV Line with 954 ACSS Conductor, Replace Line Disconnect Switch at Yukon.	6/1/2020	\$7.2	APS	11/2/2017
	b3061	Reconductor the West Mifflin - Dravosburg (Z-73) and Dravosburg - Elrama (Z-75) 138 kV lines.	6/1/2021	\$5.7	DL	11/8/2018
	b3067	Reconductor the Jackson - Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV and replace the line traps and relays at Maple 138 kV.	6/1/2022	\$7.86	ATSI	11/8/2018



Pennsylvania – RTEP Baseline Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
	b3069	Reconductor the Westraver - Route 51 138 kV line (5.63 miles) and replace line switches at Westraver 138 kV.	6/1/2022	\$7.5	APS	11/8/2018
	b3073	Replace the Blairsville East 138/115 kV transformer and associated equipment such as breaker disconnects and bus conductor.	6/1/2022	\$5.0	PENELEC	11/8/2018
	b3082	Construct a 4-breaker 115 kV ring bus at Franklin Pike.	6/1/2022	\$7.0	PENELEC	11/8/2018
	b3145	Rebuild the Hunterstown - Lincoln 115 kV line (No.962) (~2.6 mi.). Upgrade limiting terminal equipment at Hunterstown and Lincoln.	6/1/2023	\$7.21	MAIT	10/17/2019



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.

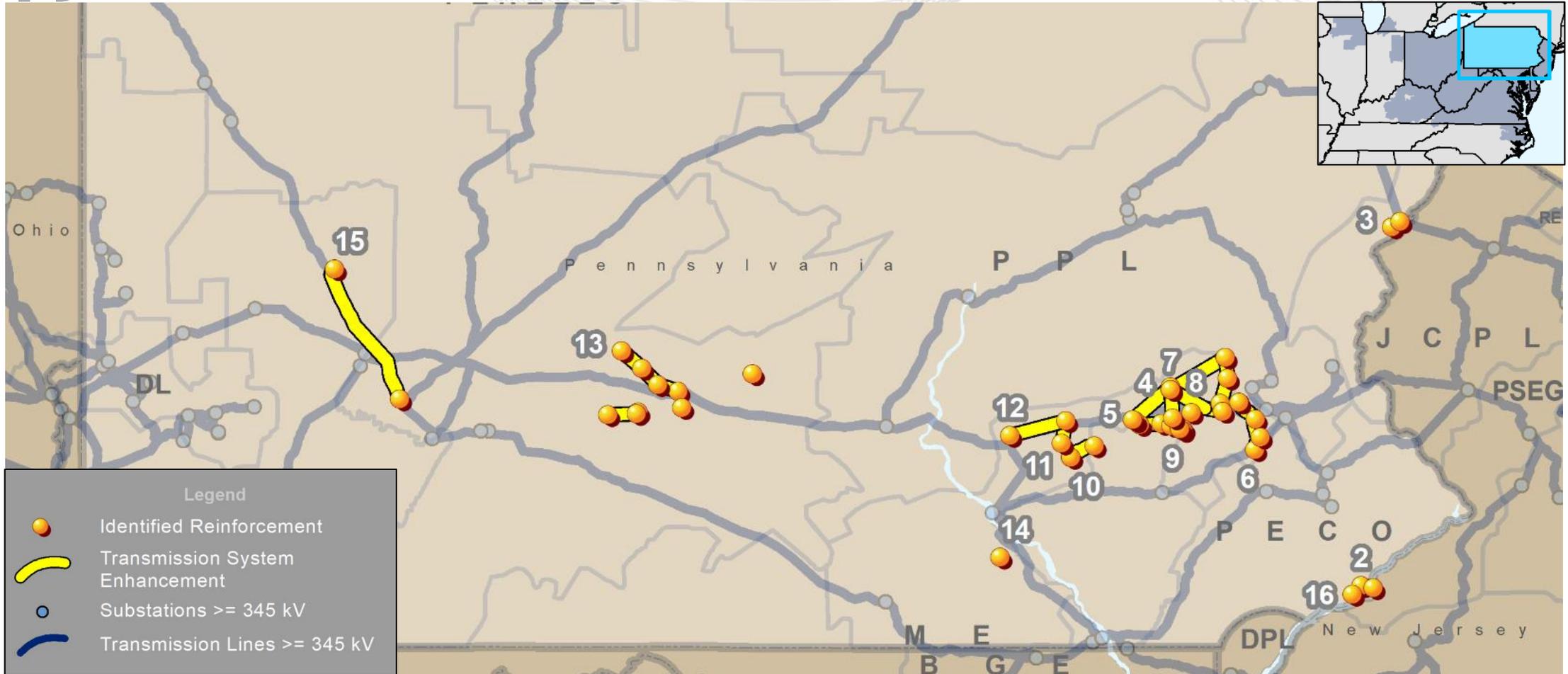


Pennsylvania – RTEP Network Projects

(Greater than \$5 million)

Map ID	Project	Description	Auction Revenue Request	Required In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	n5934	Construct 500 kV three-breaker ring bus substation. Cut and loop in the 500 kV Wylie Ridge-Harrison line and install new tie line to new generation at Strope Road substation.	AB1-069	7/1/2019	\$14.7	AP	11/14/2019

(Greater than \$10 million)



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.



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
1	s1849	Build a new Upland 230/13 kV station.	6/1/2021	\$27.0	PECO	2/22/2019
		Purchase property to accommodate construction of Upland 230/13 kV substation.				
		Construct tap from existing 230 kV Bala-Parrish line to feed new Upland substation.				
		Install 230 kV bus and two 230/13 kV transformers in the Upland station.				
2	s1850	Build a new Civic 69/13 kV distribution substation.	12/31/2023	\$89.0	PECO	4/26/2019
		Install a new Civic 69 kV bus (breaker-and-a-half configuration).	6/30/2022			
		Tap existing 69 kV Schuylkill-Angora, Schuylkill-Island Road, and Schuylkill-University lines-feed new Civic substation. Retire portions of the Schuylkill-Island Road and Schuylkill-University lines under the Schuylkill river.				
		Relocate north connection point of Schuylkill North-Central bus tie to open terminal position of retired Island Road				
		Rebuild Passyunk-Southwark 69 kV line.				
		Install two 69/13 kV transformers at Civic station.	12/31/2023			



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
3	s1880	Construct a new 69 kV transmission line from Shawnee to Walker substations.	12/31/2023	\$60.0	Met-Ed	1/25/2019
		Expand Shawnee 230 kV bus into a six breaker ring bus.				
		Install a new 230/69 kV 100/134/168 MVA transformer and associated equipment at Shawnee station.				
		Build new 69 kV delivery point at Birchwood Lakes.				
		Install a new 69 kV 9.6 MVAR capacitor at Birchwood Lakes.				
		Build new 69 kV delivery point at Bushkill Falls.				
		Install a new 69 kV 9.6 MVAR capacitor at Bushkill Falls.				
Expand Walker 69 kV bus into a three breaker ring bus.						
4	s1893	Rehab/rebuild Baldy-South Hamburg 69 kV line.	12/31/2019	\$12.3	Met-Ed	4/26/2019
		Rehab/rebuild Baldy-South Hamburg (~29.3 miles) 69 kV line.				
		Replace line relaying and substation conductor on the Weisenberg 69 kV line exit at the at Baldy substation.				
		Replace substation conductor on the Lynnville 69 kV line exit at the South Hamburg substation.				



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
5	s1894	Rehab/rebuild the North Temple-Northkill 69 kV line.	6/1/2020	\$14.2	Met-Ed	4/26/2019
		Rehab/rebuild North Temple-Berkley Tap-Cambridge Lee-Bern Church-Northkill 69 kV line. Reconductor ~5.8 miles on Cambridge Lee-Bern Church section.				
		Replace substation conductor on the Berkley Tap 69 kV line exit at the North Temple substation.				
6	s1896	Rehab/rebuild the East Tipton-North Boyertown 69 kV line.	12/31/2019	\$36.4	Met-Ed	4/26/2019
		Rehab/rebuild East Tipton-Huffs Church-Barto-North Boyertown 69 kV line.				
		Replace line relaying and substation conductor on the Huffs Church 69 kV line exit at East Tipton substation.				
7	s1898	Rehab/rebuild Bernville-State Street-South Hamburg 69 kV line.	6/1/2020	\$14.9	Met-Ed	4/26/2019
		Reconductor Bernville-State Street 69 kV line section.				
		Replace substation conductor and relays on the State Street 69 kV line exit at South Hamburg substation.				
		Replace substation conductor on the State Street 69 kV line exit at Bernville station.				



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
8	s1900	Rehab/rebuild Allentown-Lyons-South Hamburg 69 kV line.	12/31/2021	\$15.7	Met-Ed	4/26/2019
		Rehab/rebuild Allentown-Lyons-South Hamburg 69 kV line. Reconductor 15.2 miles of the circuit.				
		Replace substation conductor at South Hamburg 69 kV station.				
		Replace substation conductor at Moselem 69 kV station.				
		Replace substation conductor at Lyons 69 kV station.				
9	s1901	Rehab/rebuild the North Temple-South Hamburg 69 kV line.	12/31/2021	\$13.8	Met-Ed	4/26/2019
		Rehab/rebuild North Temple-Royal Green Tap-Berkley Tap-Leesport-South Hamburg 69 kV line. Reconductor ~11.86 miles.				
		Replace substation conductor and switches at North Temple 69 kV station.				
		Replace switches at Royal Green Tap 69 kV station.				
		Replace substation conductor at South Hamburg 69 kV station.				



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
10	s1907	Replacement 230/69 kV transformers No. 1 and No. 2 and 230 kV ring bus at South Lebanon substation.	12/31/2021	\$13.9	Met-Ed	4/26/2019
		Replace the South Lebanon 230/69 kV 60/80/100 MVA transformer No. 1 and associated equipment with a new 230/69 kV 100/134/168 MVA transformer.				
		Replace the South Lebanon 230/69 kV 60/80/100 MVA transformer No. 2 and associated equipment with a new 230/69 kV 100/134/168 MVA transformer.				
		Expand the South Lebanon 230 kV bus into a five-breaker ring bus.				
11	s1909	Rehab the South Lebanon-Bayer Labs-Myerstown 69 kV line.	12/31/2021	\$10.4	Met-Ed	4/26/2019
		Rehab South Lebanon-Bayer Labs-Myerstown 69 kV line.				
		Replace substation conductor on the Bayer Labs 69 kV line exit at South Lebanon substation.				
12	s1910	Rehab/rebuild North Lebanon-Fredericksburg Tap-Lickdale-Indiantown Gap-Turf Club 69 kV line.	12/31/2021	\$21.1	Met-Ed	4/26/2019
		Reconductor approximately 18.5 miles of Frystown-Fredericksburg Tap-Lickdale-Indiantown Gap-Turf Club 69 kV line.				
		Replace switches on the Fredericksburg Tap 69 kV line exit at North Lebanon substation.				



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
13	s1923	Warrior Ridge 46 kV project.	12/1/2021	\$26.4	PENELEC	5/31/2019
		Build a 46 kV breaker-and-a-half substation at Warrior Ridge.				
		Replace disconnect switch on Warrior Ridge 46 kV line exit with motor operated disconnect switch with whip at the Center Union substation.				
		Replace disconnect switch on Center Union 46 kV line exit with motor operated disconnect switch with vacuum bottles at Belleville substation.				
		Replace disconnect switch on Belleville 46 kV line exit with motor operated disconnect switch with vacuum bottles at the New Holland station.				
		Replace line relaying, substation conductor, disconnect switches on the Warrior Ridge 46 kV line exit at the Huntingdon substation.				
		Replace line relaying, disconnect switches on the Williamsburg 46 kV line exit at the Altoona substation.				
		Rebuild ~0.9 miles of the Altoona-Williamsburg 46 kV line.				
		Replace line relaying, disconnect switches and substation conductor on the Altoona 46 kV line exit at the Williamsburg substation.				
		Replace disconnect switches with motor operated disconnect switches with whips on the Williamsburg 46 kV line exit at the Williamsburg REC substation.				

Note: Project s1923 detail continued on the following slide.



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
13	s1923	Rebuild ~0.5 miles of Williamsburg-Williamsburg REC 46 kV line.	12/1/2021	See Previous Slide	PENELEC	5/31/2019
		Eliminate ABW Tap via a line loop and rebuild ~7.5 miles of Williamsburg REC-Warrior Ridge 46 kV line.				
		Rebuild the Alexandria-Warrior Ridge 46 kV line.				
		Replace disconnect switch on the Warrior Ridge 46 kV line exit with motor operated disconnect switch with whip at the Alexandria substation.				
		Replace disconnect switches with motor operated disconnect switches with vacuum bottles on Pemberton and Alexandria 46 kV line exits at the Water Street substation.				
		Replace disconnect switch on the Sinking Valley REC 46 kV line exit with a disconnect switch with vacuum bottles at the Pemberton station.				
		Replace substation conductor on Sinking Valley REC and Tyrone North 46 kV line exits at the Birmingham substation.				
		Replace line relaying and substation conductor Birmingham 46 kV line exit at the Tyrone North substation.				

Note: Project s1923 detail continued from the previous slide.



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
14	s2037	Expand Pleasureville 115 kV substation into a breaker-and-a-half configuration (eight breakers).	12/31/2022	\$10.0	Met-Ed	7/31/2019
15	s2054	Rebuild and reconductor ~33.0 miles of the Armstrong-Homer City 345 kV line, of wood pole construction.	12/31/2023	\$138.0	PENELEC	8/8/2019
16	s2076	Construct new 230/13 kV substation at Navy Yard.	6/1/2023	\$71.0	PECO	10/21/2019
	s1879	Replace the 230/69 kV 60/80/100 MVA transformer No.1 and 230 kV ring bus at the North Hershey station.	12/31/2021	\$9.1	ME	1/25/2019
		Replace North Hershey 230/69 kV 60/80/100 MVA transformer No.1 and associated equipment with new 230/69 kV 100/134/168 MVA transformer				
		Expand the North Hershey 230 kV bus into a three breaker ring bus.				
s1881	Replace East Towanda 230/115 kV transformer No.4 with a 230/115 kV 180/240/300 MVA transformer. Replace substation conductor.	6/1/2021	\$5.0	PENELEC	3/25/2019	
s1884	Rebuild and reconductor approximately 5.7 miles of the Loretto, Sankertown Bypass, Summit 46 kV line wood pole construction	12/31/2020	\$6.6	PENELEC	3/25/2019	
s1891	Replace substation conductor on the Titusville 115 kV line exit at Grandview 115 kV substation.	12/1/2022	\$9.3	PENELEC	3/25/2019	



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
	s1892	Rehab/Rebuild Adamstown - Flying Hills - South Reading 69 kV line	12/31/2019	\$9.4	ME	4/26/2019
		Reconductor 5.4 miles on Adamstown-Flying Hills 69 kV line				
		Reconductor 1.8 miles on Flying Hills-South Reading 69 kV line				
		Replace substation conductor and drops on the Adamstown 69 kV Line exit at Flying Hills substation.				
	s1895	Rehab/Rebuild the Carsonia, South Reading 69 kV line.	12/31/2019	\$8.3	ME	4/26/2019
		Rehab/Rebuild Carsonia - South Reading 69 kV line				
		Replace substation conductor and line drops on the South Reading 69 kV line exit at Carsonia substation.				
	s1902	Rehab/Rebuild Alcoa - Broad Street 69 kV line	12/31/2021	\$6.5	ME	4/26/2019
		Rehab/Rebuild Alcoa - North Cornwall - Broad Street 69 kV line				
		Replace substation conductor and switches on the North Cornwall 69 kV line exit at Broad Street substation.				
		Replace switches on the North Cornwall 69 kV line exit at Alcoa substation.				
	s1903	Rehab/Rebuild North Hershey - Grantville - Turf Club 69 kV line. Reconductor ~4.5 miles	12/31/2021	\$6.4	ME	4/26/2019



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

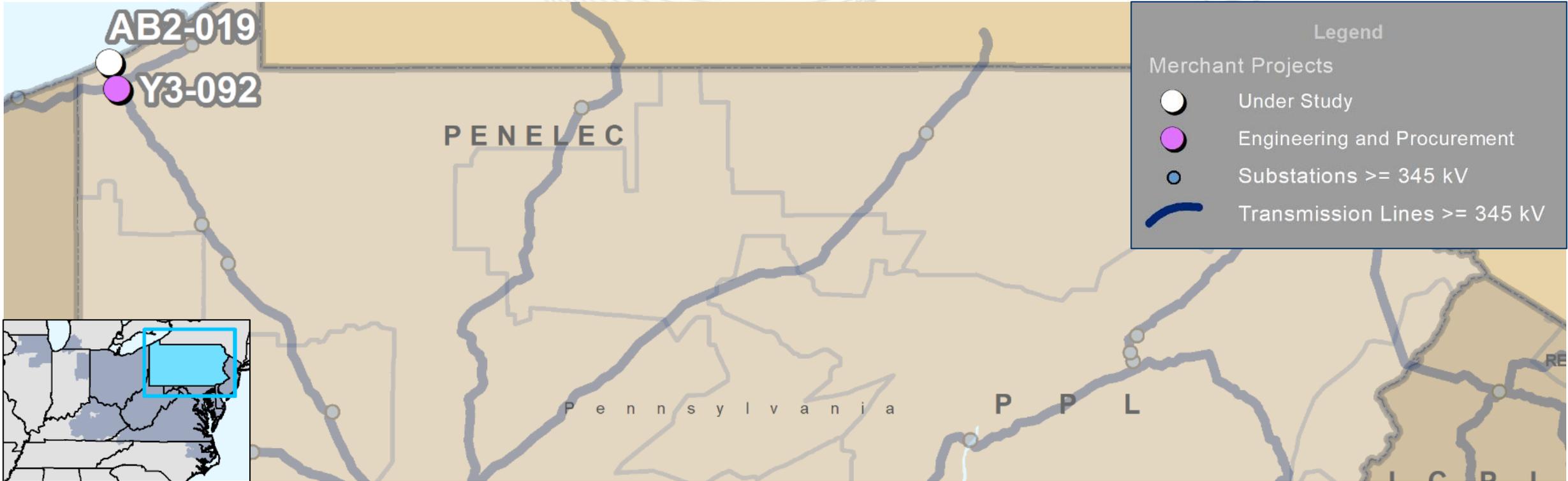
Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
	s1911	Rehab/Rebuild Hokes - Smith Street 69 kV line. Reconductor 5.4 miles of the circuit	12/31/2021	\$5.8	ME	4/26/2019
	s1922	Build a new 17th Street 46 kV substation.	6/1/2022	\$9.0	PENELEC	5/31/2019
		Build a new 17th Street 46 kV breaker-and-a-half substation to replace the existing Collinsville substation				
		Install a new terminal for 20th Street 46 kV line exit at the 17th Street substation.				
		Install a new terminal for Greenwood 46 kV line exit at the 17th Street substation.				
		Install a new terminal for Pleasant Valley 46 kV line exit at the 17th Street substation.				
		Install a new terminal for Altoona F 46 kV line exit at the 17th Street substation.				
		Install a new terminal for Altoona AG 46 kV line exit at the 17th Street substation.				
		Install a new terminal for Altoona G 46 kV line exit at the 17th Street substation.				
		Install a new terminal for No.1 46/12.47 kV transformer at the 17th Street substation.				
		Install a new terminal for No.2 46/12.47 kV transformer at the 17th Street substation.				
		Install a new terminal for 46 kV capacitor at the 17th Street substation.				



Pennsylvania – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	TEAC Date
	s1924	Construct a 115 kV ring bus at the Buffalo Road substation.	6/1/2022	\$9.0	PENELEC	5/31/2019
		Expand the bus configuration to a six breaker ring bus by installing three (3) new 115 kV breakers at Buffalo Road.				
		Replace limiting substation conductor on the Four Mile No.2 115 kV line exit at the Buffalo Road station.				
	s2033	Convert Glendon 115 kV to a six breaker ring bus	12/31/2023	\$9.9	ME	7/31/2019
	s2034	Convert Lincoln 115 kV to a six breaker ring bus	12/31/2022	\$6.9	ME	7/31/2019
	s2039	Convert Fredericksburg 69 kV to a four breaker ring bus	12/31/2024	\$6.0	ME	7/31/2019
	s2053	Replace the Homer City North 345/230-23 kV transformer and associated equipment with 345/230-23 kV 336/448/560 MVA transformer	12/31/2021	\$6.6	PENELEC	8/8/2019
	s2067	Rebuild/reconductor approximately 3.6 miles of the existing Warrendale (Pine) 69 kV Line (Warrendale-Richard line segment). Replace four line switches (A-157, A-218, A-6071, and A-6072) due to age and obsolescence.	3/15/2020	\$7.5	ATSI	4/23/2019
	s2074	Rebuild the existing Macungie 69 kV Tap line (Macungie-Zionsville Tap-Hosensack), to PPL's current design standard utilizing monopole steel structures and 556 ACSR conductor	11/30/2021	\$7.5	PPL	10/21/2019

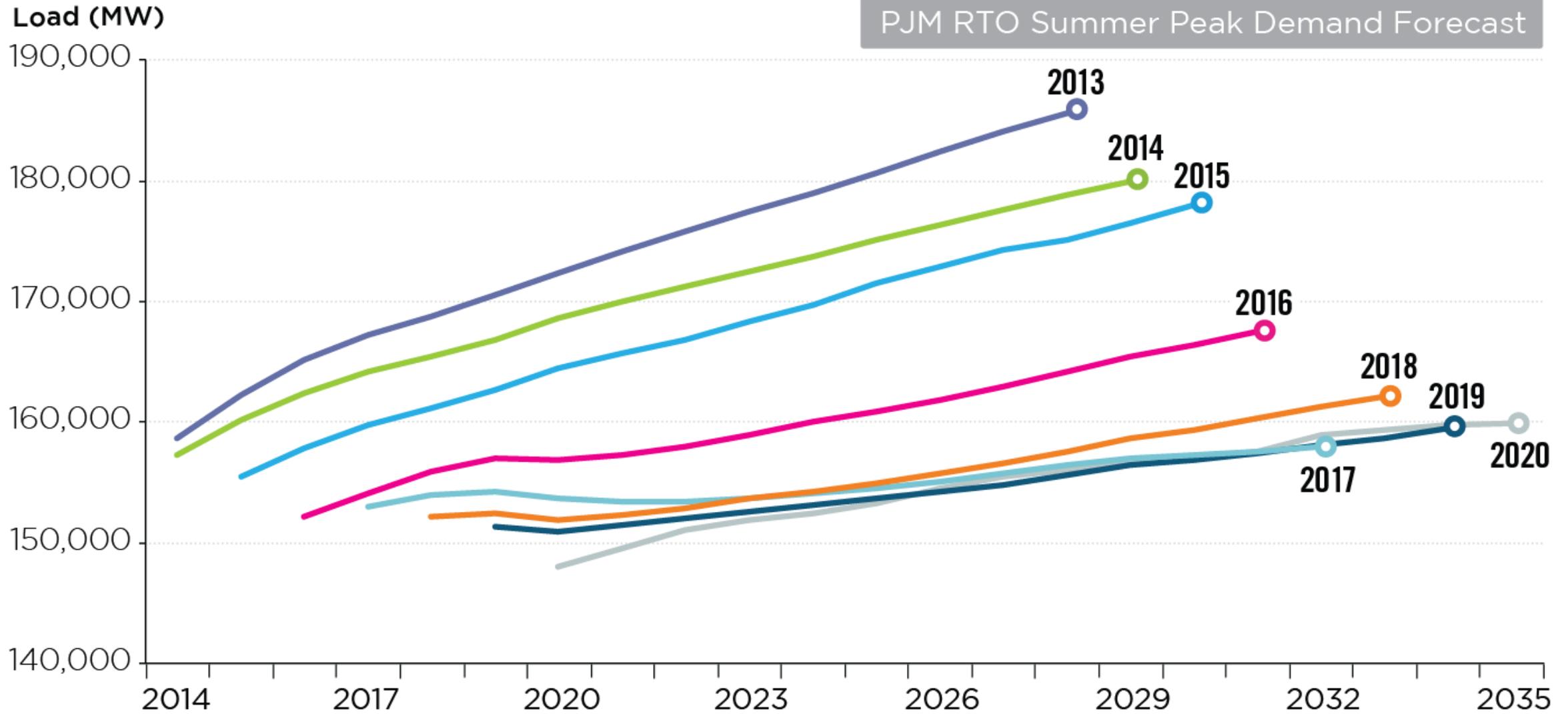


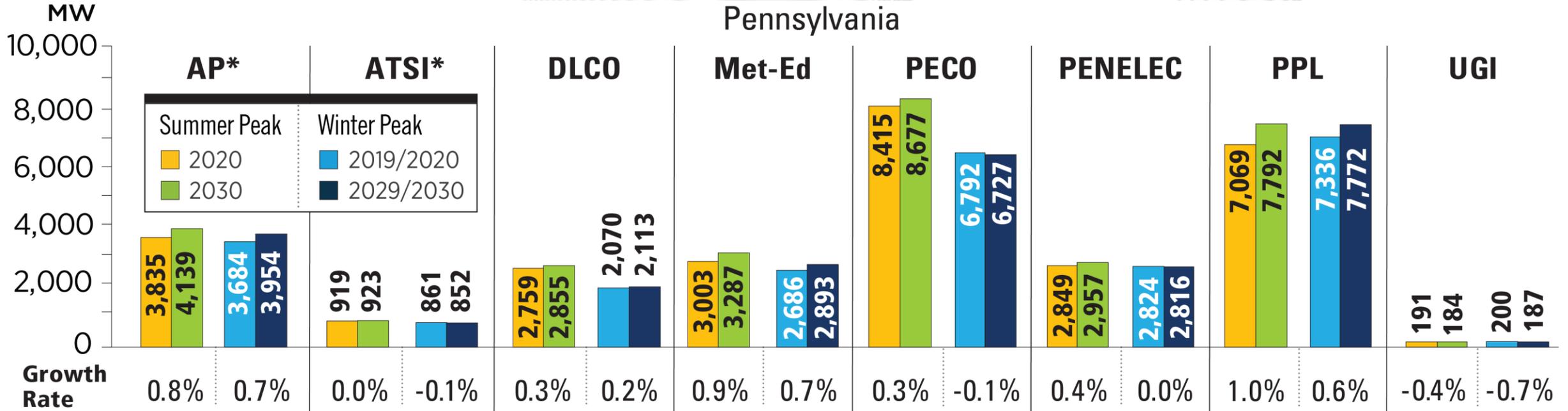
Queue Number	Queue Name	TO Zone	Status	Actual or Requested In-Service Date	Maximum Output (MW)
Y3-092	Erie West 345 kV	PENELEC	Under Construction	3/31/2024	1,000.0
AB2-019	Erie West 345 kV	PENELEC	Active	3/31/2024	28.0

Planning

Load Forecast

PJM RTO Summer Peak Demand Forecast





*Serves load outside PA

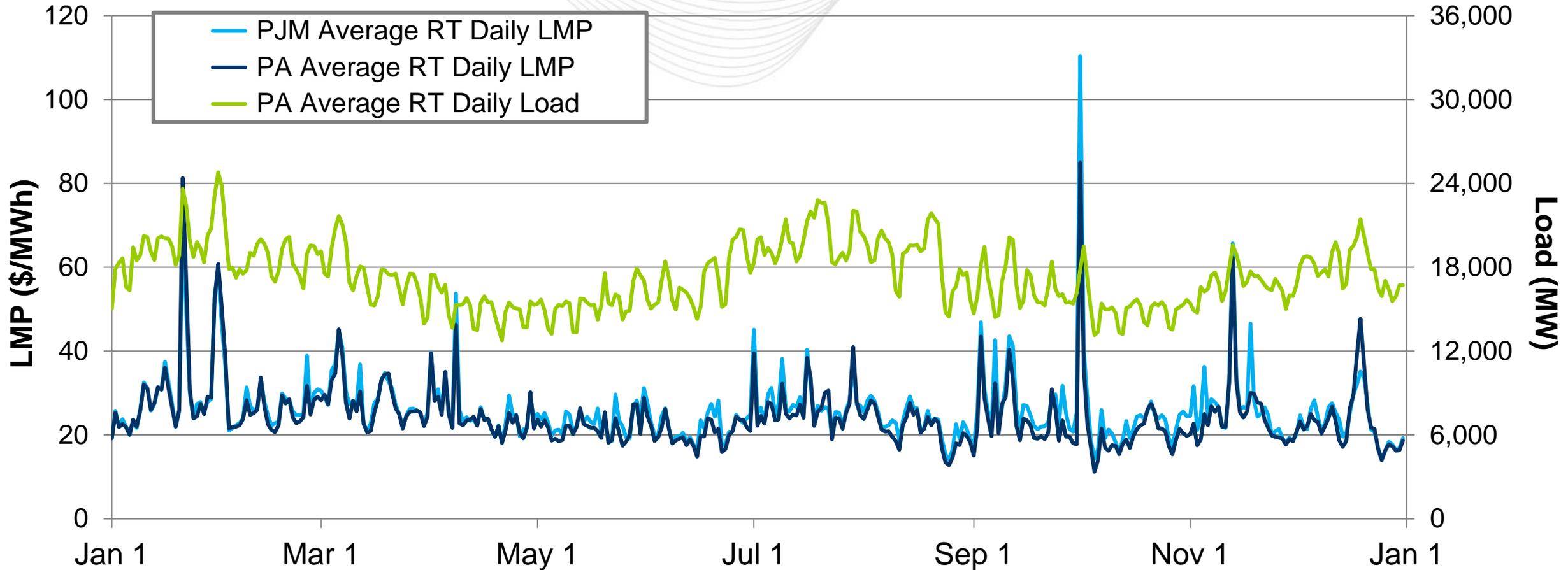
PJM RTO Summer Peak		PJM RTO Winter Peak	
2020	2030	2019/2020	2029/2030
148,092 MW	157,132 MW	131,287 MW	139,970 MW
Growth Rate 0.6%		Growth Rate 0.6%	

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.

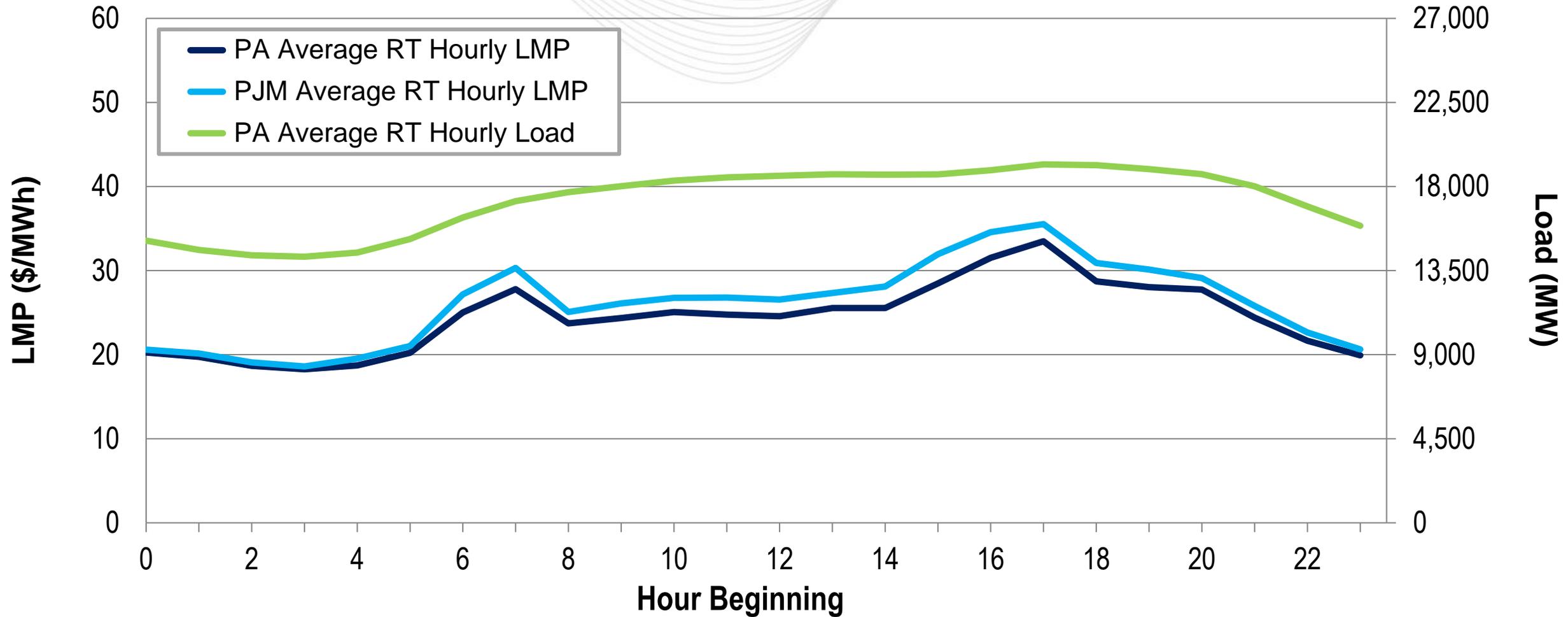
Markets

Market Analysis



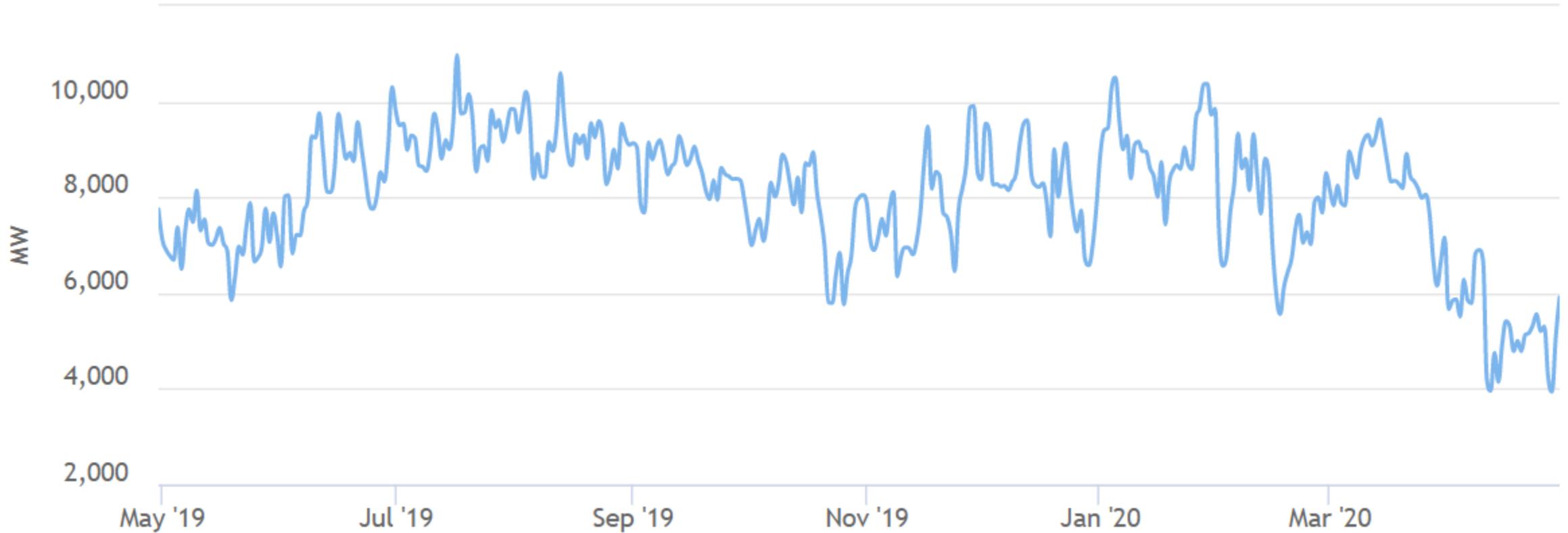
Note: The price spike in October reflects the Performance Assessment Interval event that occurred on October 2nd.

Pennsylvania's average hourly LMPs were slightly below the PJM average hourly LMP.



Pennsylvania – Net Energy Import/Export Trend

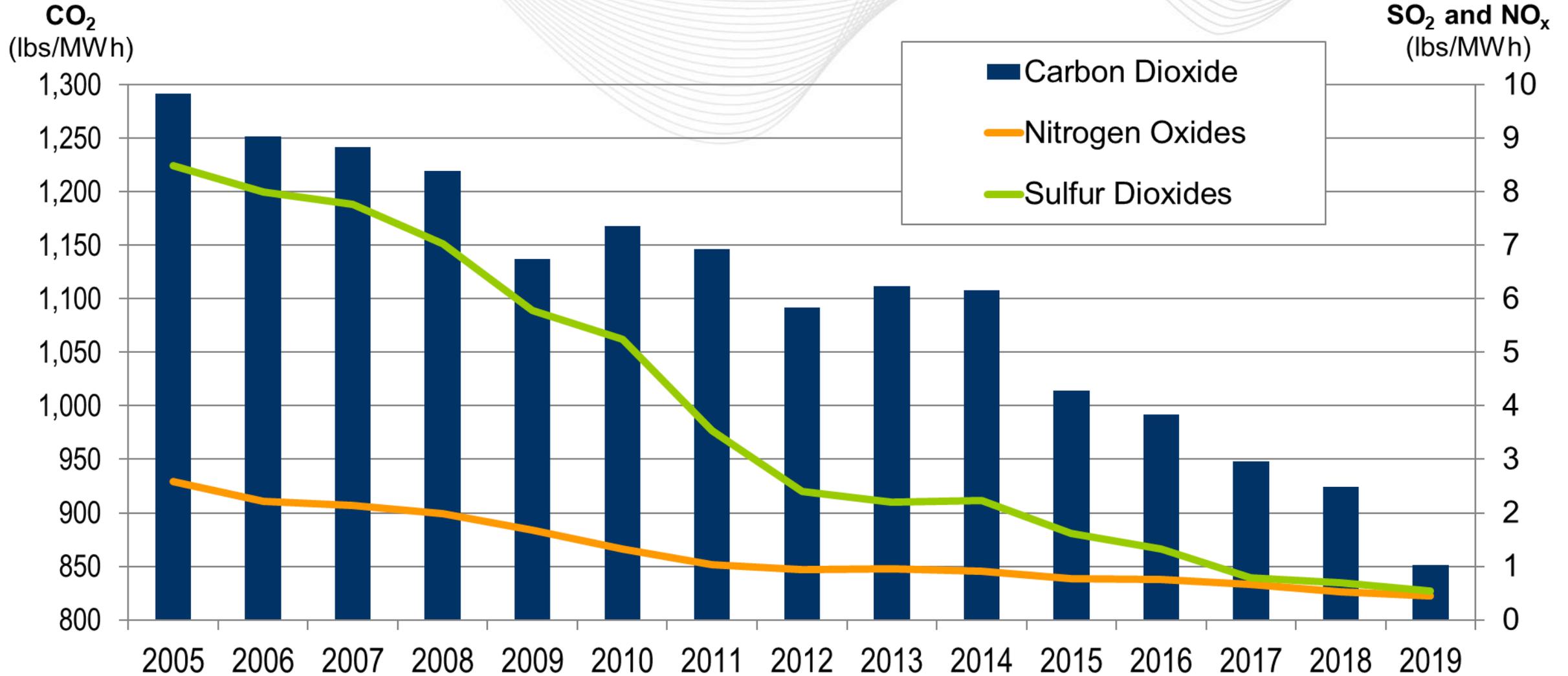
(May 2019 – April 2020)



Positive values represent exports and negative values represent imports.

Operations Emissions Data

2005 – 2019 PJM Average Emissions



Pennsylvania – Average Emissions (lbs/MWh)

(Feb. 7, 2020)

CO₂
(lbs/MWh)

SO₂ and NO_x
(lbs/MWh)

