2020 Pennsylvania State Infrastructure Report

(January 1, 2020 – December 31, 2020)

April 2021

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- **Existing Capacity:** Natural gas represents approximately 44 percent of the total installed capacity in the Pennsylvania service territory while coal represents approximately 21.3 percent and nuclear 19.4 percent. In PJM natural gas and coal are 43.4 and 27.5 percent of total installed capacity, while nuclear represents 17.7 percent.

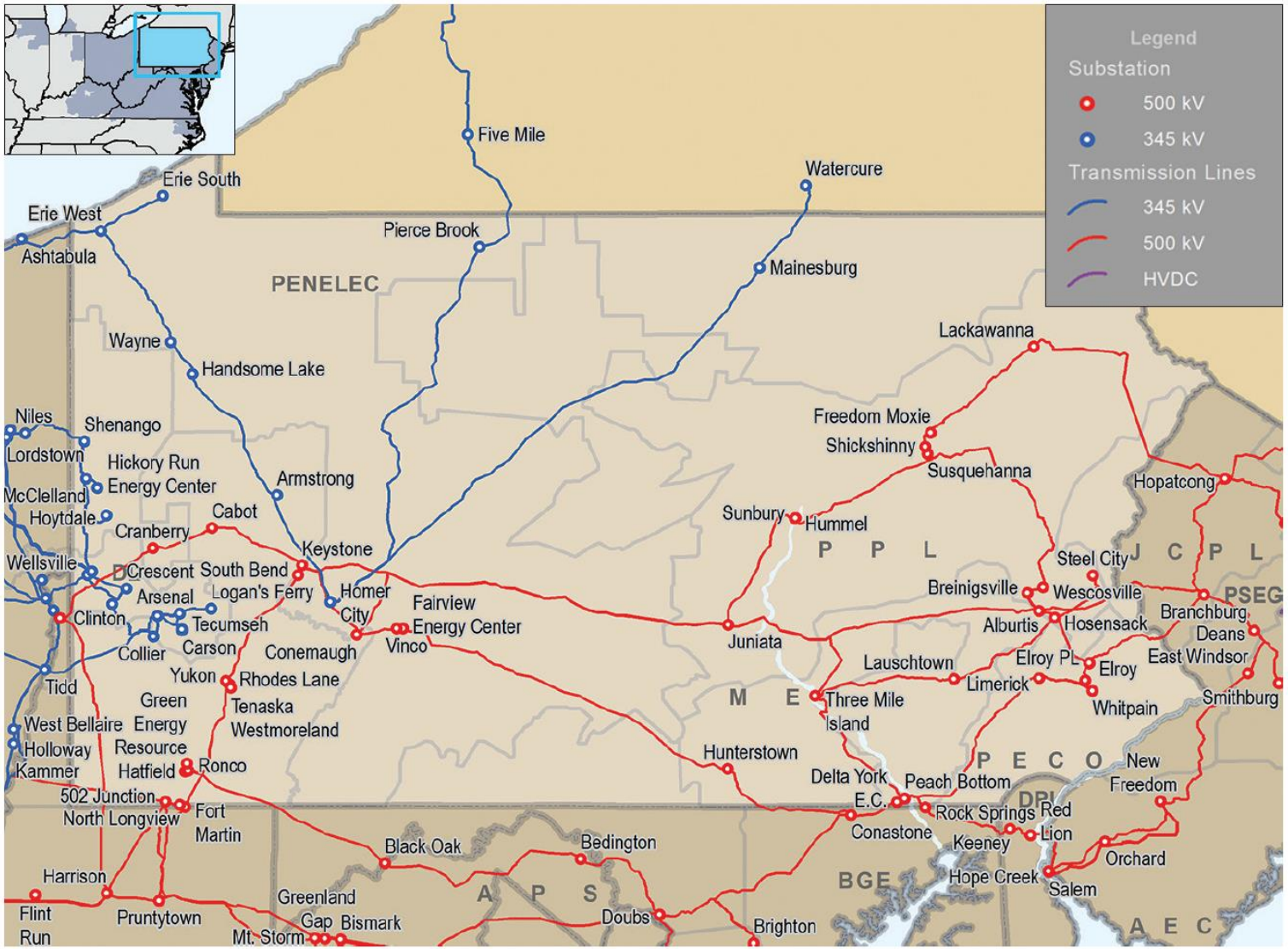
- **Interconnection Requests:** Solar represents 54.6 percent of new interconnection requests in Pennsylvania, while natural gas represents approximately 32 percent of new requests.

- **Deactivations:** 78.3 MW in Pennsylvania gave notification of deactivation in 2020.

- **RTEP 2020:** Pennsylvania's 2020 RTEP projects total approximately $752.7 million in investment. Approximately 85.3 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.

- **Load Forecast:** Pennsylvania's summer peak load growth is projected to range between 0.2 and 0.9 percent annually over the next ten years, based on the service territory. The overall PJM RTO projected load growth rate is 0.3 percent.
- **2022/23 Capacity Market:** No Base Residual Auction was conducted in 2020. For the most recent auction results, please see the 2018 Pennsylvania State Infrastructure Report.
- **1/1/20 – 12/31/20 Market Performance:** Pennsylvania's average hourly LMPs were slightly below the PJM average hourly LMP.
- **Emissions:** 2020 carbon dioxide, sulfur dioxide, and nitrogen oxide emissions all decreased from 2019 levels.

PJM Service Area – Pennsylvania

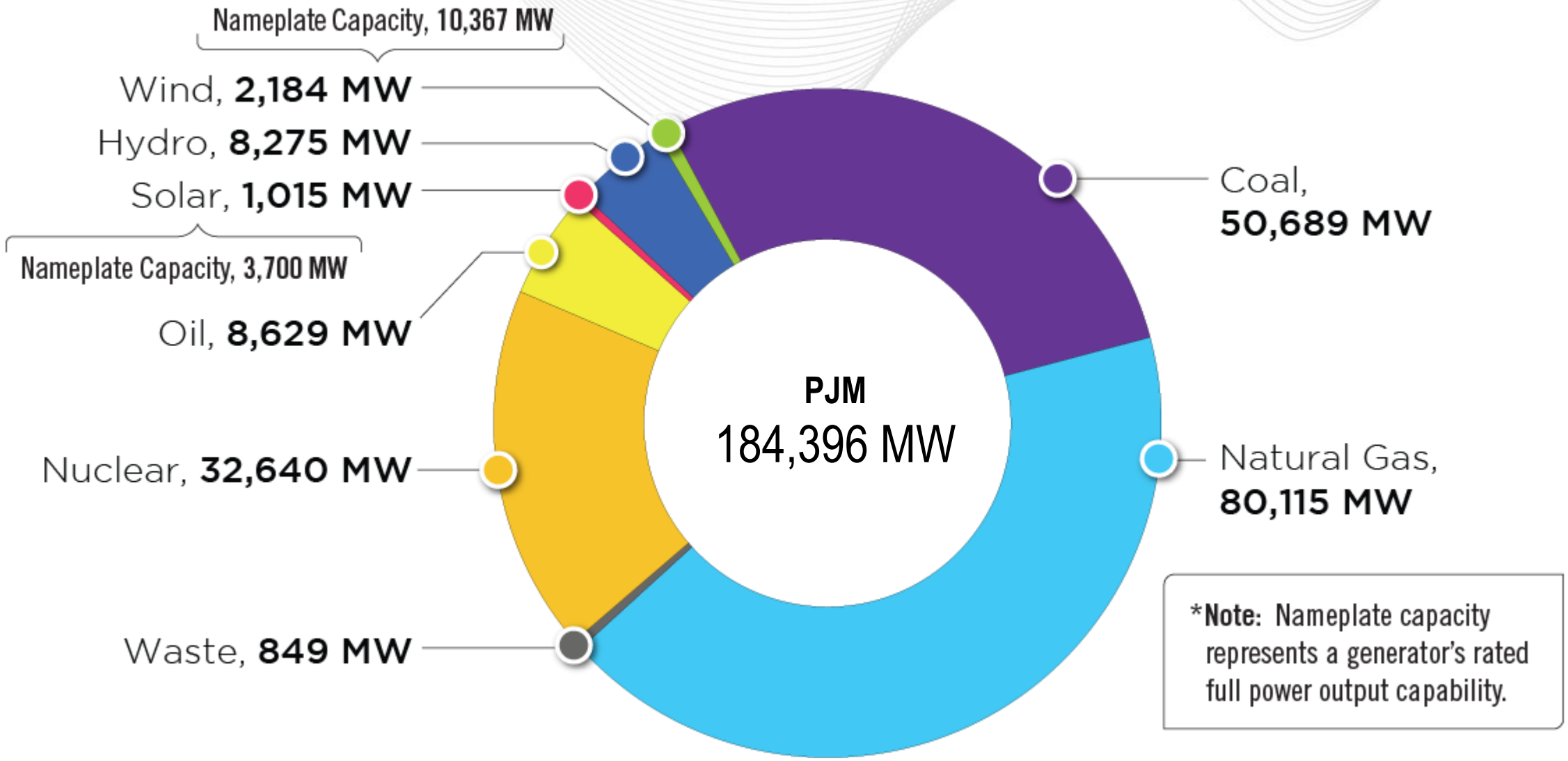


Planning

Generation Portfolio Analysis

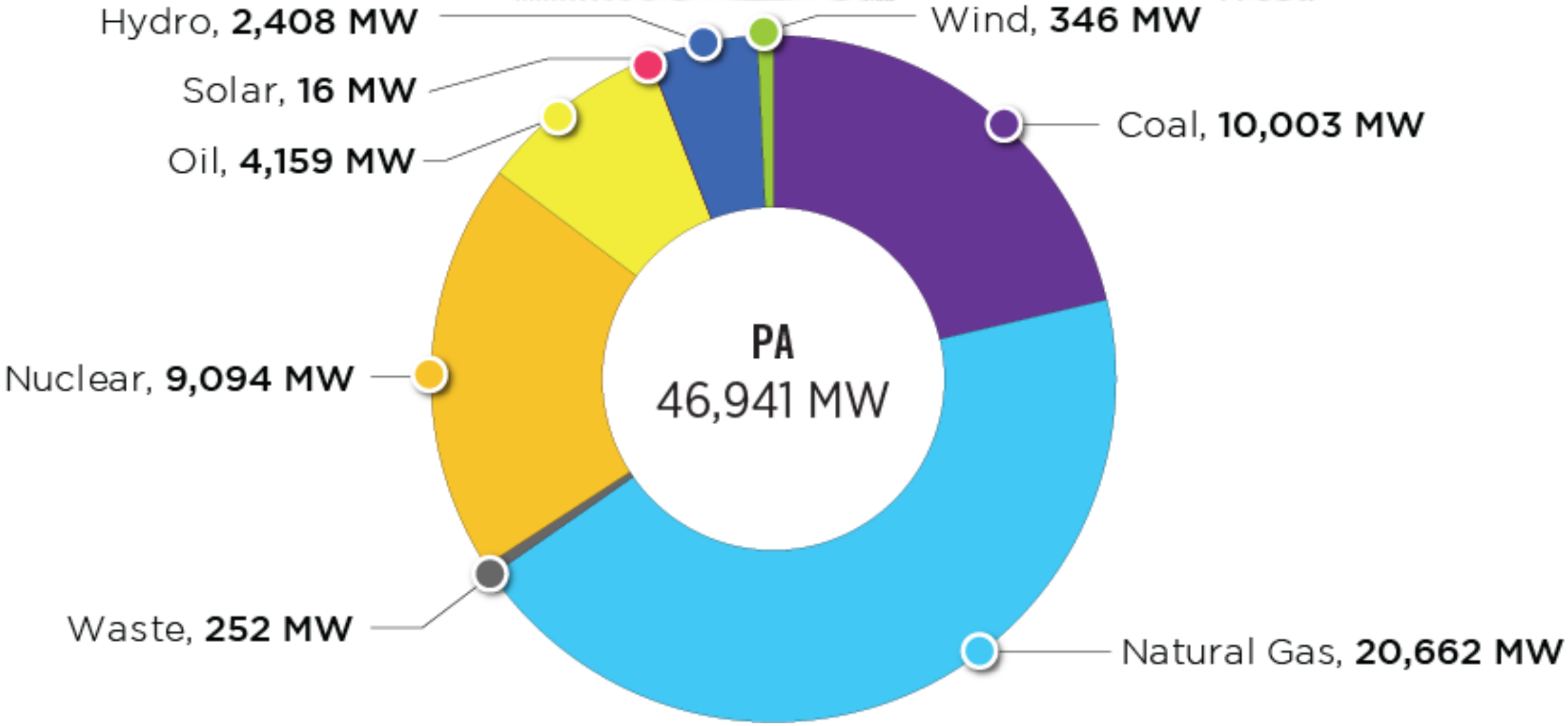
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



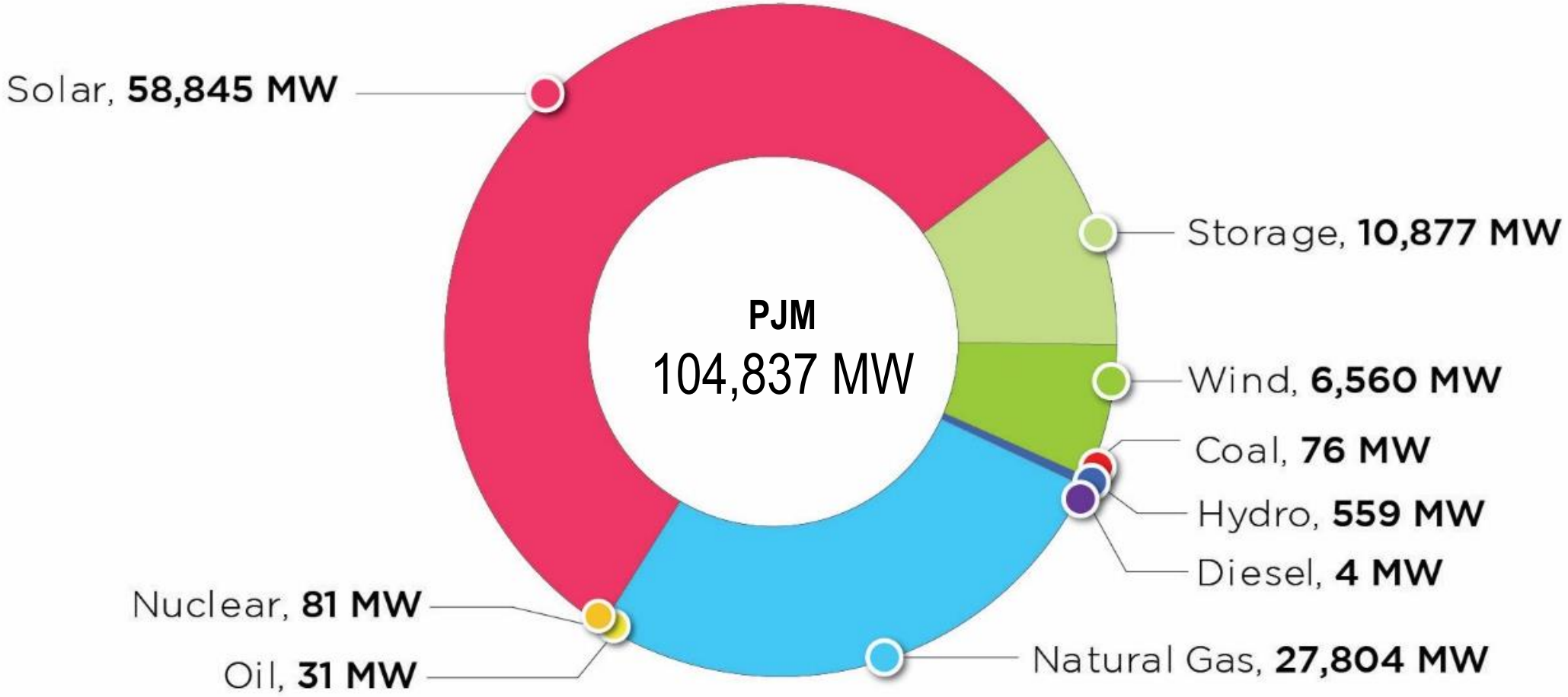
Pennsylvania – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



PJM – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2020)



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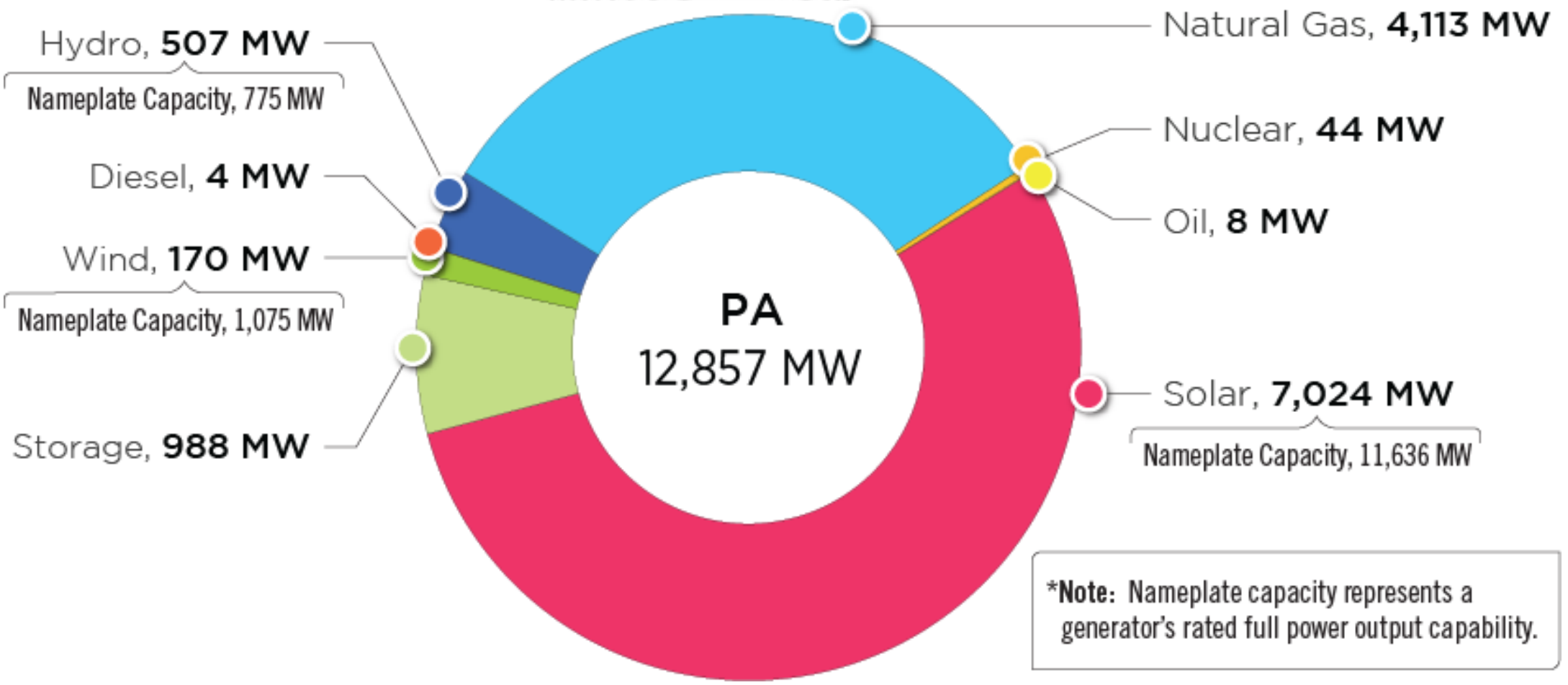


Pennsylvania – Interconnection Requests by Fuel Type

(Unforced Capacity – as of Dec. 31, 2020)

		In Queue						Complete				Grand Total	
		Active		Suspended		Under Construction		In Service		Withdrawn			
		Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)
Non-Renewable	Coal	0	0.0	0	0.0	0	0.0	17	229.0	28	14,354.6	45	14,583.6
	Diesel	0	0.0	0	0.0	1	4.1	3	33.3	12	51.5	16	88.9
	Natural Gas	13	952.6	1	950.0	27	2,210.1	98	20,477.1	245	89,688.0	384	114,277.8
	Nuclear	2	0.0	0	0.0	1	44.0	14	2,565.0	12	1,731.0	29	4,340.0
	Oil	0	0.0	0	0.0	6	7.5	3	9.4	9	1,307.0	18	1,323.9
	Other	0	0.0	0	0.0	0	0.0	2	306.5	6	344.0	8	650.5
	Storage	38	976.5	2	11.8	1	0.0	5	0.0	39	722.8	85	1,711.1
Renewable	Biomass	0	0.0	0	0.0	0	0.0	2	15.4	4	36.5	6	51.9
	Hydro	6	506.5	0	0.0	0	0.0	12	480.8	17	443.9	35	1,431.1
	Methane	0	0.0	0	0.0	0	0.0	24	130.7	37	201.3	61	332.0
	Solar	312	6,704.5	9	129.4	49	190.2	10	37.4	181	2,961.7	561	10,023.2
	Wind	5	101.7	2	21.4	3	47.0	39	259.6	137	1,749.0	186	2,178.7
	Wood	0	0.0	0	0.0	0	0.0	0	0.0	1	16.0	1	16.0
	Grand Total	**376**	**9,241.7**	**14**	**1,112.7**	**88**	**2,502.9**	**229**	**24,544.2**	**728**	**113,607.2**	**1,435**	**151,008.7**

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
56	Interconnection Service Agreements	**6,049** MW	7,836 MW
49	Wholesale Market Participation Agreements	**308** MW	423 MW

Percentage of planned capacity and projects that have reached commercial operation	18% Requested capacity megawatts	24 % Requested projects

This graphic shows the final state of generation submitted to the PJM queue that completed the study phase as of Dec. 31, 2020, meaning the generation reached in-service operation, began construction, or was suspended or withdrawn. It does not include projects considered active in the queue as of Dec. 31, 2020.

Pennsylvania – Generation Deactivation Notifications Received in 2020

Pennsylvania – Generation Deactivation Notifications Received in 2020

Unit	TO Zone	Fuel Type	Request Received to Deactivate	Actual or Projected Deactivation Date	Age (Years)	Capacity (MW)
Keystone NUG Recovery (Units 1–7)	PPL	Methane	2/28/2020	6/1/2020	25	4.90
Harwood Unit 1		Oil	10/29/2020	5/31/2021	53	13.60
Harwood Unit 2			10/29/2020	5/31/2021	53	13.60
York Generation Facility	METED	Natural Gas	10/29/2020	5/31/2022	31	46.20

Planning

Transmission Infrastructure Analysis

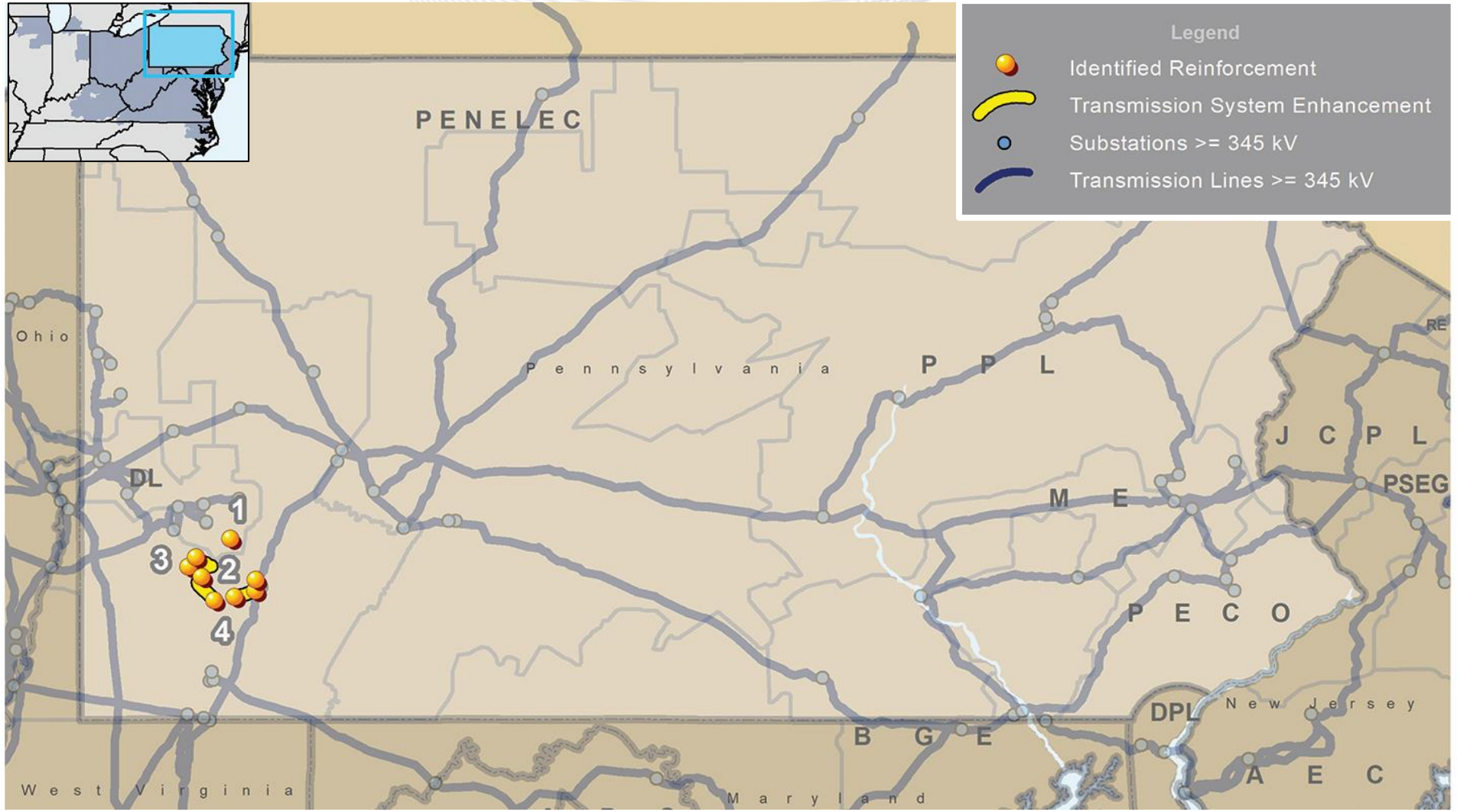
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that 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/planning/project-construction

Pennsylvania – RTEP Baseline Projects

(Greater than $10 million)



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

Pennsylvania – RTEP Baseline Projects

(Greater than $5 million)

Map ID	Project	Description	Required In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	b3011	Upgrade 138 kV breaker Z-78 Logans at Dravosburg.	6/1/2021	$29.42	DLCO	1/17/2020
2	b3015	Upgrade terminal equipment at Mitchell for Mitchell-Elrama 138 kV line.		$39.25	AP	9/12/2019
3	b3064	Upgrade line relaying at Piney Fork and Bethel Park for Piney Fork-Elrama 138 kV line and Bethel Park-Elrama 138 kV line.		$13.05		
4	b3214	Reconductor the Yukon-Smithton-Shepler Hill Jct 138 kV line. Upgrade terminal equipment at Yukon and replace line relaying at Mitchell and Charleroi.	6/1/2023	$21.40		5/12/2020
	b3217	Reconductor Wilson to Mitchell 138 kV line - DL portion. 4.2 miles total. 2x795 ACSS/TW 20/7	6/1/2021	$7.50	DLCO	5/12/2020

Pennsylvania – RTEP Network Projects

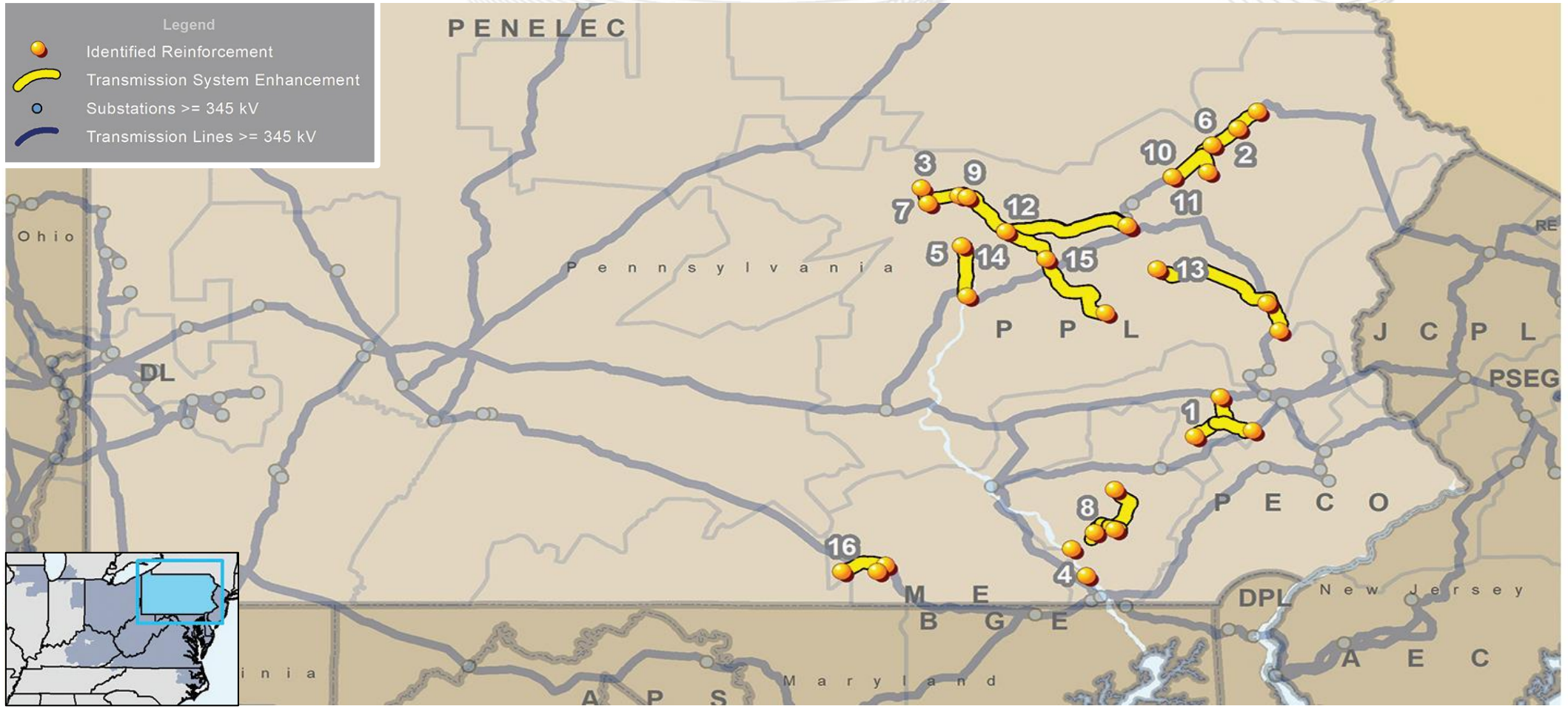
(Greater than $5 million)

Pennsylvania had no network project upgrades in 2020.

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. The costs of network projects are borne by the interconnection customer.

Pennsylvania – TO Supplemental Projects

(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	s2310	Rebuild and reconductor Carsonia-Lyons-North Boyertown 69 kV line.	12/31/2025	$26.40	METED	7/16/2020
		Replace disconnect switches, substation conductor and line relaying at Carsonia 69 kV substation.				
		Replace disconnect switches and substation conductor at Friedensburg 69 kV substation.				
		Replace circuit breaker and disconnect switches at North Boyertown 69 kV substation.				
2	s2363	Rebuild the 5 mile Corten tower section of the Summit-Lackawanna 1 & 2 230 kV circuits with steel monopoles and new conductor.	12/31/2023	$14.30	PPL	10/6/2020
3	s2364	Rebuild the 4.1 mile Corten tower section of the Elimsport-Lycoming 2 & 3 230 kV circuits with steel monopoles and new conductor.	12/31/2023	$10.40		
4	s2365	Rebuild the 5.2 mile Corten tower section of the Manor-Millwood 230 kV & Face Rock-Millwood 1 69 kV circuits with steel monopoles and new conductor.	12/31/2024	$13.20		
5	s2366	Rebuild the entire 10.5 miles of the Sunbury-Milton 230 kV and Sunbury-Milton 69 kV line with steel monopoles and new conductor.	12/31/2023	$26.10		
6	s2367	Rebuild the 7.7 mile Corten tower section of the Stanton-Summit 3 & 4 230 kV circuits with steel monopoles and new conductor.	12/31/2025	$21.10		
7	s2368	Rebuild the 8.0 miles of Corten tower sections of the Saegers-Elimsport and Clinton-Elimsport/Clinton-Saegers 230 kV lines with steel monopoles and new conductor.	12/31/2026	$23.10		
8	s2369	Rebuild the 20.4 mile Corten tower section of the South Akron-Millwood 230 kV and Millwood-Strasburg tie 69 kV lines with steel monopoles and new conductor.	12/31/2025	$53.30		

Pennsylvania – TO Supplemental Projects

(Greater than $5 million)

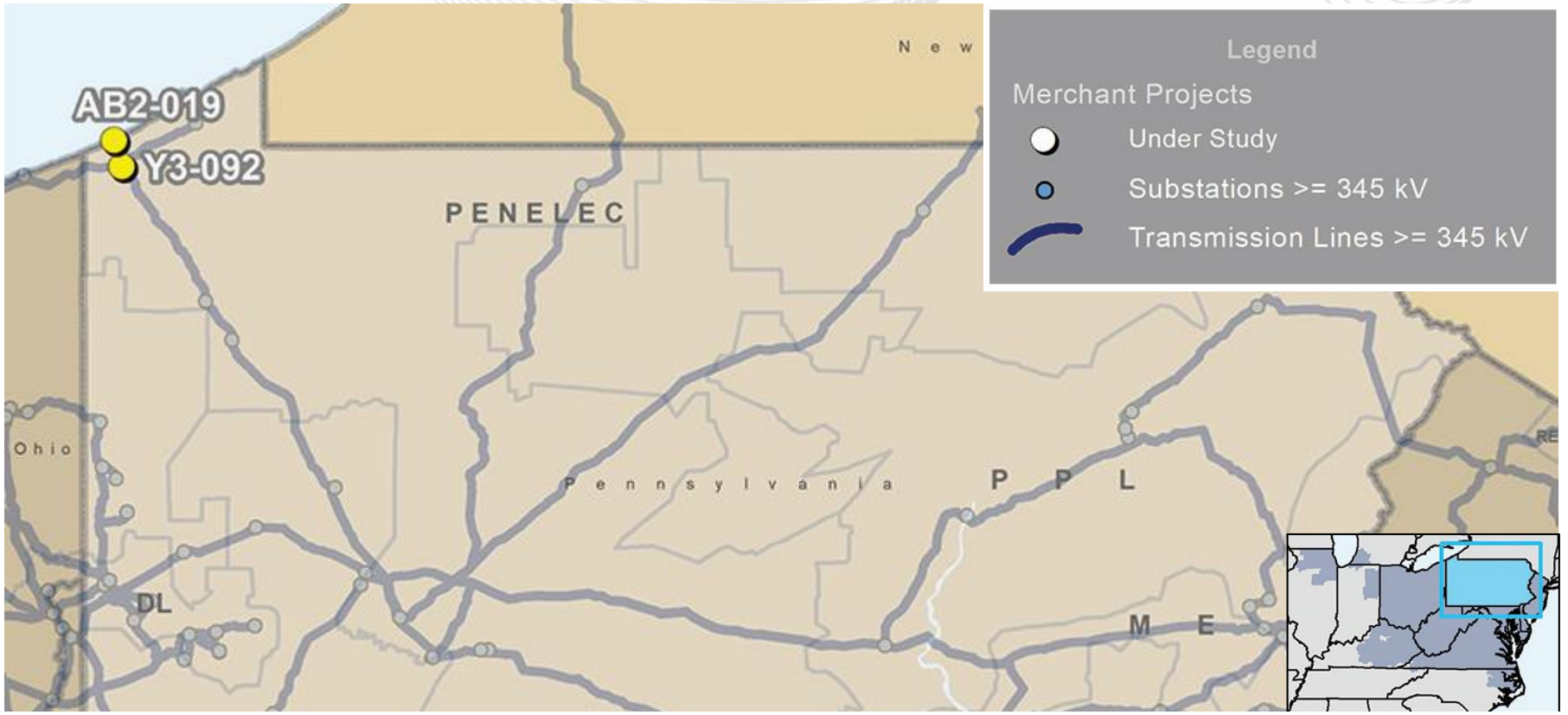
Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
9	s2370	Rebuild the 6.2 mile Corten tower section of the Montour-Saegers 1 & 2 230 kV lines with steel monopoles and new conductor.	12/31/2027	$17.50	PPL	10/6/2020
10	s2371	Rebuild the 8.5 mile Corten tower section of the Jenkins-Stanton and Mountain-Stanton 230 kV lines with steel monopoles and new conductor.	12/31/2028	$22.80		
11	s2372	Rebuild the 9.8 mile Corten tower section of the Mountain-Stanton and Mountain-Jenkins 230 kV lines with steel monopoles and new conductor.	12/31/2029	$27.00		
12	s2373	Rebuild the 21.9 miles of Corten tower sections of the Montour-Susquehanna and Montour-Susquehanna T10 230 kV lines with steel monopoles and new conductor.		$69.60		
13	s2374	Rebuild the 38.0 miles of Corten tower sections of the Siegfried-Harwood and Harwood-East Palmerton/Siegfried-East Palmerton 230 kV lines with steel monopoles and new conductor.	12/31/2026	$136.80		
14	s2375	Rebuild the 9.25 mile Corten tower section of the Montour-Columbia 230 kV line with steel monopoles and new conductor.	12/31/2028	$28.20		
15	s2376	Rebuild the 25.9 mile Corten tower section of the Frackville-Columbia 230 kV line with steel monopoles and new conductor.	12/31/2030	$91.90		

Pennsylvania – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
16	**s2381**	Loop the Hunterstown-Lincoln 115 kV line, approximately 9 miles, into Orrtanna substation by constructing a double-circuit 115 kV line adjacent to the existing radial 963 line. Remove the existing radial 963 line from Orrtanna tap to Orrtanna (~9 miles).	12/31/2021	$38.50	METED	10/15/2020
	s2278	Replace Emilie #8 230/138kV transformer and low side circuit breaker	12/31/2021	$8.30	PECO	6/2/2020
	s2301	Replace the Portland #3 230/115 kV transformer and associated equipment with a 180/240/300 MVA transformer	6/30/2021	$6.90	METED	7/7/2020
	s2279	Shelocta 230 kV Substation: Construct three breaker ring bus	6/1/2022	$6.70	PENELEC	6/2/2020
		Replace line trap at Keystone on the Keystone – Shelocta 230 kV Line				
		Replace line trap at Homer City on the Homer City – Shelocta 230 kV Line				

Pennsylvania – Merchant Transmission Project Requests

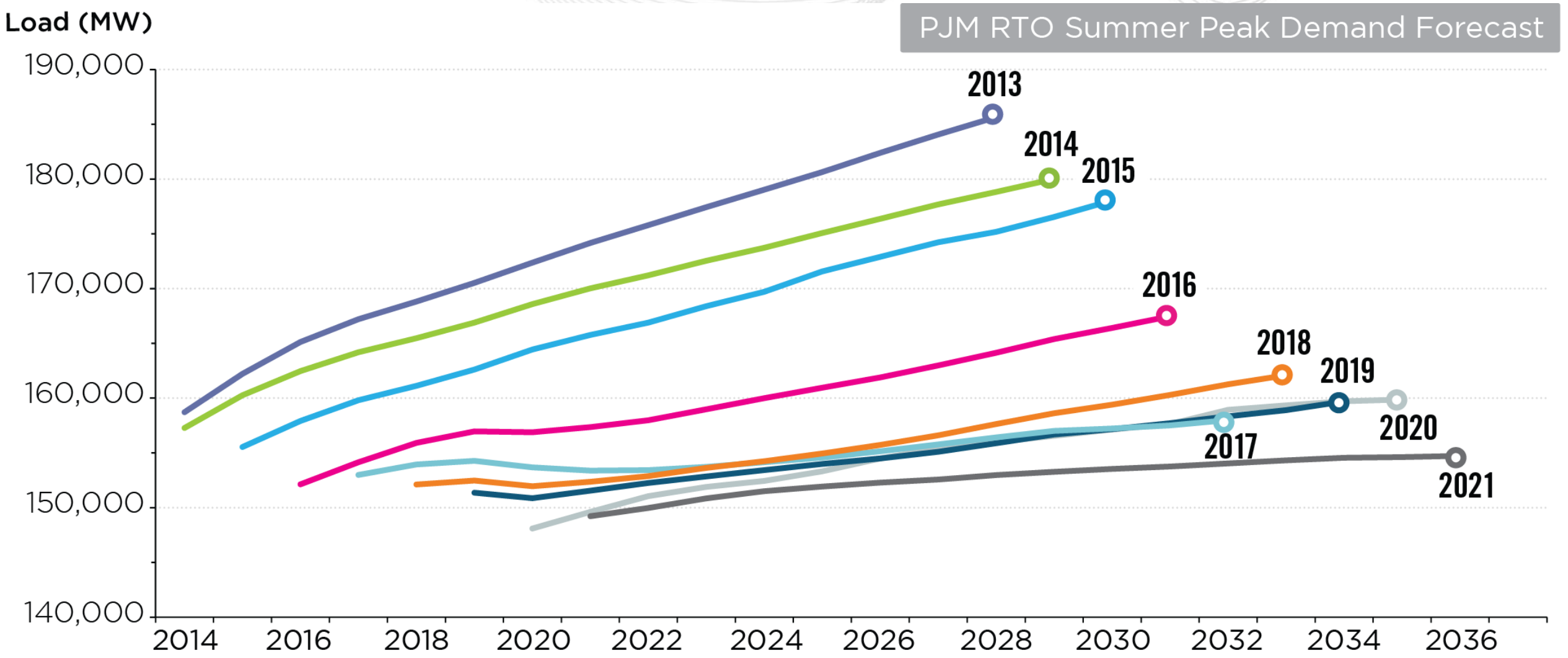


Queue Number	Queue Name	TO Zone	Status	Actual or Requested In-Service Date	Maximum Output (MW)
Y3-092	Erie West 345 kV	PENELEC	Under Construction	3/31/2024	1,000.0
AB2-019	Erie West 345 kV	PENELEC	Under Construction	3/31/2024	28.0

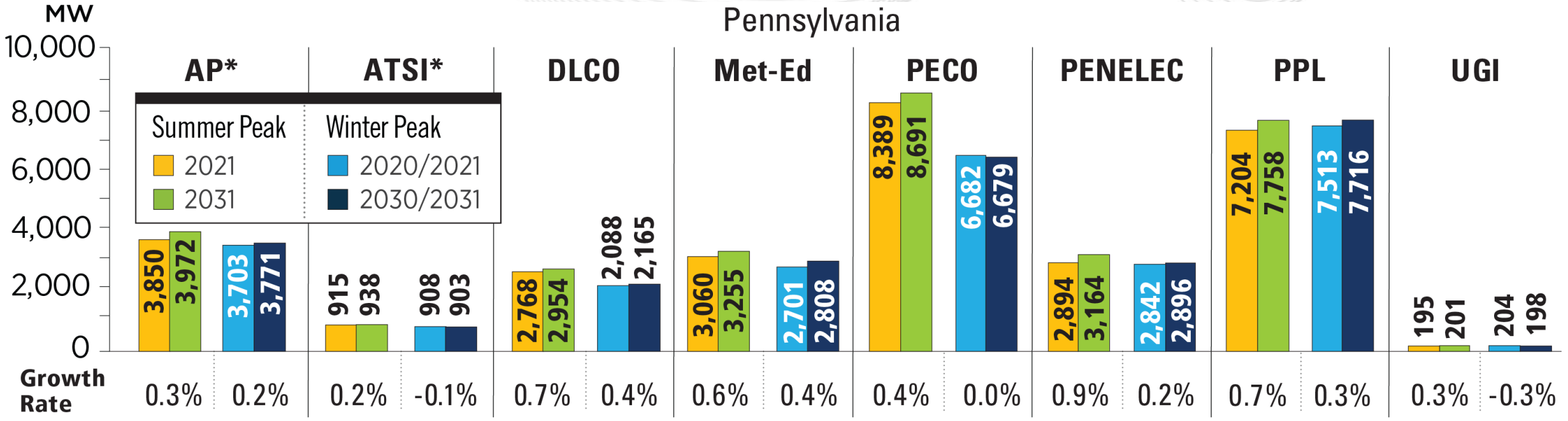
Planning
Load Forecast

PJM Annual Load Forecasts

(Jan. 2021)



Pennsylvania – 2021 Load Forecast Report



*Serves load outside PA

PJM RTO Summer Peak

2021	2031
149,223 MW	153,759 MW

Growth Rate 0.3%

PJM RTO Winter Peak

2020/2021	2030/2031
132,027 MW	135,568 MW

Growth Rate 0.2%

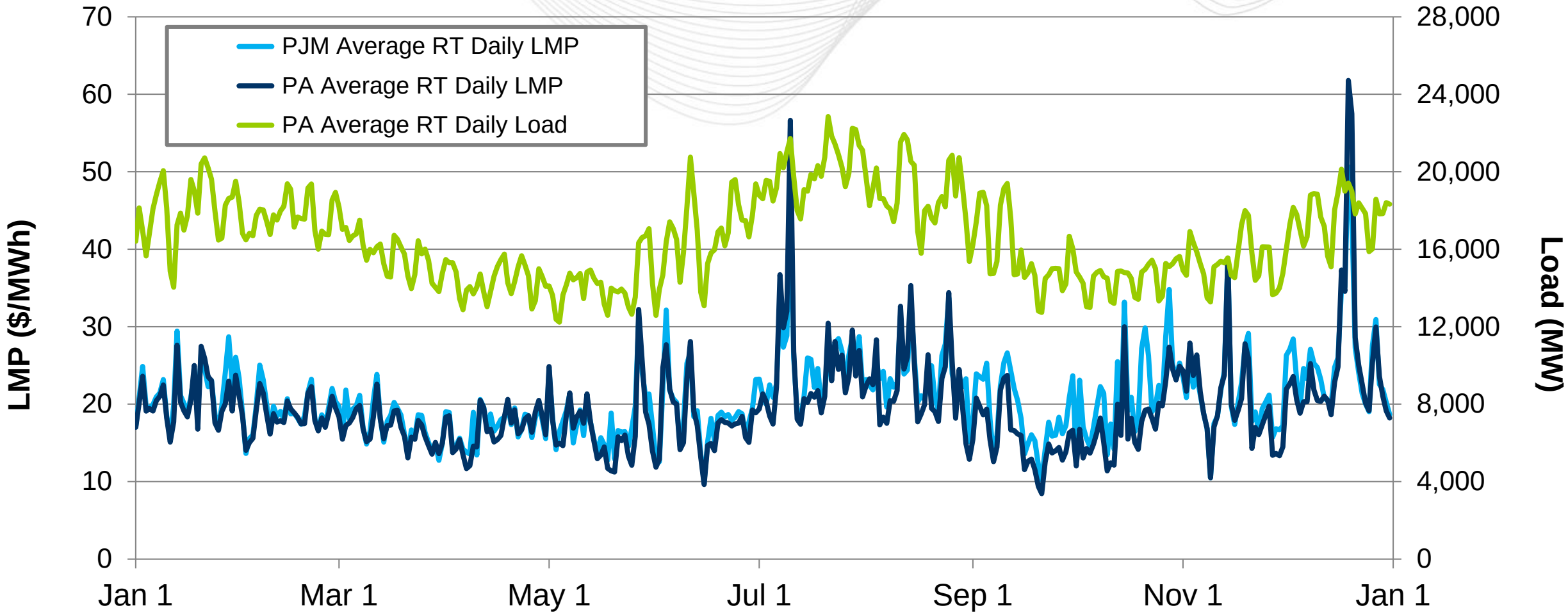
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas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

Markets

Market Analysis

Pennsylvania – Average Daily LMP and Load

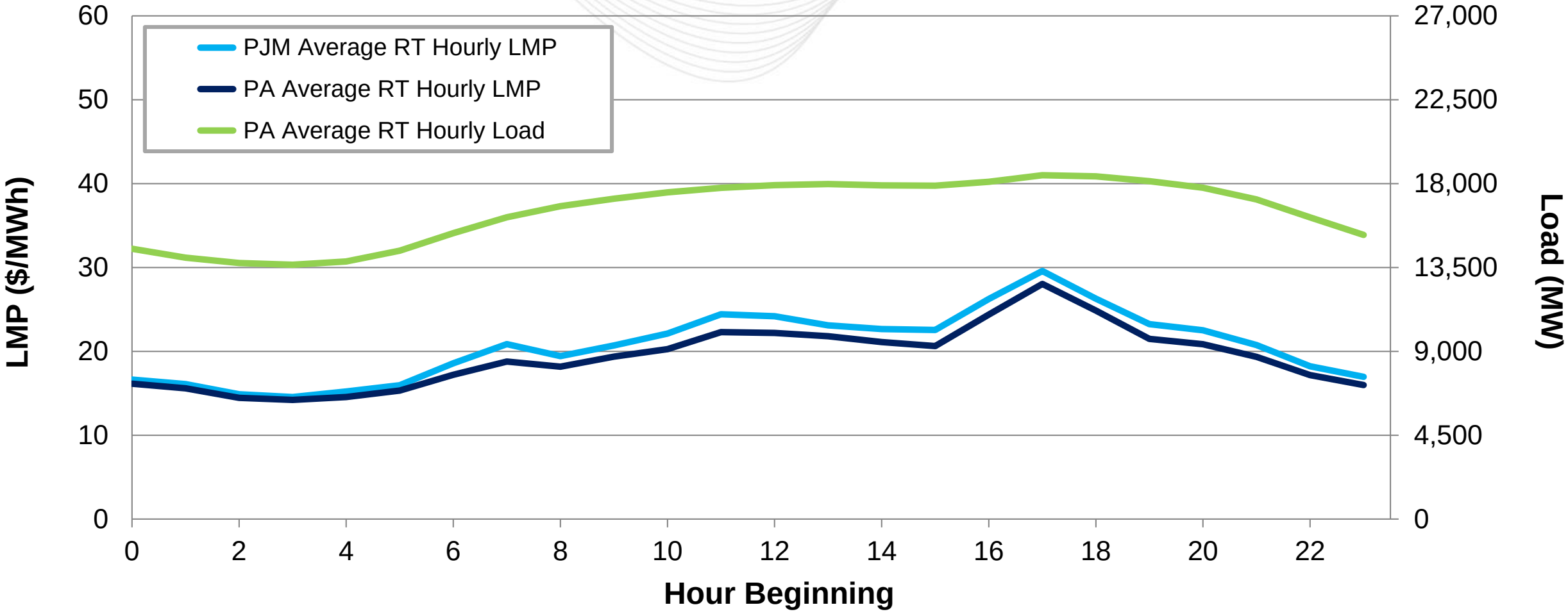
(Jan. 1, 2020 – Dec. 31, 2020)



Pennsylvania – Average Hourly LMP and Load

(Jan. 1, 2020 – Dec. 31, 2020)

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



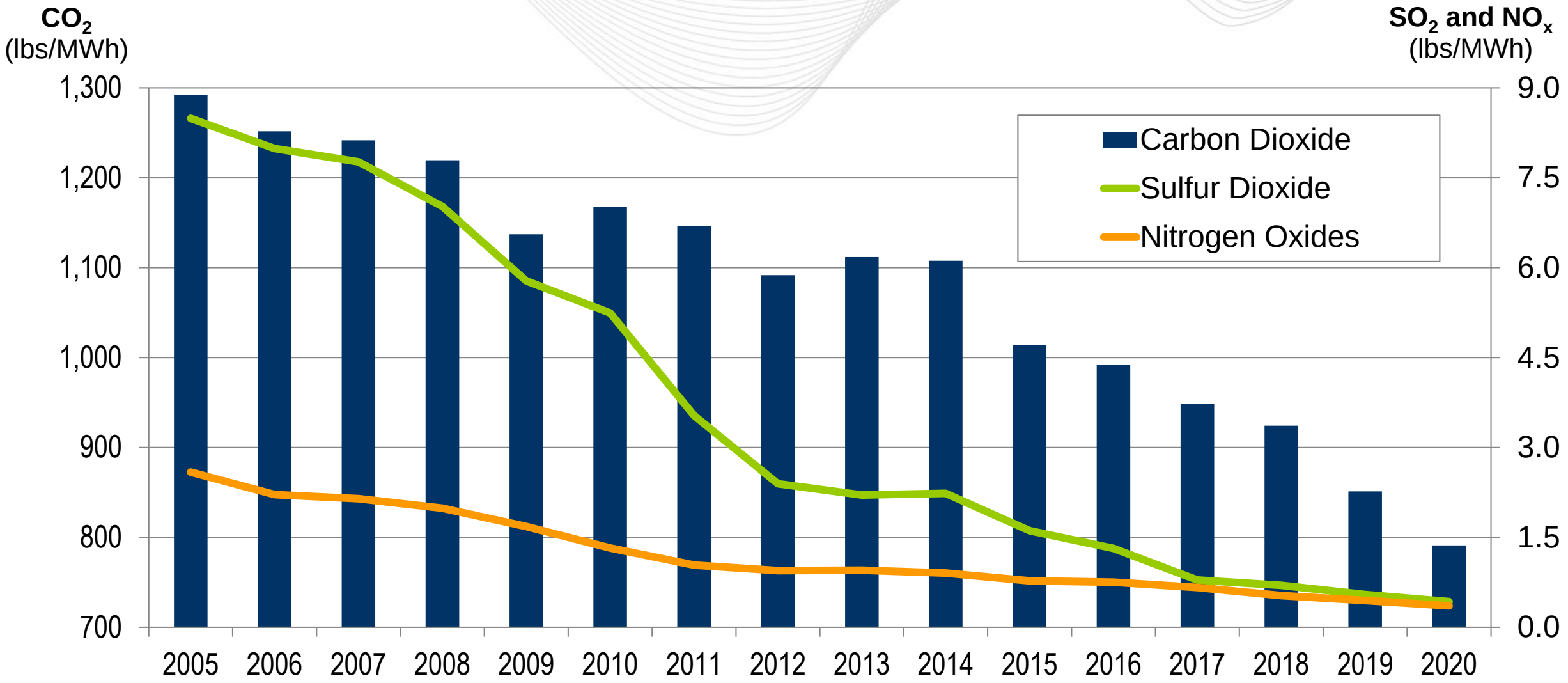
Pennsylvania – Net Energy Import/Export Trend

(Jan. 2020 – Dec. 2020)

Positive values represent exports and negative values represent imports.

Operations
Emissions Data

2005 – 2020 PJM Average Emissions



Pennsylvania – Average Emissions (lbs/MWh)

(Feb. 2021)