2020 Kentucky State Infrastructure Report
(January 1, 2020 – December 31, 2020)

April 2021

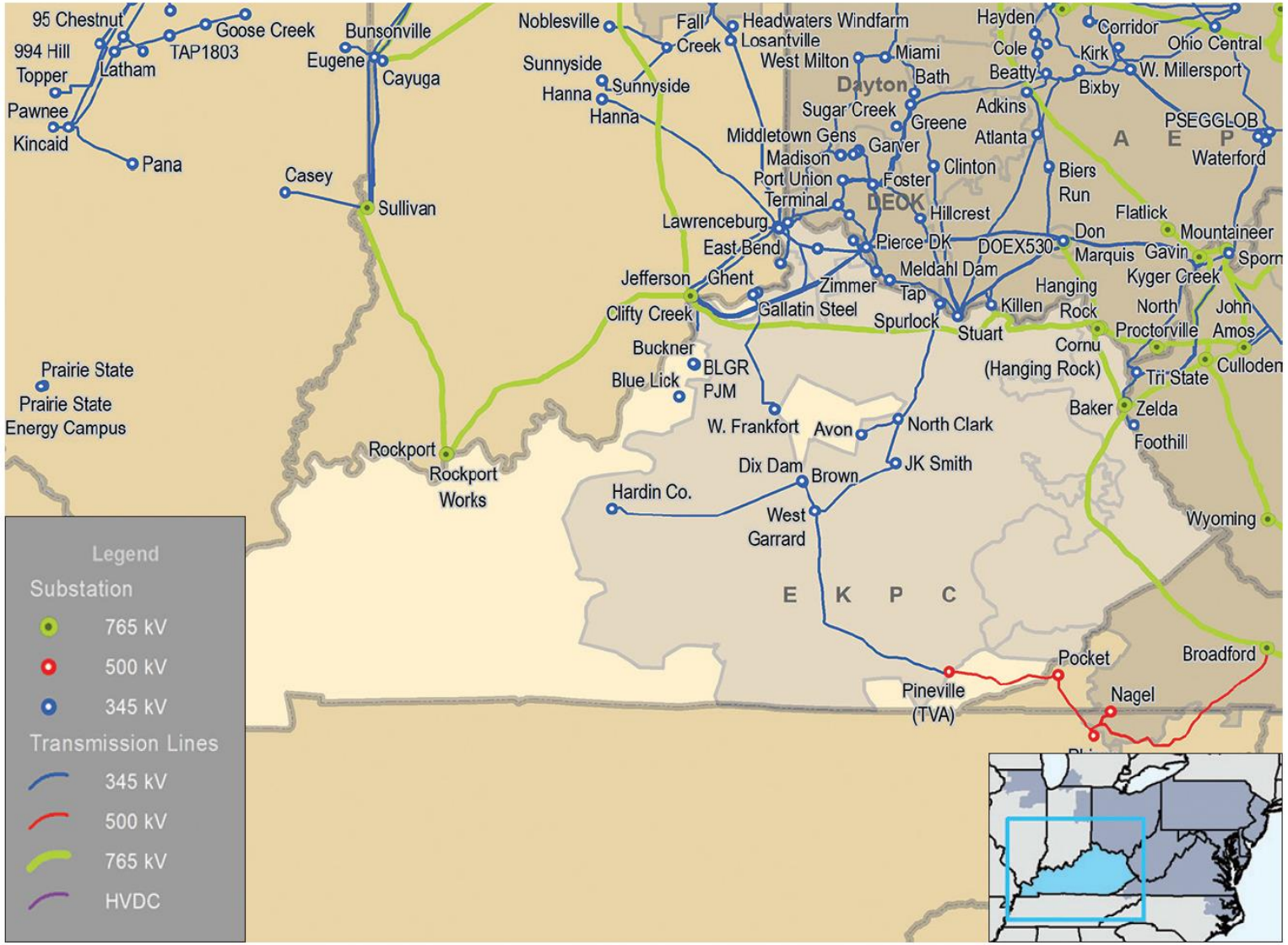
This report reflects information for the portion of Kentucky within the PJM service territory.

Table of Contents

- **Existing Capacity:** Coal represents approximately 53.5 percent of the total installed capacity in the Kentucky service territory while natural gas represents approximately 43.7 percent. Comparatively across PJM, natural gas and coal are at 43.4 and 27.5 percent of total installed capacity.
- **Interconnection Requests:** Solar represents 74.2 percent of new interconnection requests in Kentucky, while natural gas represents approximately 22.9 percent of new requests.
- **Deactivations:** No generation in Kentucky gave notification of deactivation in 2020.
- **RTEP 2020:** Kentucky's 2020 RTEP projects total approximately $180 million in investment. Approximately 87 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.

- **Load Forecast:** Kentucky's peak load growth is projected to range between 0.1 and 0.7 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 Kentucky State Infrastructure Report.
- **1/1/20 – 12/31/20 Market Performance:** Kentucky's average hourly LMPs generally aligned with the PJM average hourly LMP.
- **Emissions:** 2020 carbon dioxide emissions were up from 2019, while sulfur dioxide and nitrogen oxide emissions are both slightly down from 2019 levels.

PJM Service Area – Kentucky



The PJM service area in Kentucky is represented by the shaded portion of the map.

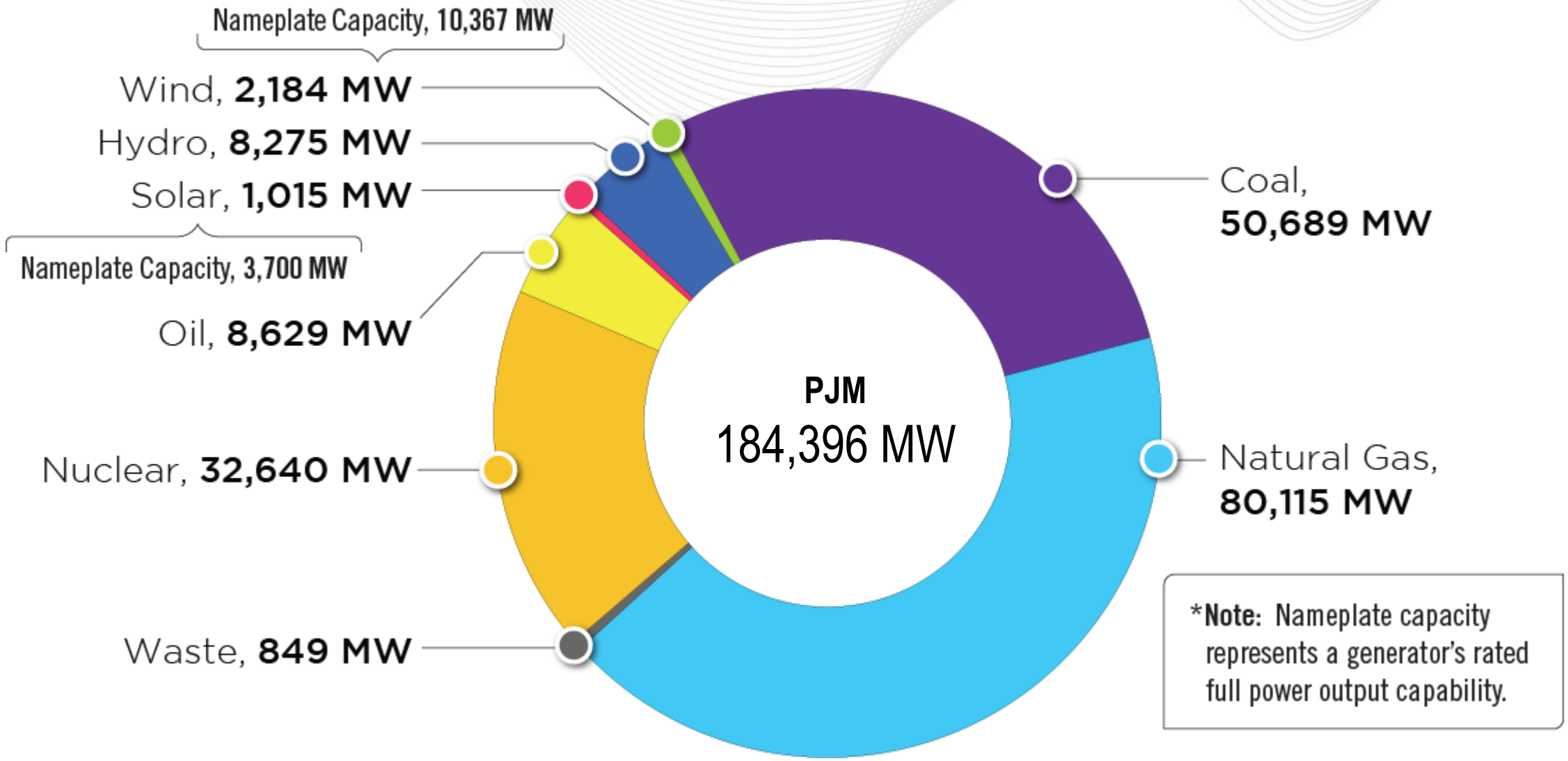
PJM operates transmission lines that extend beyond the service territory.

Planning

Generation Portfolio Analysis

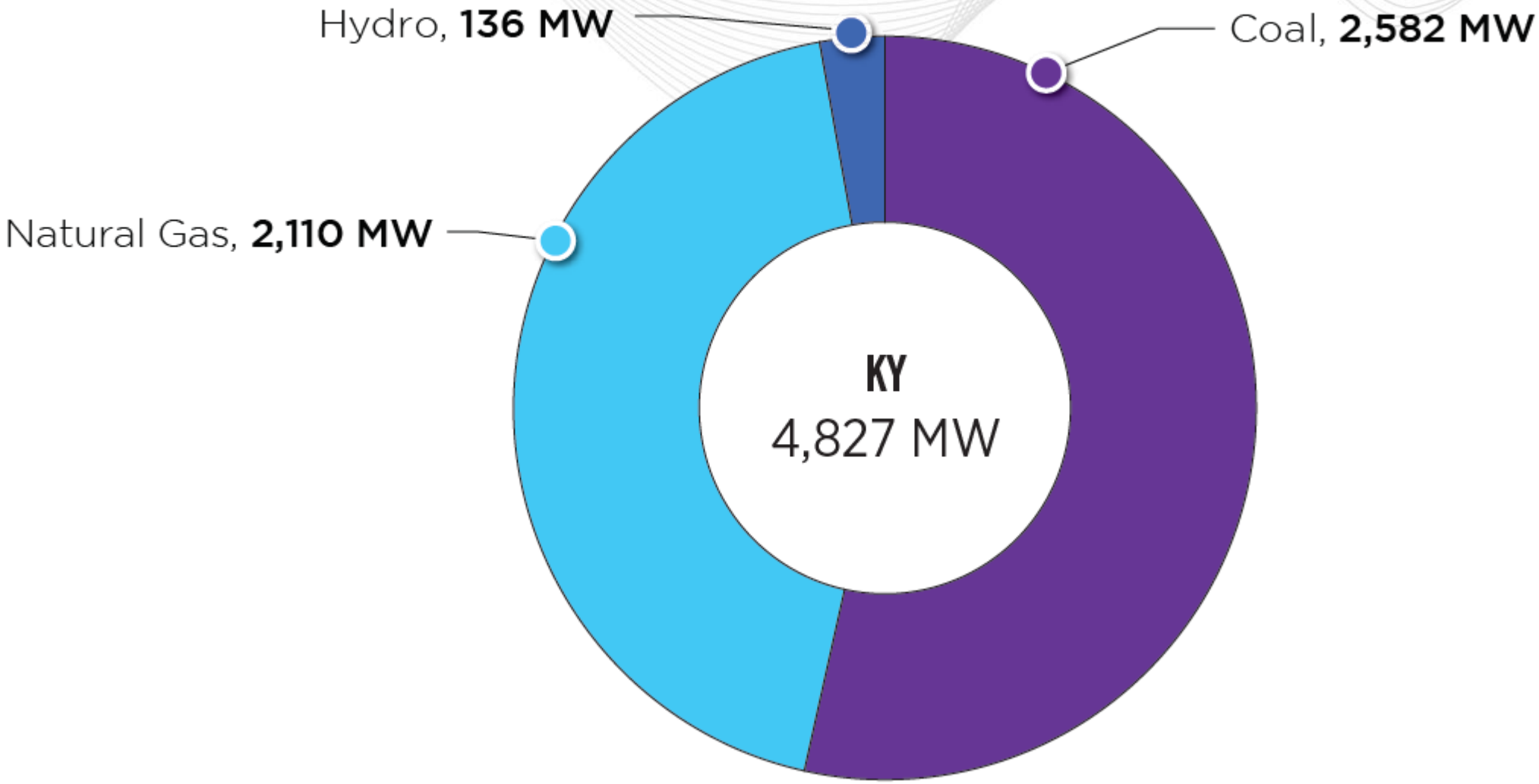
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



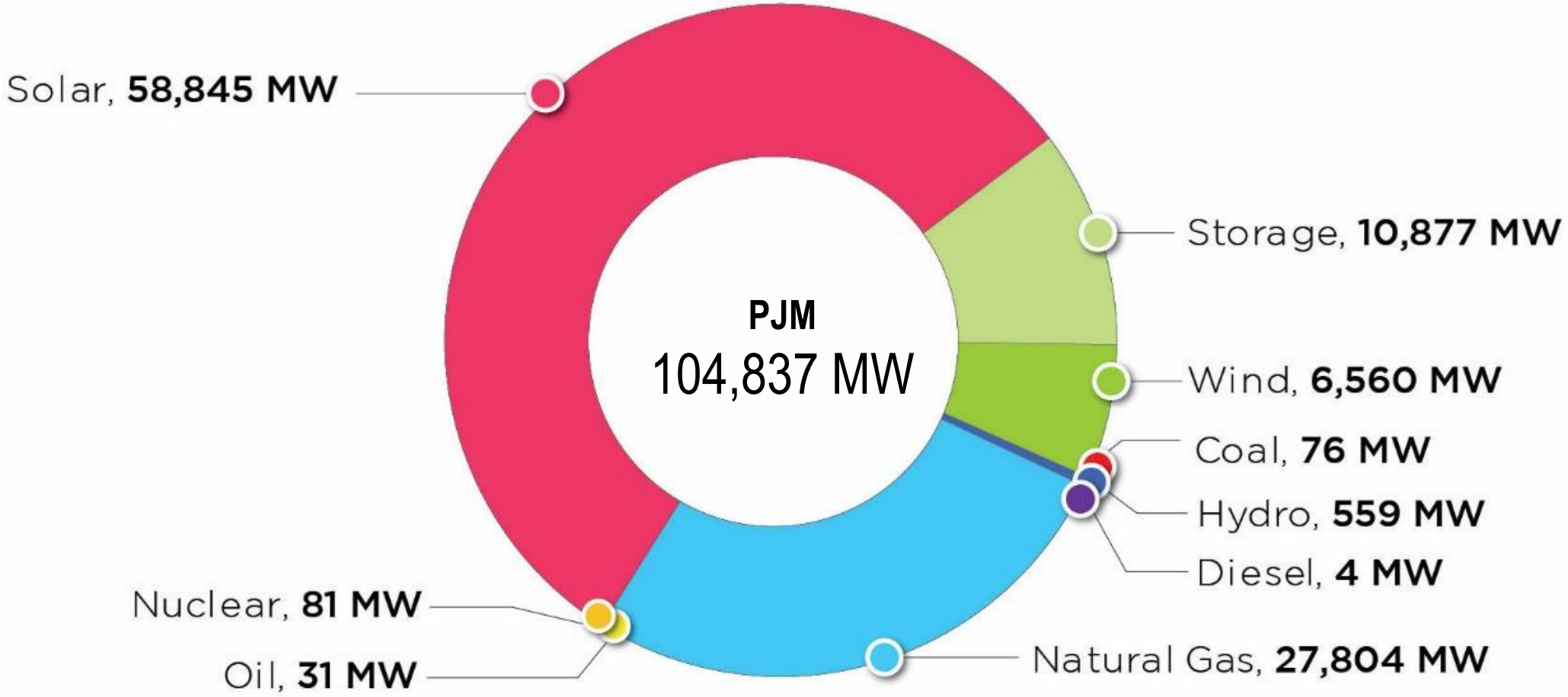
Kentucky – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



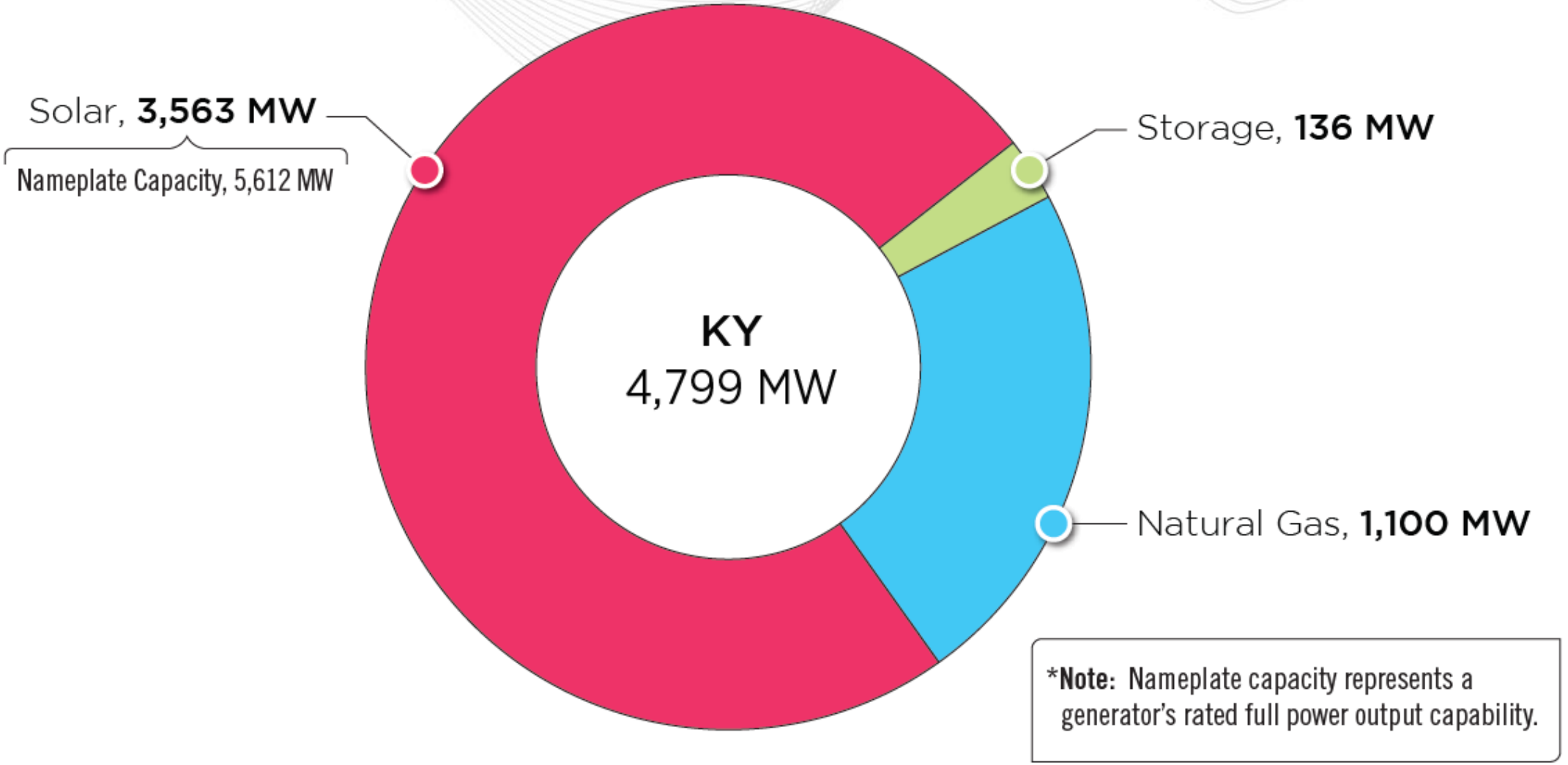
PJM – Queued Capacity (MW) by Fuel Type

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



Kentucky – Queued Capacity (MW) by Fuel Type

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



Kentucky – Interconnection Requests by Fuel Type

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

		In Queue				Complete				Grand Total	
		Active		Under Construction		In Service		Withdrawn			
		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	6	2,969.0	6	2,969.0
	Natural Gas	0	0.0	1	1,100.0	6	71.0	5	1,704.7	12	2,875.7
	Storage	4	136.0	0	0.0	0	0.0	3	106.2	7	242.2
Renewable	Biomass	0	0.0	0	0.0	0	0.0	5	198.5	5	198.5
	Hydro	0	0.0	0	0.0	0	0.0	1	70.0	1	70.0
	Solar	55	3,434.9	2	127.9	0	0.0	25	1,214.0	82	4,776.8
	Wind	0	0.0	0	0.0	0	0.0	2	27.3	2	27.3
	Grand Total	**59**	**3,570.9**	**3**	**1,227.9**	**6**	**71.0**	**47**	**6,289.7**	**115**	**11,159.5**

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

Kentucky – Progression History of Interconnection Requests

Projects withdrawn after final agreement		Nameplate Capacity
1 Interconnection Service Agreements	80 MW	80 MW

Percentage of planned capacity and projects that have reached commercial operation	1% Requested capacity megawatts	11 % 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.

Kentucky – Generation Deactivation Notifications Received in 2020

Kentucky had no generation deactivation notifications in 2020.

Planning

Transmission Infrastructure Analysis

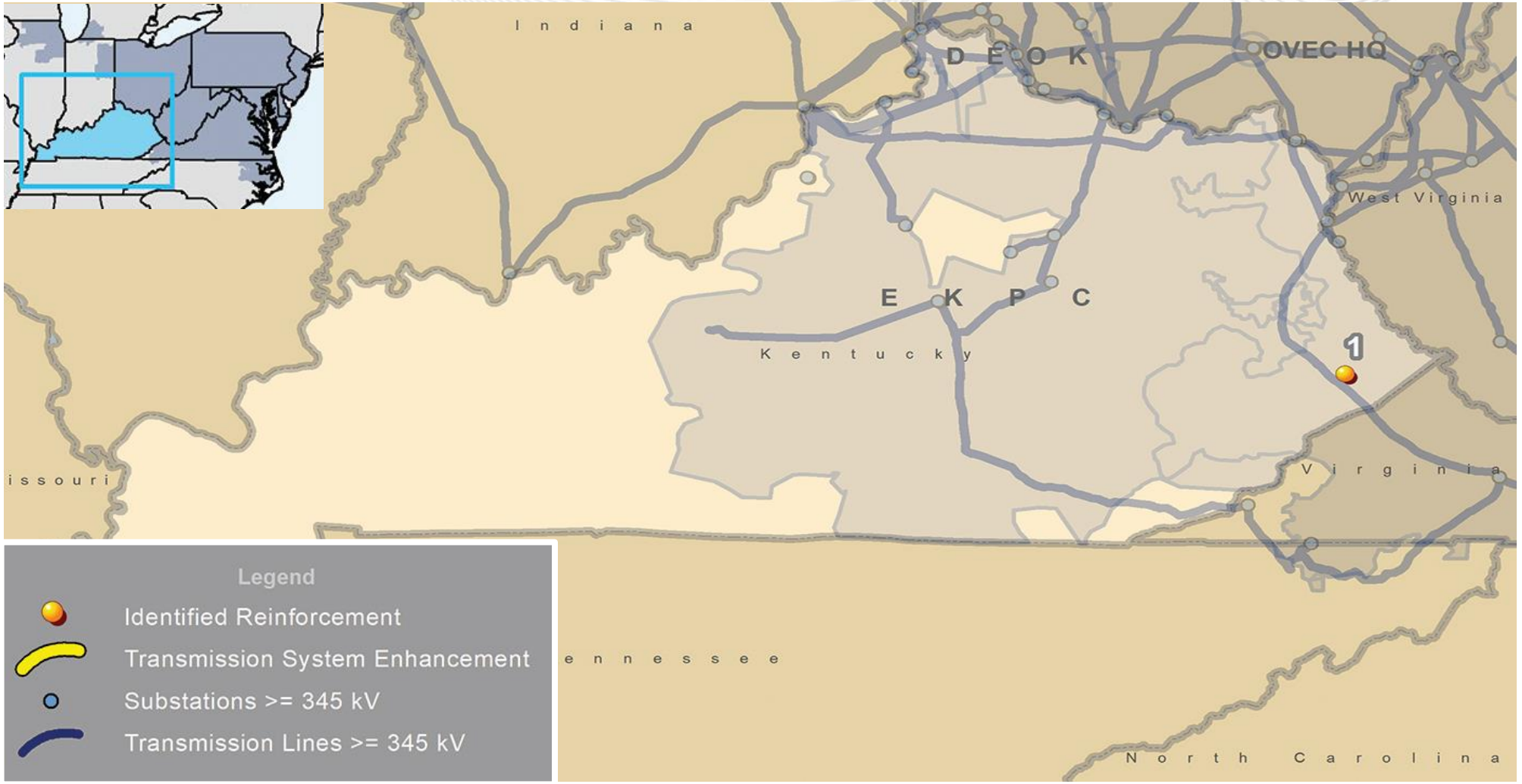
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that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

Kentucky – RTEP Baseline Projects

(Greater than $10 million)



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

Kentucky – RTEP Baseline Projects

(Greater than $5 million)

Map ID	Project	Description	Required In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	b3087	Install 28.8 MVAR switching shunt at the new Fords Branch substation.	12/1/2023	$23.70	AEP	10/25/2019

Kentucky – RTEP Network Projects

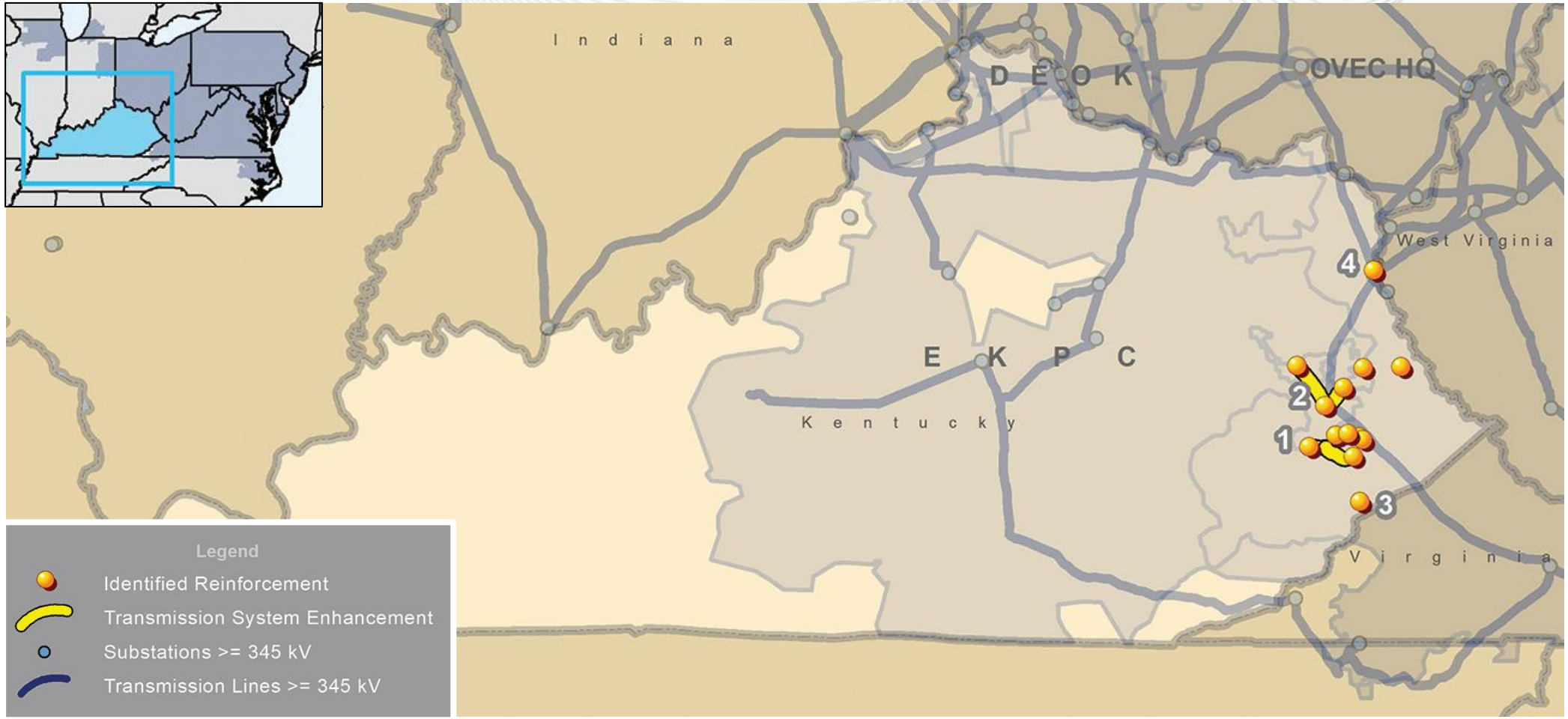
(Greater than $5 million)

Kentucky 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.

Kentucky – 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.

Kentucky – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	s2188	Construct ~9.3 miles of single circuit 138 kV from Soft Shell to Garrett picking up Salt Lick Co-op via Snag Fork along the way. Complete associated remote end relaying.	10/31/2023	$81.20	AEP	2/21/2020
		Construct ~3.5 miles of single-circuit 138 kV from the Eastern station to Garrett station. A short extension will be required from the new station to the existing Hays Branch metering point. Construct short extension to existing Morgan Fork-Hays Branch 138 kV circuit from Eastern station.				
		Double circuit cut into existing Hays Branch-Morgan Fork line to tie into new Hays Branch S.S phase-over-phase switch. Install new heavy double circuit dead-end tap structure on the existing Hays Branch-Morgan Fork 138 kV line because of unequal loading on the transmission line.				
		Construct ~0.25 miles of double-circuit 138 kV line named Hays Branch Substation-Eastern. Install three double-circuit suspension structures, one of which is a custom pole structure.				
		New phase-over-phase switch structure at Hays Branch to accommodate new line from Eastern station.				

Kentucky – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	s2188	Expand Garrett station. Install a 138 kV, three-breaker ring bus and138/12 kV 30 MVA transformer. If space becomes a constraint, we should look at installing a straight bus arrangement with two 138 kV breakers and a circuit switcher on the high side of the transformer.	10/31/2023	(Continued)	AEP	2/21/2020
		Establish a new 138 kV substation named Eastern south of the existing Hays Branch station. Install two 138 kV breakers (3000A 40kA) at the new Eastern station on exits toward Morgan Fork and Garrett station.				
		Establish Snag Fork substation. Install a three-way phase-over-phase motorized (automated) switching structure near Saltlick to serve the East Kentucky Power Cooperative.				
		Move the existing 69 kV rated circuit breaker G to the Beaver Creek-McKinney No.2 circuit exit at McKinney substation.				
		Install a 138 kV breaker (3000A 40kA) with an exit towards Garrett station (via Snag Fork) at Softshell substation.				
		Retire ~25 miles of the 46 kV Beaver Creek-McKinney No.1 46 KV circuit. Retire Spring Fork Tap.				
2	s2200	Install a 2 MW Battery Energy Storage System (BESS) at Middle Creek substation.	12/1/2020	$41.30	AEP	1/17/2020
		Rebuild ~8.5 miles of 46 kV line between Prestonsburg and Middle Creek station.	4/1/2023			
		Retire ~14.5 miles of 46 kV line between Falcon and Middle Creek.				

Kentucky – TO Supplemental Projects

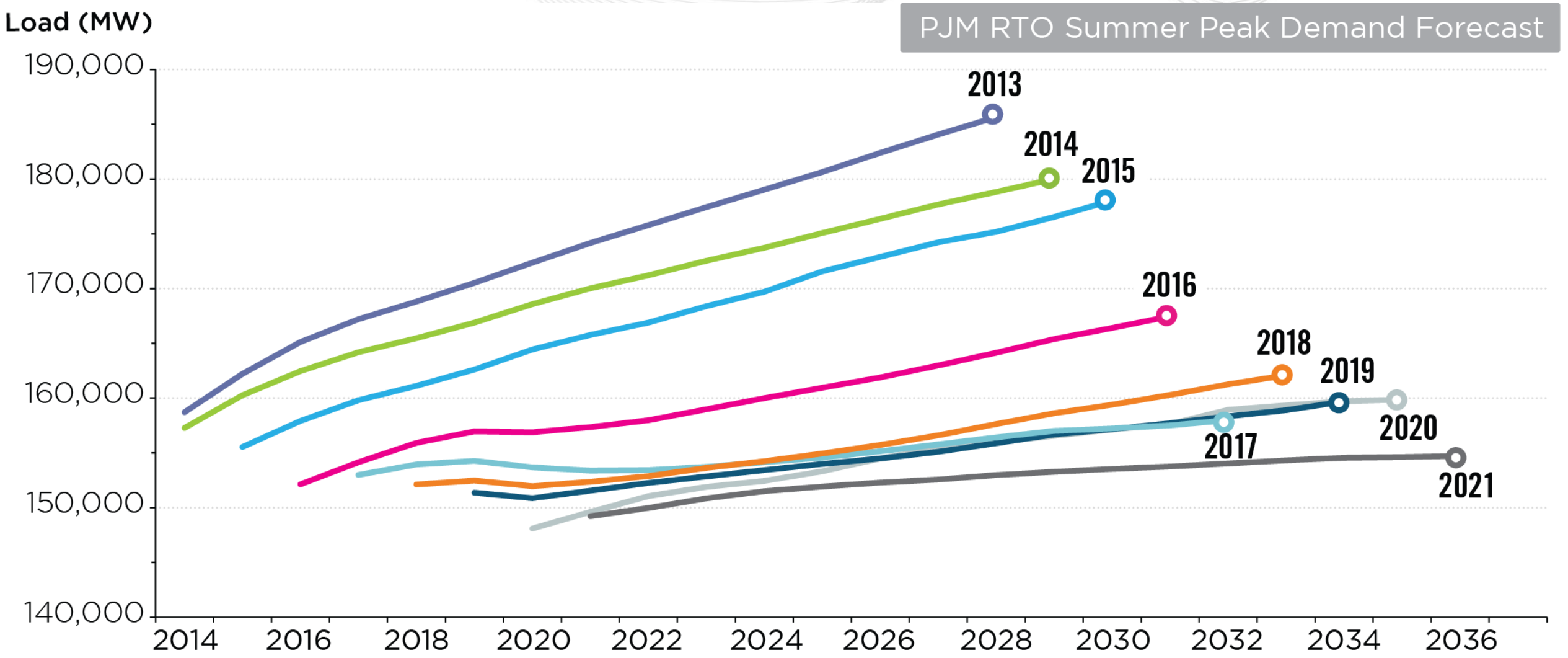
(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
3	**s2219**	Rebuild Fleming station in the clear. Replace 138/69 kV Fleming Transformer No.1 with 138/69 kV, 130 MVA transformer with high side 138 kV CB; install a 5-breaker, 69 kV ring bus on the low side of the transformer, replace 69 kV circuit switcher AA, replace 69/12 kV transformer No. 3 with 69/12 kV, 30 MVA transformer. Replace 12 kV circuit breakers A and D. Retire existing Fleming substation.	9/1/2022	$21.10	AEP	3/19/2020
4	**s2281**	At Inez station, replace Breakers B, B2, C and C1. Install three new 138 kV breakers and create third string in the existing breaker-and-a-half configuration. Replace 138/69 kV Inez Transformer No. 1 with a 138/69 kV/12 kV 90 MVA autotransformer. Move the new Inez 139/69/12 kV Transformer No. 1 and Martiki 138 kV feed to the new string. Install Breaker B1 towards Johns Creek to complete the string. Installation of Breaker B1 and the third string addresses dissimilar zones of protection between the No. 1 bus and the more-than-20-mile Inez to Johns Creek 138 kV circuit and dissimilar zones of protection between the 138 kV bus No. 2, 138/69 kV transformer No. 1, and the 138 kV circuit to the Martiki coal service point. Replace cap bank switchers CS-BB and CS-CC with 138 kV circuit breakers. Replace obsolete relays at Inez substation. Retire 69 kV capacitor bank and the circuit switcher AA.	9/1/2022	$12.40	AEP	6/19/2020
		Remote end work at Big Sandy, Logan, Sprigg and Dewey substations.				

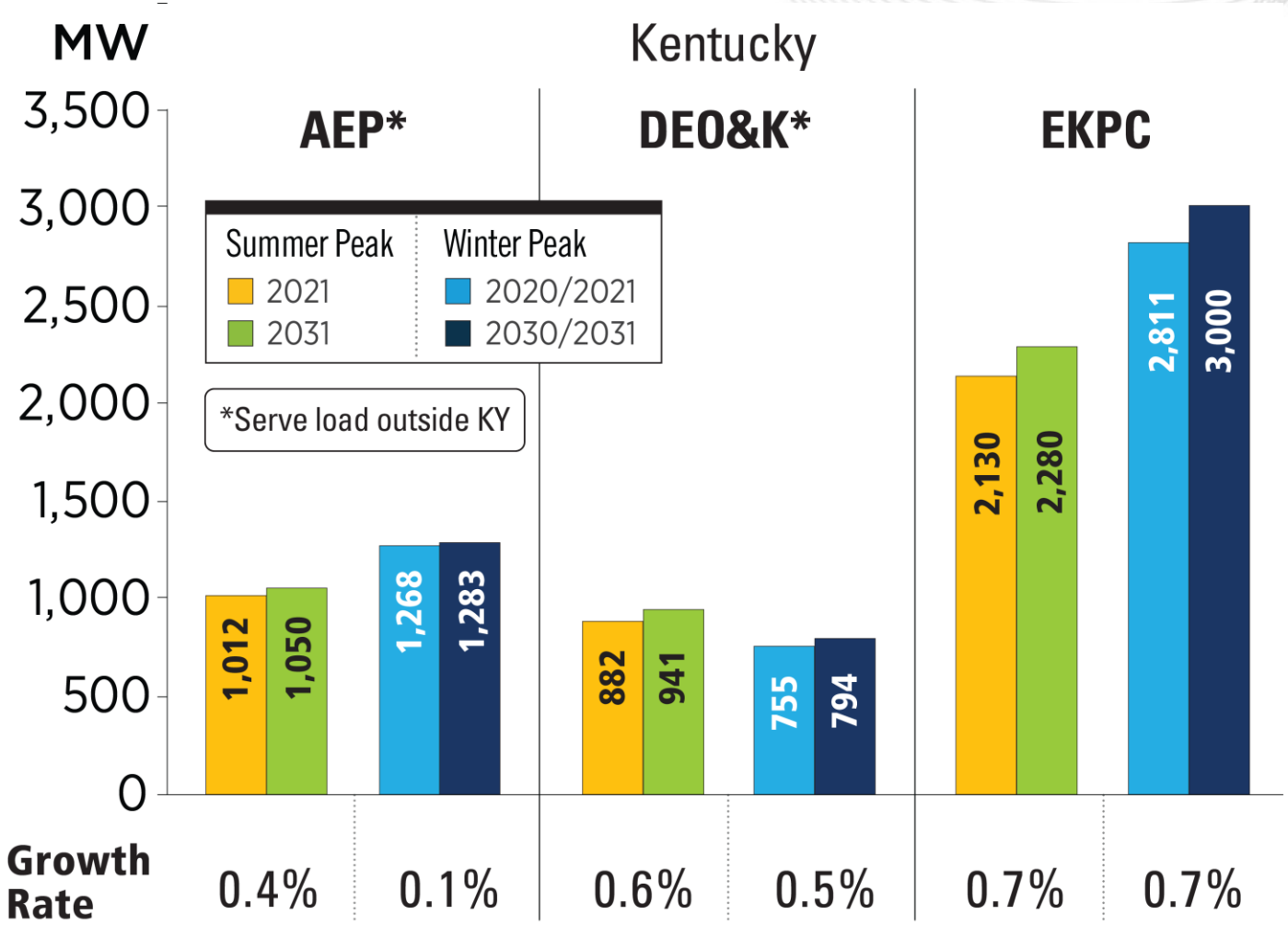
Planning
Load Forecast

PJM Annual Load Forecasts

(Jan. 2021)



Kentucky – 2021 Load Forecast Report



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%

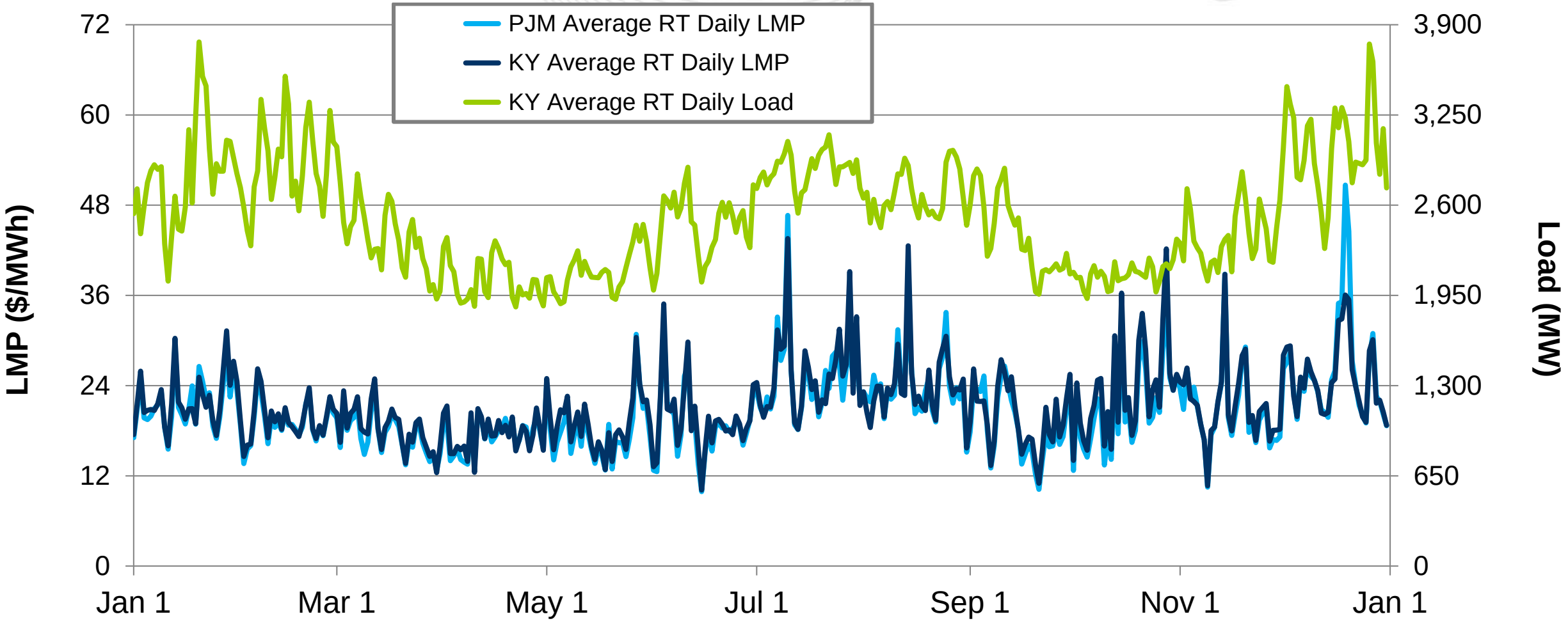
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas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

Markets

Market Analysis

Kentucky – Average Daily LMP and Load

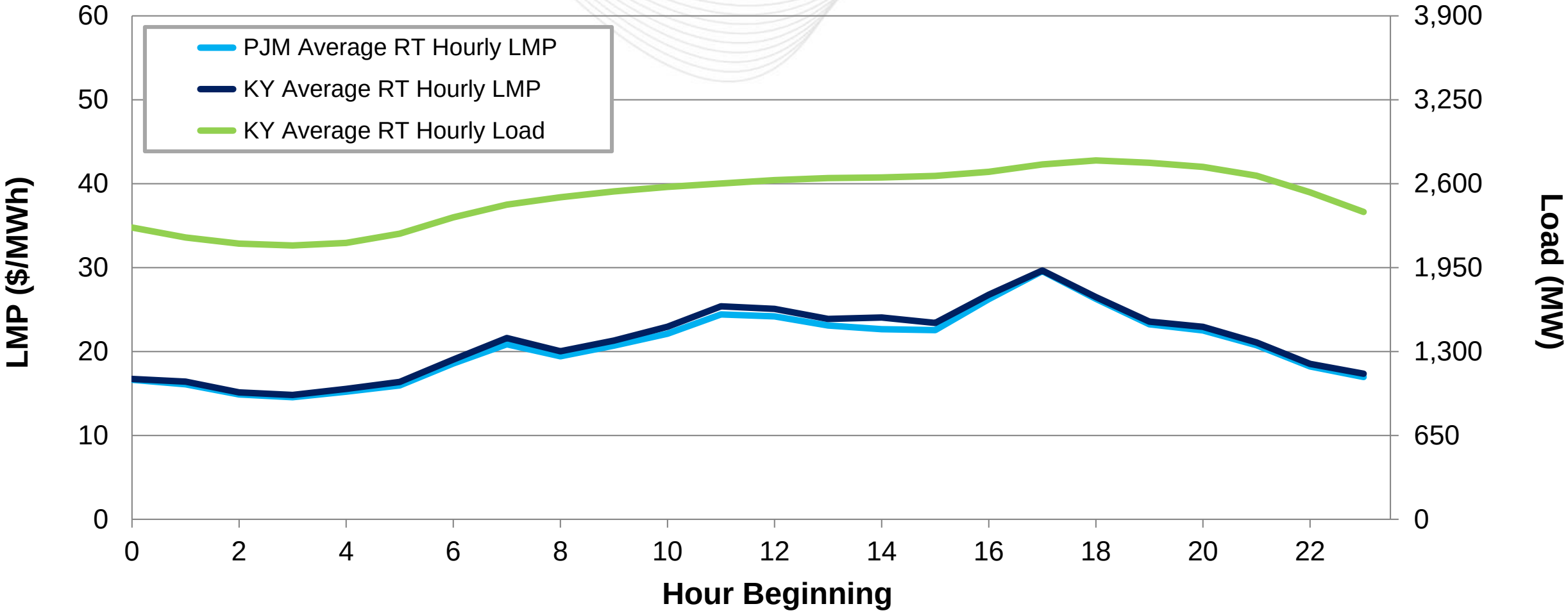
(Jan. 1, 2020 – Dec. 31, 2020)



Kentucky – Average Hourly LMP and Load

(Jan. 1, 2020 – Dec. 31, 2020)

Kentucky's average hourly LMPs generally aligned with the PJM average hourly LMP.



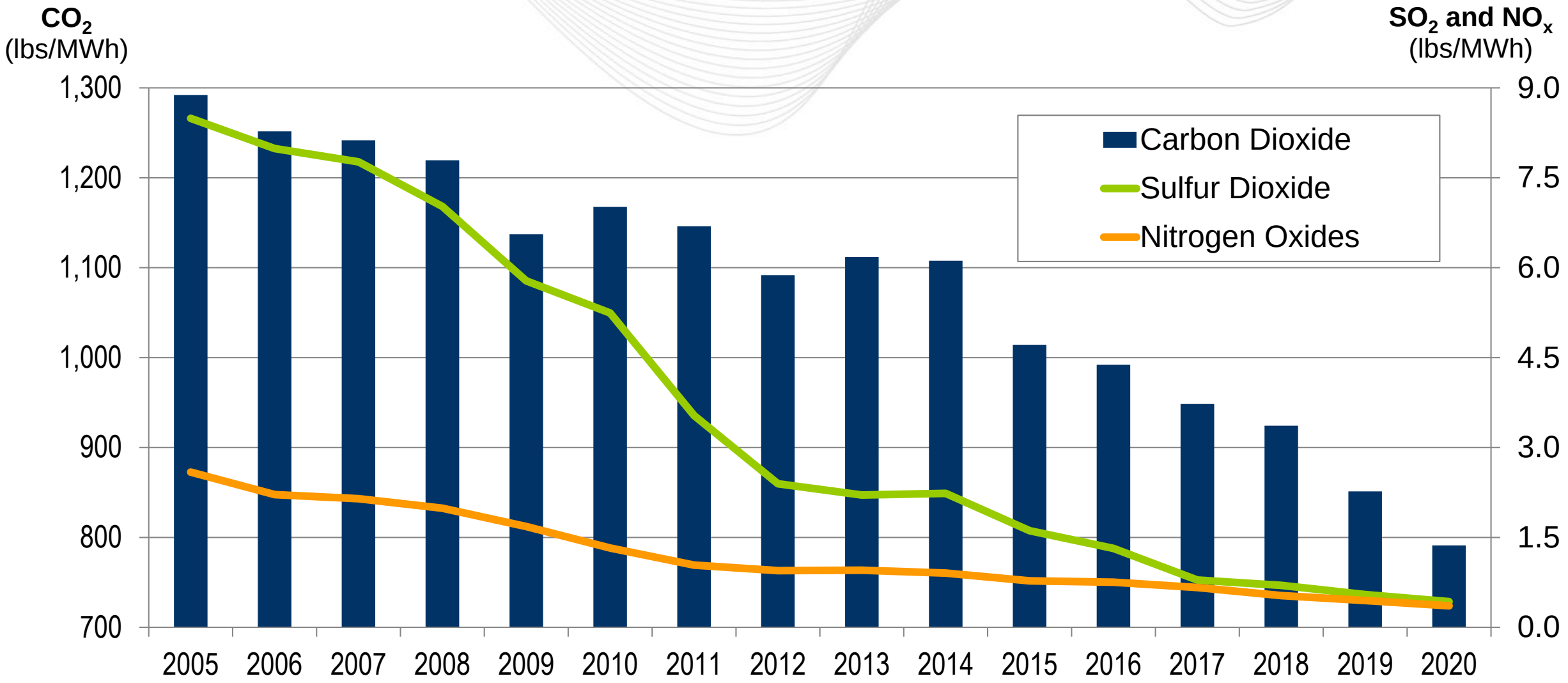
Kentucky – Net Energy Import/Export Trend

(Jan. 2020 – Dec. 2020)

This chart reflects the portion of Kentucky that PJM operates. Positive values represent exports and negative values represent imports.

Operations
Emissions Data

2005 – 2020 PJM Average Emissions



Kentucky – Average Emissions (lbs/MWh)

(Feb. 2021)