2019 Kentucky State Infrastructure Report
(January 1, 2019 – December 31, 2019)

May 2020

(updated July 2020)

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

Table of Contents

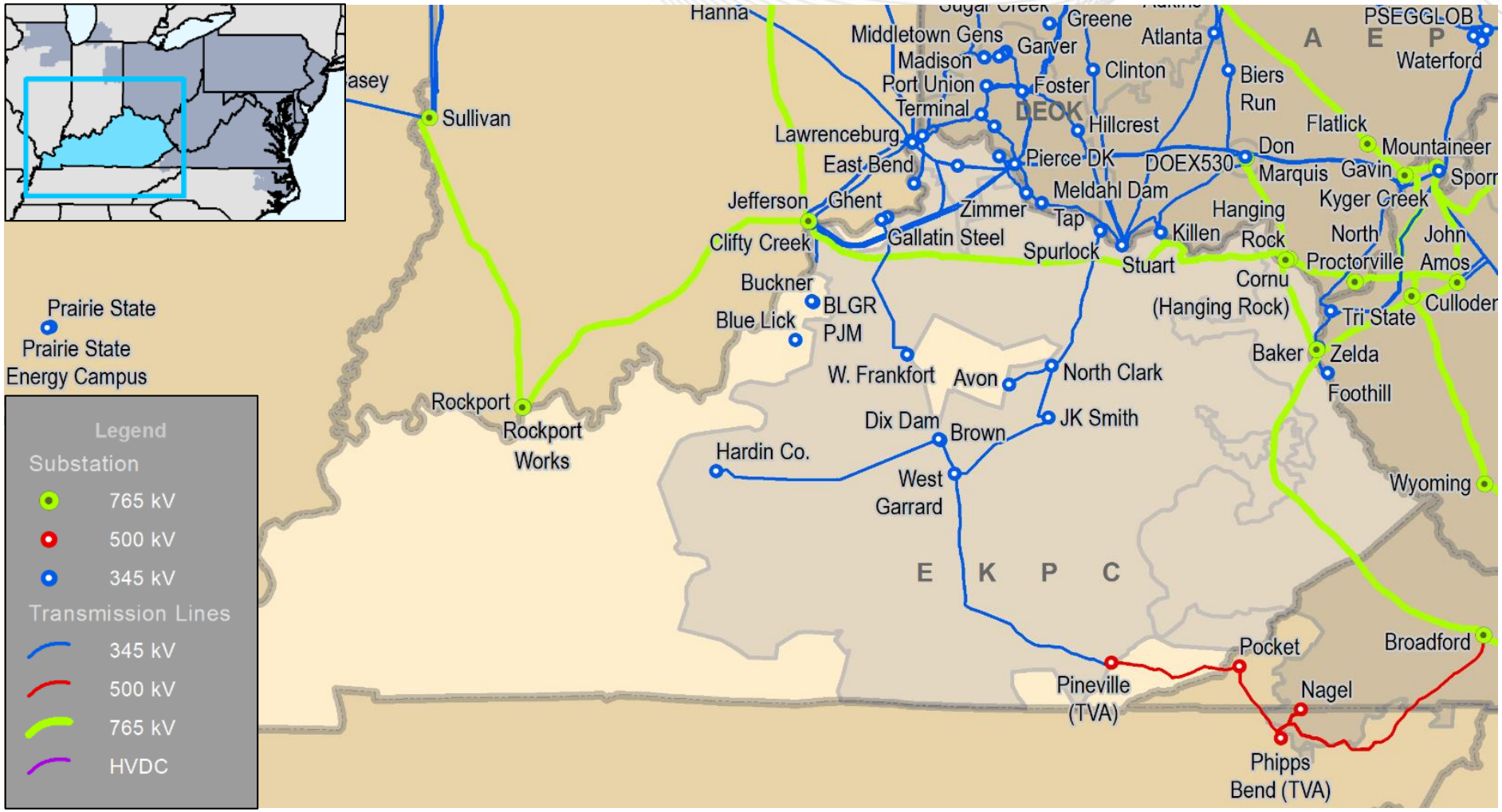
Executive Summary
(May 2020)

- **Existing Capacity:** Coal represents approximately 53.4 percent of the total installed capacity in the Kentucky service territory while natural gas represents approximately 43.7 percent. This differs from PJM where natural gas and coal are at 42.4 and 28.7 percent of total installed capacity.
- **Interconnection Requests:** Solar represents 65.3 percent of new interconnection requests in Kentucky, while natural gas represents approximately 32.2 percent of new requests.
- **Deactivations:** No generation in Kentucky gave notification of deactivation in 2019.
- **RTEP 2019:** Kentucky's 2019 RTEP projects total approximately $125 million in investment. Approximately 52 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.

Executive Summary
(May 2020)

- **Load Forecast:** Kentucky's load in PJM is projected to grow from 0.7 to 1.5 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 Kentucky State Infrastructure Report.
- **1/1/19 – 12/31/19 Market Performance:** Kentucky's average hourly LMPs generally aligned with PJM average hourly LMPs.
- **Emissions:** 2019 carbon dioxide emissions were down from 2018, while sulfur dioxide and nitrogen oxide emissions are both flat from 2018 levels.

PJM Service Area – Kentucky



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

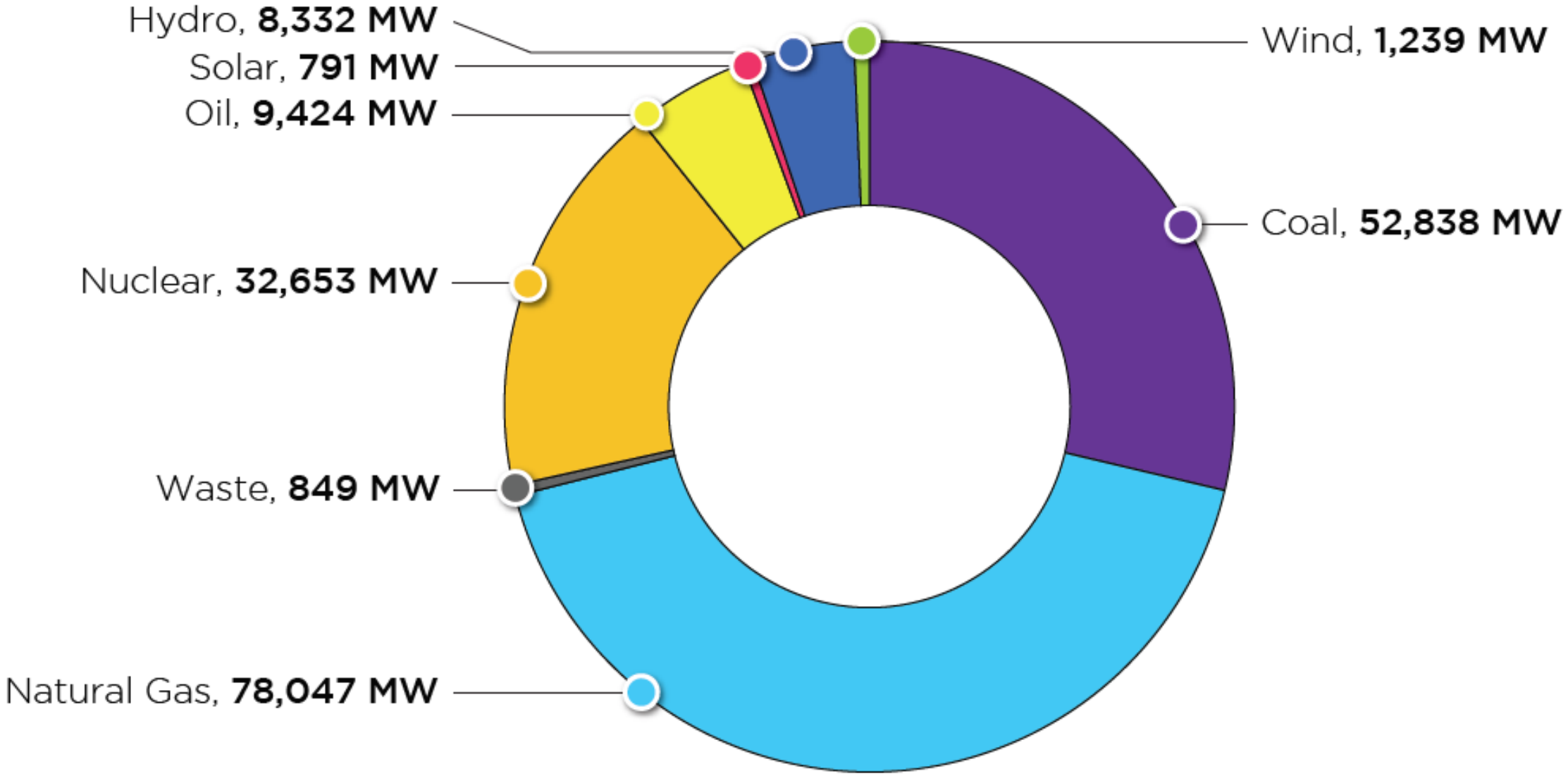
PJM operates transmission lines that extend beyond the service territory.

Planning

Generation Portfolio Analysis

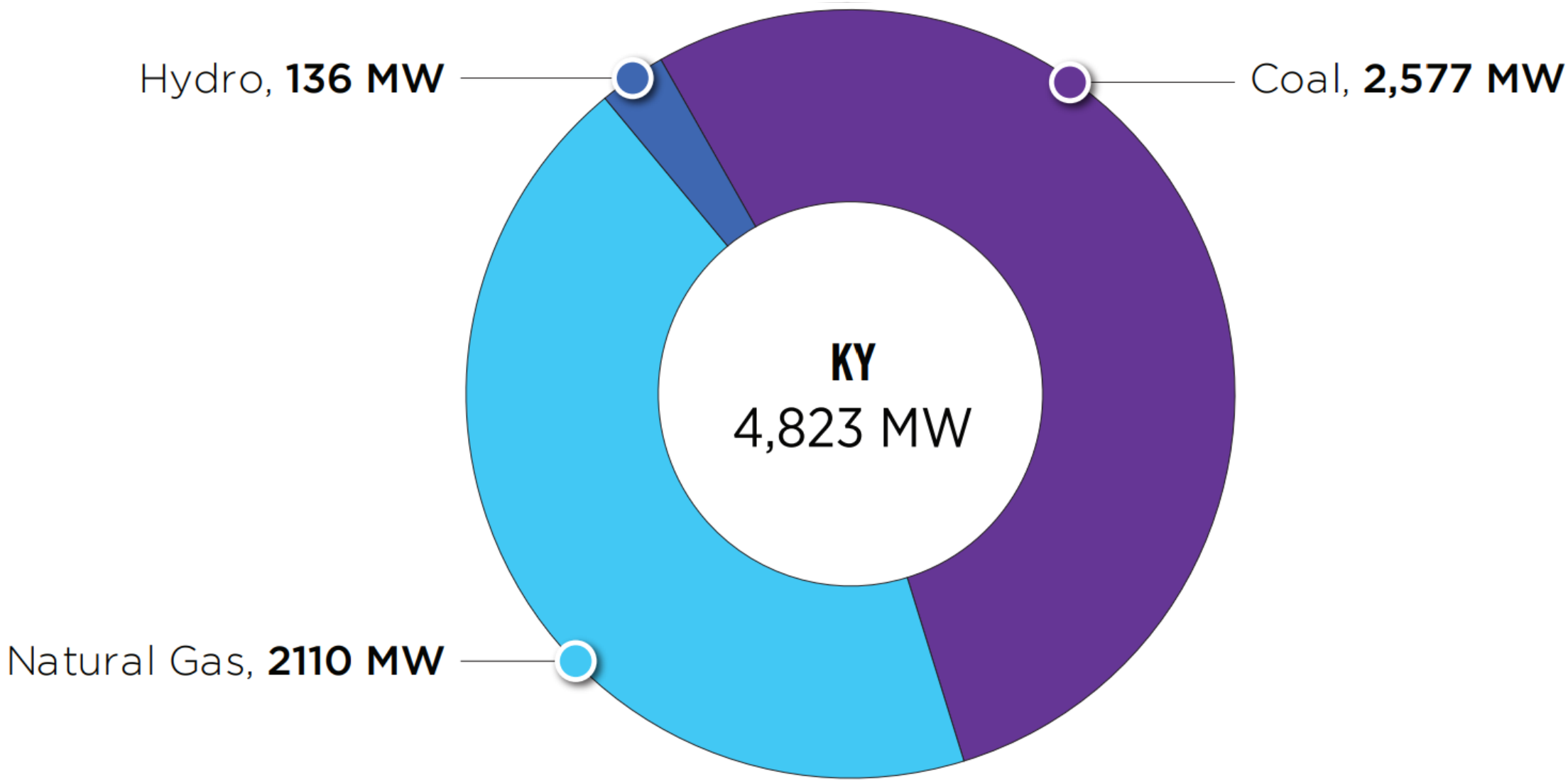
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



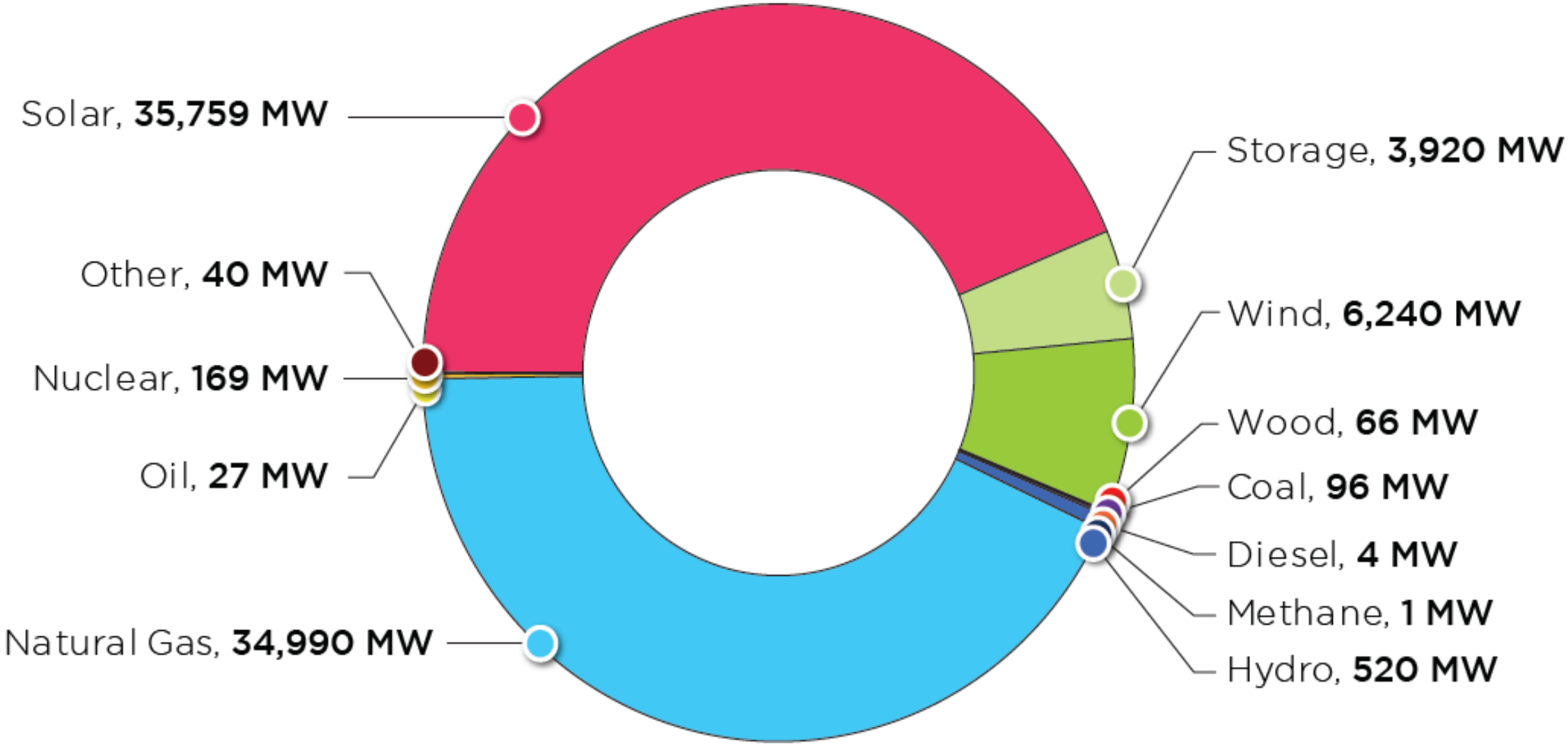
Kentucky – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



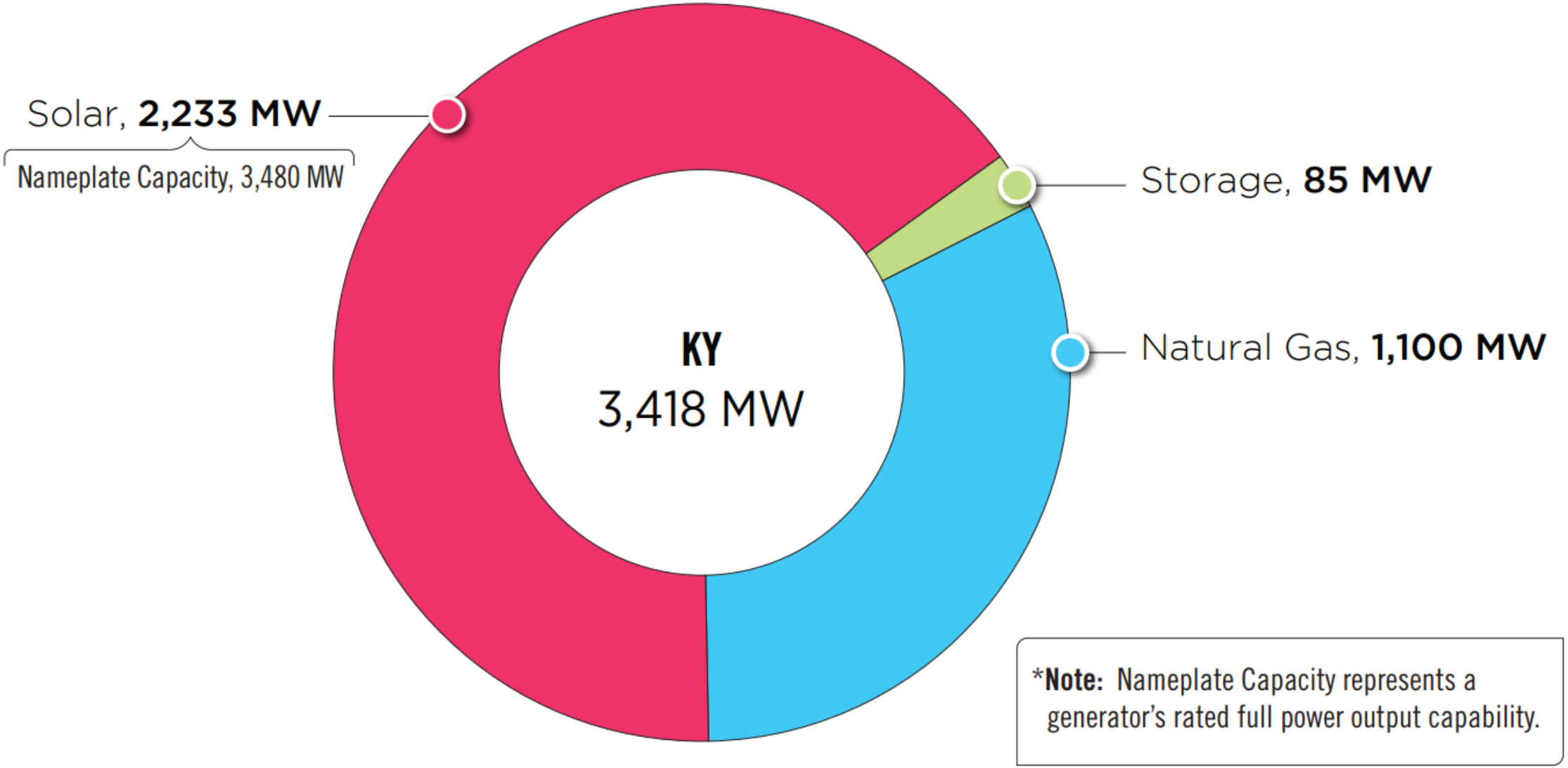
PJM – Queued Capacity (MW) by Fuel Type

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



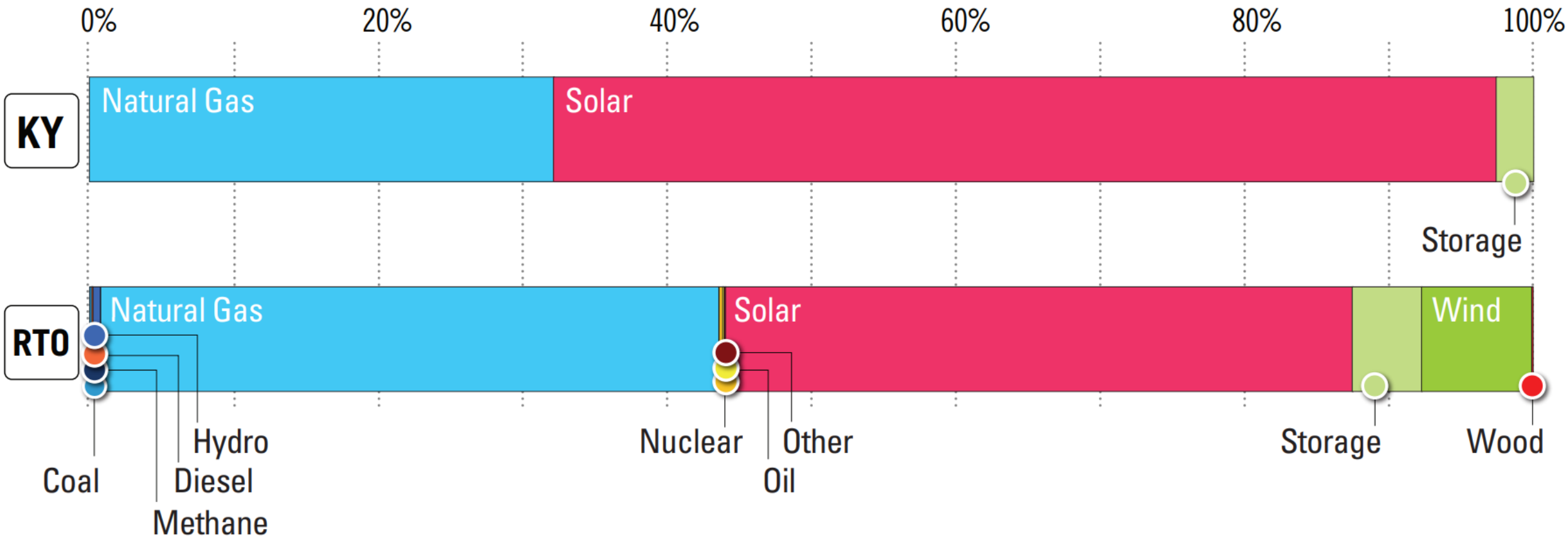
Kentucky – Queued Capacity (MW) by Fuel Type

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



Kentucky – Percentage of MW in Queue by Fuel Type

(Dec. 31, 2019)



Kentucky – Interconnection Requests

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

		In Queue				Complete				Grand Total	
		Active		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)
Non-Renewable	Coal	0	0	0	0	0	0	6	2,969.0	6	2,969.0
	Natural Gas	0	0	1	1,100.0	6	71.0	5	1,704.7	12	2,875.7
	Storage	2	85.0	0	0	0	0	1	81.2	3	166.2
Renewable	Biomass	0	0	0	0	0	0	5	198.5	5	198.5
	Hydro	0	0	0	0	0	0	1	70.0	1	70.0
	Solar	36	2,232.7	0	0	0	0	11	605.1	47	2,837.8
	Grand Total	**38**	**2,317.7**	**1**	**1,100.0**	**6**	**71.0**	**31**	**5,655.8**	**76**	**9,144.5**

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 megawatt	16% 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.

Kentucky – Generation Deactivation Notifications Received in 2019

Kentucky had no generation deactivation notifications in 2019.

Planning

Transmission Infrastructure Analysis

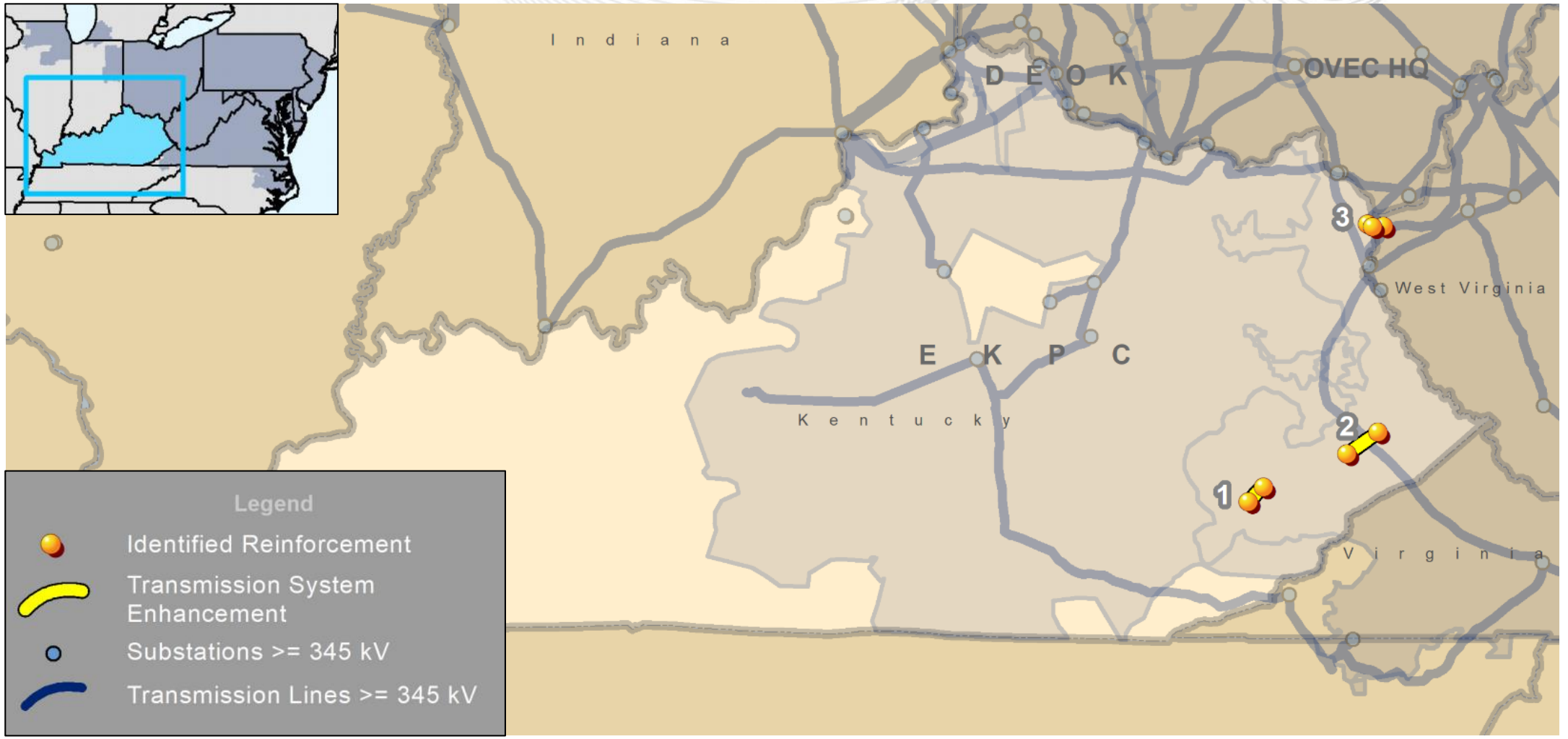
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that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

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	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	b2761	Replace and relocate the Hazard 161/138 kV transformer and circuit breaker M. Upgrade protection scheme on the new transformer including installation of low side breaker.	6/1/2021	$20.6	AEP	10/6/2016
		Rebuild the Hazard-Wooton 161 kV line utilizing 795 26/7 ACSR conductor (300 MVA rating). Replace line relaying and associated termination equipment.				11/2/2017
2	b3087	Construct a new greenfield station to the west (~1.5 mi.) of the existing Fords Branch Station, potentially in/near the new Kentucky Enterprise Industrial Park. This new station will consist of four 138 kV breaker ring buses and two 30 MVA 138/34.5 kV transformers. The existing Fords Branch Station will be retired.	12/1/2023	$23.2	AEP	11/29/2018
		Construct ~5 miles of new double circuit 138 kV line in order to loop the new Fords Branch station into the existing Beaver Creek-Cedar Creek 138 kV circuit.				
		Remote end work will be required at Cedar Creek Station.				

Kentucky – RTEP Baseline Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
3	b3118	Expand existing Chadwick station and install a second 138/69 kV transformer at a new 138 kV bus tied into the Bellefonte-Grangston 138 kV circuit. The 69 kV bus will be reconfigured into a ring bus arrangement to tie the new transformer into the existing 69 kV via installation of four 3000A 63 kA 69 kV circuit breakers.	6/1/2022	$16.9	AEP	2/20/2019
		Perform 138 kV remote end work at Grangston station.				
		Perform 138 kV remote end work at Bellefonte station.				
		Relocate the Chadwick-Leach 69 kV circuit within Chadwick station.				
		Terminate the Bellefonte-Grangston 138 kV circuit to the Chadwick 138 kV bus.				
		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 construction aspects.				
		Reconductor Chadwick-Leach and Chadwick-England Hill 69 kV lines with 795 ACSS conductor. Perform a LiDAR survey and a sag study.				
		Rebuild 336 ACSR portion of Leach-Miller Stainless Steel 69 kV line section (~0.3 miles) with 795 ACSS conductor.				
		Replace 69 kV line risers (towards Chadwick) at Leach station.				

Kentucky – RTEP Network Projects

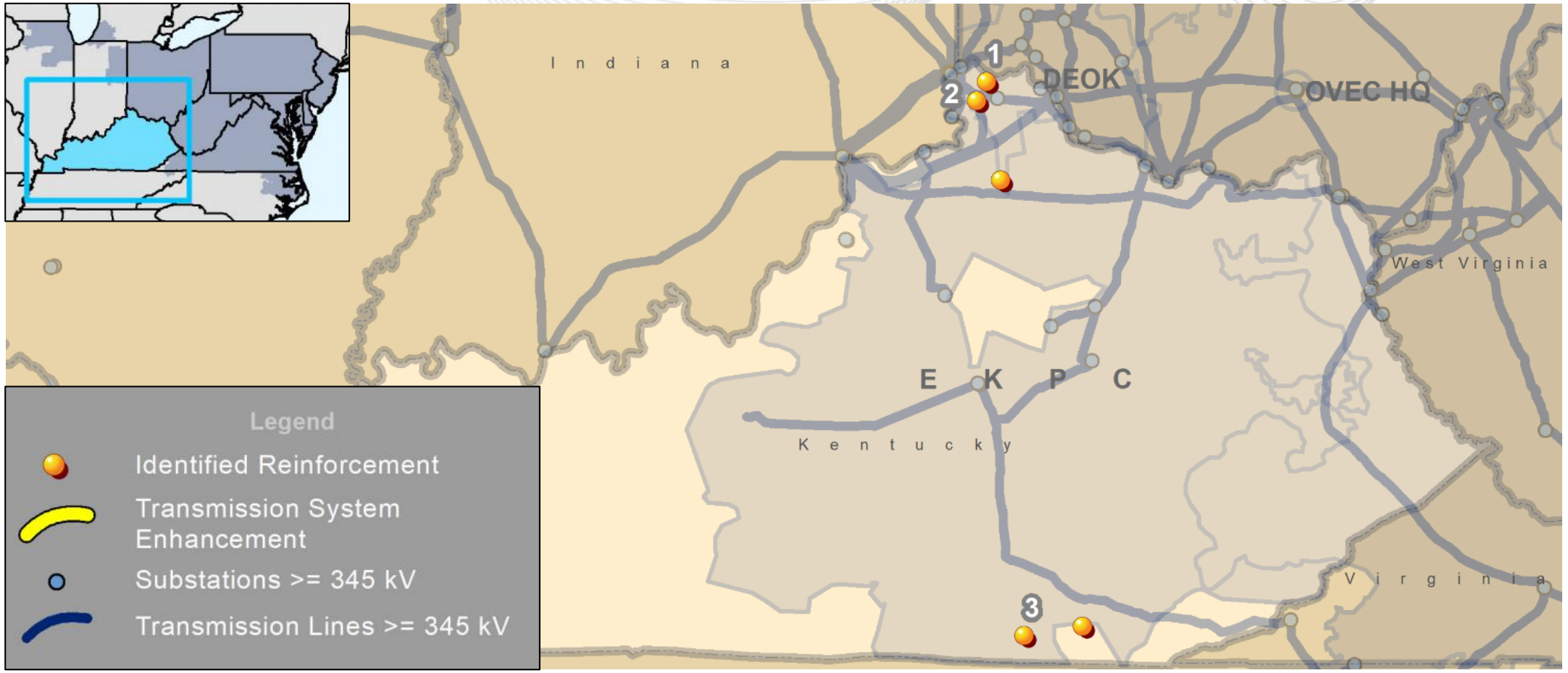
(Greater than $5 million)

Kentucky 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.

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

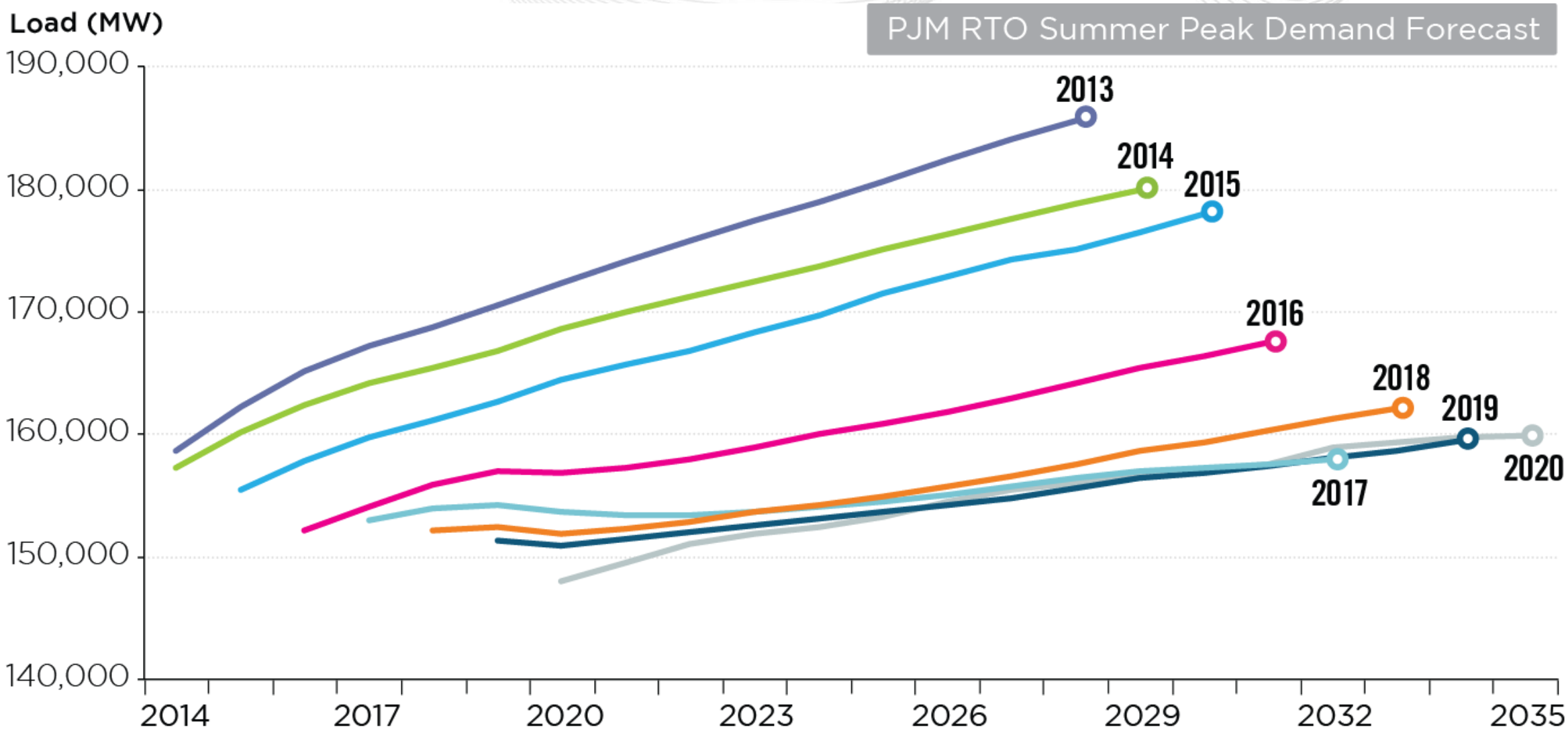
(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	**s1782**	Install a new 138 kV, three-breaker ring bus substation, Woodspoint. Install a new 138 kV, six-breaker ring bus, Aero, near Amazon Prime Hub. Install new 138 kV lines from Woodspoint to Aero, and from Aero to Oakbrook.	12/31/2020	$30.2	DEO&K	1/11/2019
2	**s1940**	Rebuild Boone County-Williamstown 69 kV line using 556.5 ACSR (28.5 miles).	12/1/2024	$15.8	EKPC	3/25/2019
3	**s1941**	Rebuild the KU Wofford-Whitley City 69 kV line using 556.5 ACSR conductor (20.7 miles)	12/31/2022	$13.0	EKPC	3/25/2019
	s1939	Rebuild Monticello 69/25/12.5 kV substation on new site with a 69 kV breaker station. Rebuild Homestead Tap partially on new R/W (1.3 miles).	12/1/2020	$5.5	EKPC	3/25/2019

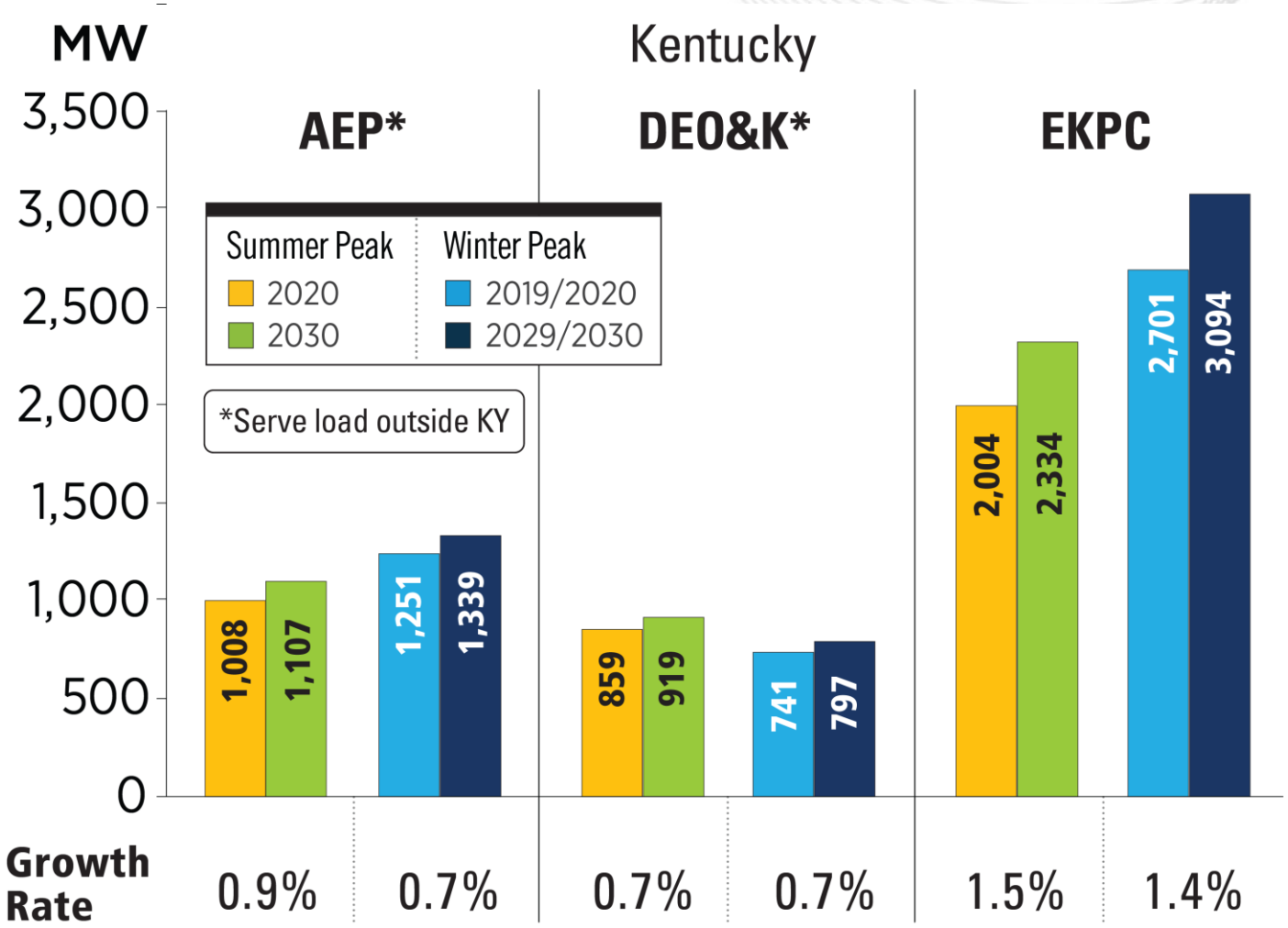
Planning
Load Forecast

PJM Annual Load Forecasts

(January 2020)



Kentucky – 2020 Load Forecast Report



PJM RTO Summer Peak

2020	2030
148,092 MW	157,132 MW

Growth Rate 0.6%

PJM RTO Winter Peak

2019/2020	2029/2030
131,287 MW	139,970 MW

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.

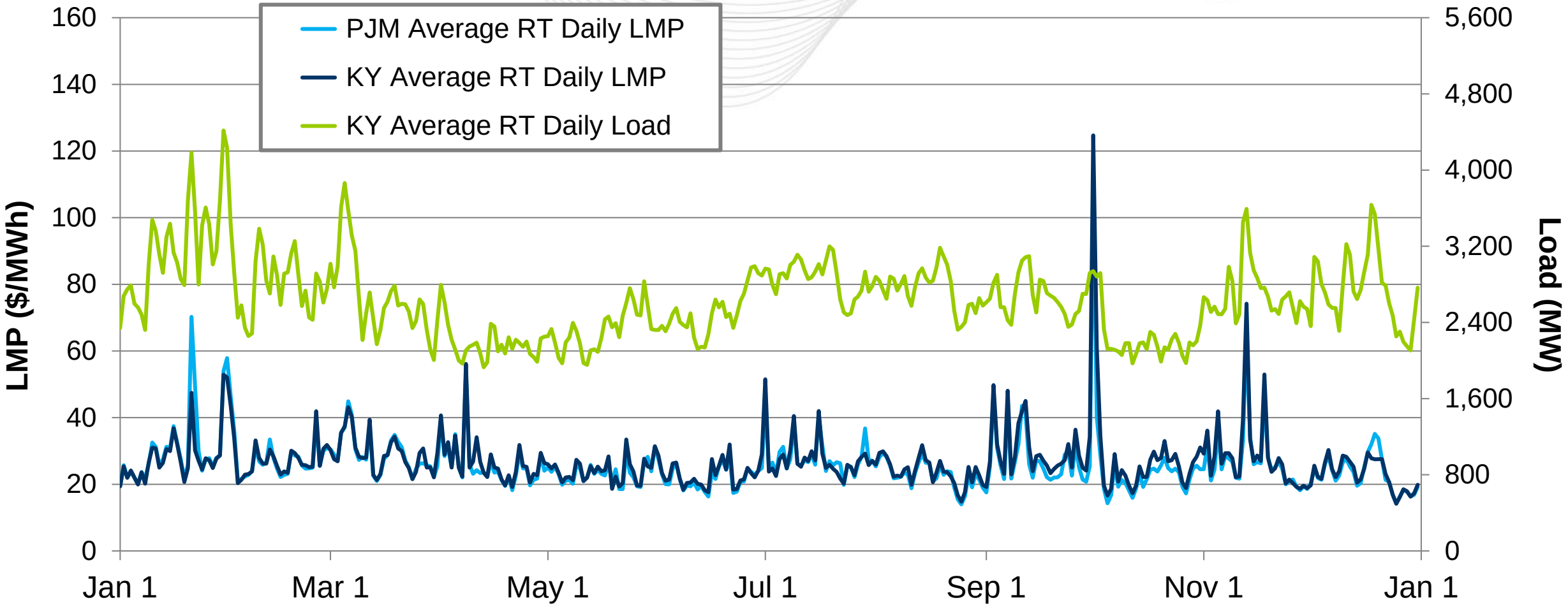
The Load Forecast was produced prior to COVID-19 and will be updated before the next Base Residual Auction to reflect changes in load patterns.

Markets

Market Analysis

Kentucky – Average Daily Load and LMP

(Jan. 1, 2019 – Dec. 31, 2019)

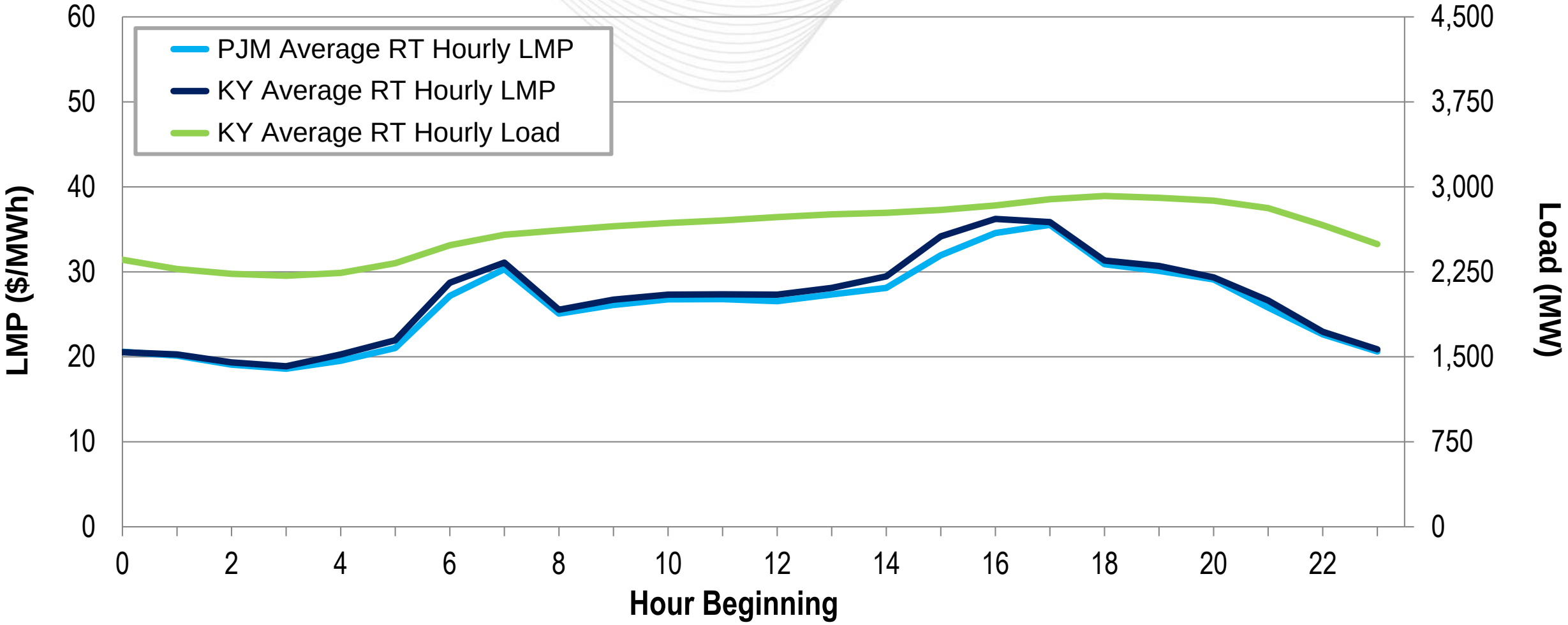


Note: The price spike in October reflects the Performance Assessment Interval event that occurred on October 2nd.

Kentucky – Average Hourly Load and LMP

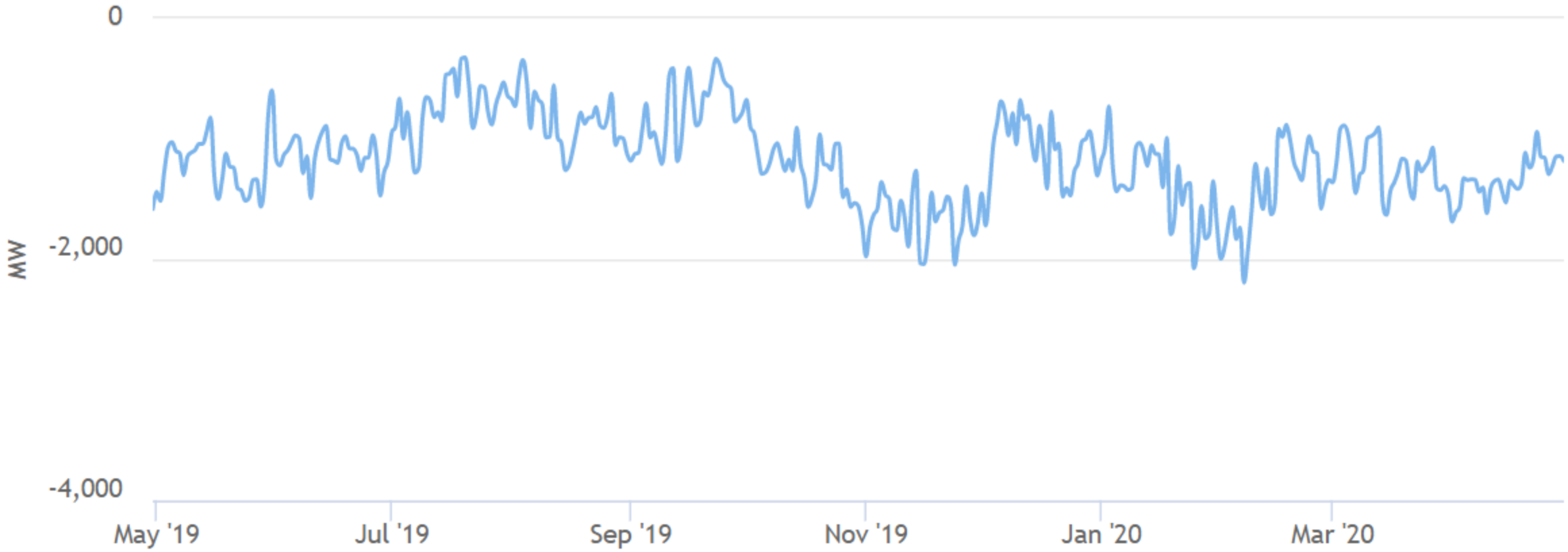
(Jan. 1, 2019 – Dec. 31, 2019)

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



Kentucky – Net Energy Import/Export Trend

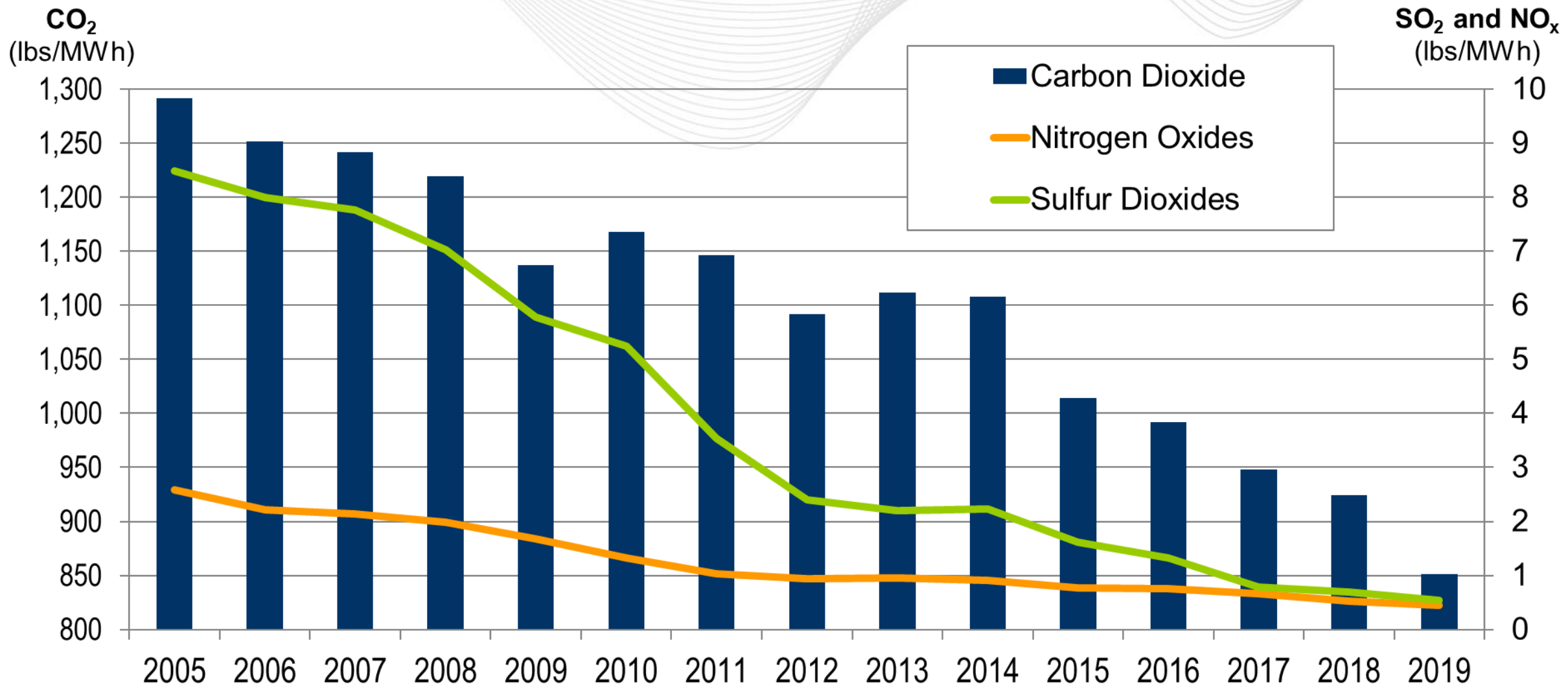
(May 2019 – April 2020)



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

Operations
Emissions Data

2005 – 2019 PJM Average Emissions



Kentucky – Average Emissions (lbs/MWh)

(Feb. 7, 2020)