Kentucky Energy Profile

7th Edition • 2019

Kentucky Energy and Environment Cabinet

Office of Energy Policy

eec.ky.gov

Executive Summary

The Commonwealth of Kentucky remains a leader in energy production and consumption. The Kentucky Energy and Environment Cabinet (EEC) offers the Kentucky Energy Profile 2019 to serve as an impartial point of reference for the general public and as a foundation for discussing Kentucky's energy future.

In 2019, after more than two centuries of commercial mining operations, Kentucky's domestic supply of coal remains a primary source of energy. Although coal is Kentucky's primary energy source, the state also produces oil and natural gas. Kentucky is the fifth-largest coal producing state in the United States, producing the coal needed to fuel 59 power plants in 13 states (pg. 52-53). Coal accounts for 75% of Kentucky's electricity portfolio (pg.16) and 39% of its total energy consumption (pg. 37-38). Although coal is Kentucky's primary energy source, it also produces small amounts of oil (pg. 55) and natural gas. Kentucky also has growing renewable energy resources and opportunities (pg. 60).

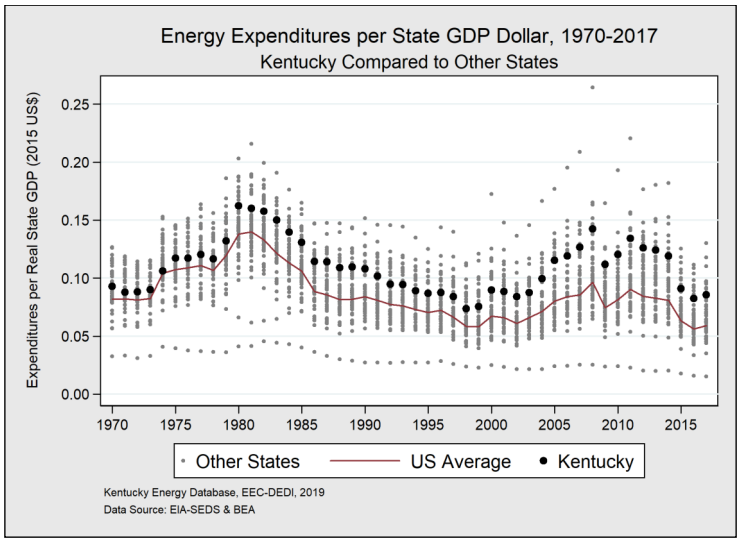
Kentucky's low energy costs stimulate economic growth by lowering the costs of doing business. Kentucky maintained the seventh-lowest industrial electricity price in the United States in 2019 and the lowest east of the Mississippi River (pg. 9-10). In 2018, 38% of the energy and electricity consumed in Kentucky went to manufacturing (pg. 16), which remains Kentucky's largest source of revenue and a leading source of employment (pg. 5). In addition to large flagship manufacturers, Kentucky is also home to other energy-intensive manufacturing processes and a growing commercial sector. Kentucky is also a transportation and logistics hub, which consume large amounts of transportation fuels to ship manufactured goods around the United States and the world.

While Kentucky maintains one of the lowest electricity prices in the United States (pg. 8-12), electricity prices do vary across the Commonwealth and between utilities. Electricity in Kentucky is supplied by 169 individual electricity generating units at 51 power plants across the state (pg. 20-21). Our utility power plants average 47 years of age, with our oldest hydroelectric station being built in 1925 and newest natural gas combined cycle units coming online in 2015 and 2016. Electricity is sold by six major electric utilities and dozens of smaller municipalities, as shown on the maps (pg. 14-15). Each major electric utility is profiled (pg. 24-35), and each coal-fired power plant (pg. 70-105). Kentucky's power plants have reduced emissions of pollutants such as sulfur dioxide and nitrogen oxides by more than 85% since 1995 (pg. 23), as shown on the profile for each utility and power plant.

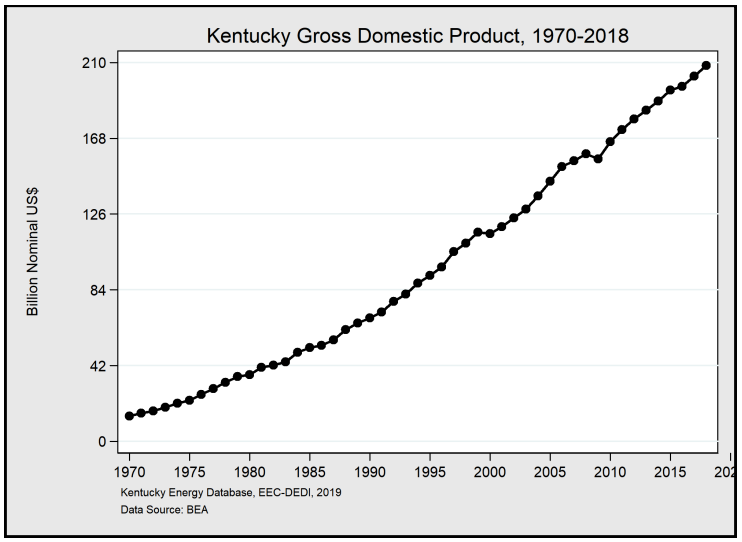
Direct all inquiries or feedback to Greg Bone (Greg.Bone@ky.gov). All of the data in this report are public information aggregated from a variety of state and federal government agencies, and are available at: https://eec.ky.gov/Energy/News-Publications/Pages/Kentucky-Energy-Profile.aspx

Table of Contents

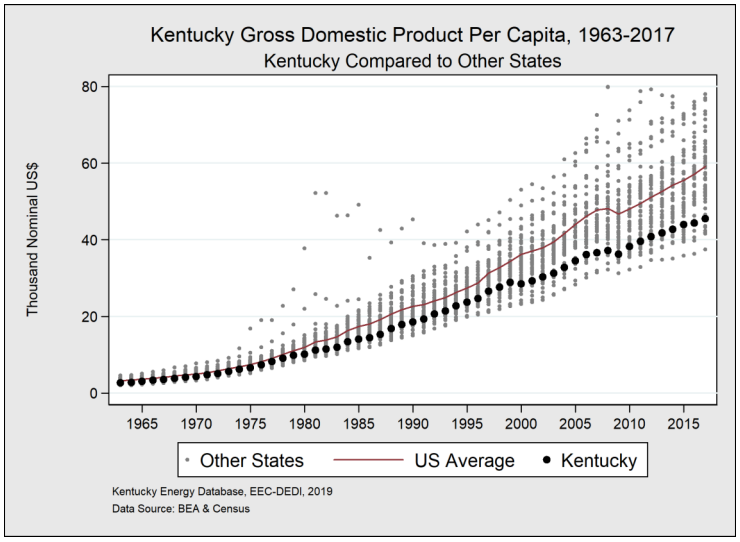
General Statistics



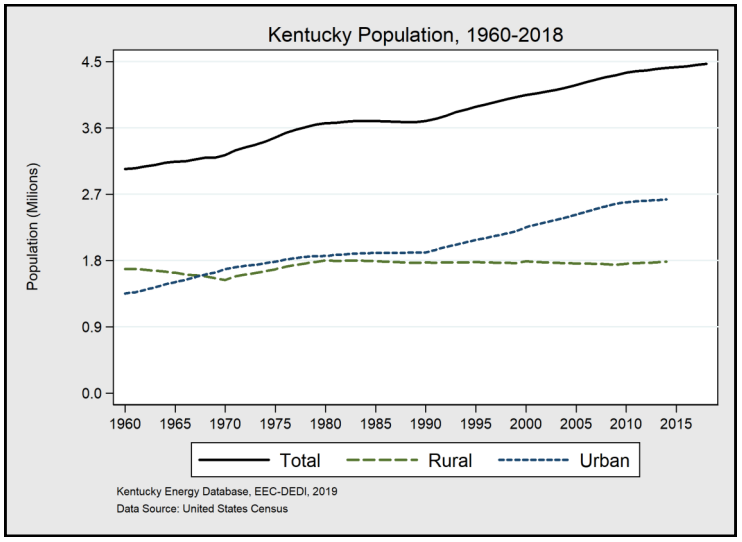
In 2017, on average $0.09 was spent in Kentucky on energy to produce one dollar of state Gross Domestic Product (GDP). Kentucky ranked 13th in energy intensity of GDP in 2017, and increased its intensity by 4% from 2016. Kentucky is home to large, energy-intensive, manufacturing operations which cause Kentucky's electricity intensity to be higher than other states.



In 2018, the Gross Domestic Product of Kentucky was $208 billion, an increase of 3.7% from 2017, or $5.8 billion. Kentucky has experienced steady growth in nominal GDP over the course of recorded history.

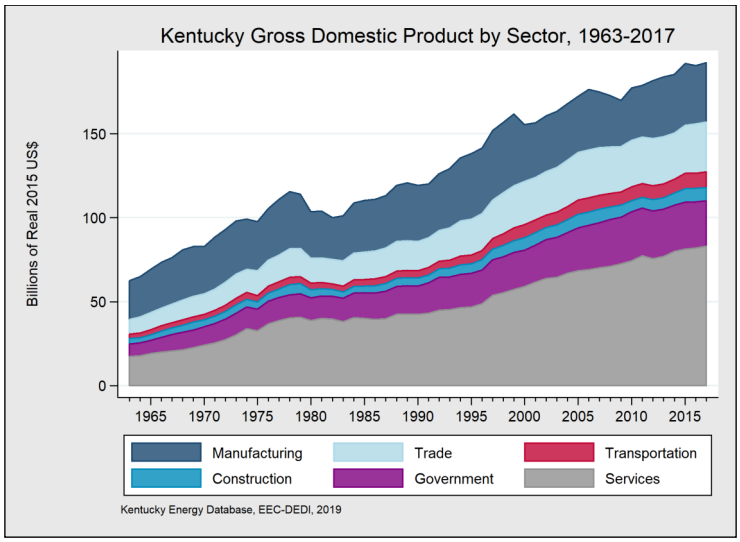


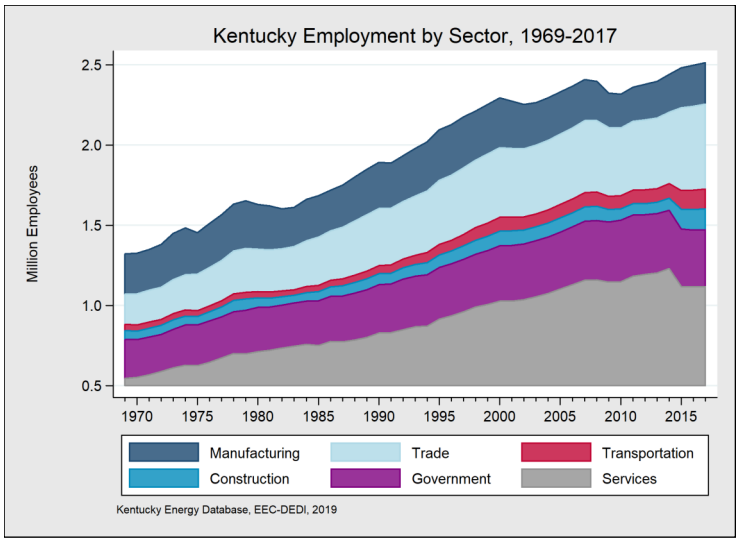
In 2017, Kentucky's GDP per capita was $45,464, an increase of 2.6% from 2016. Kentucky ranked 45th in the nation in terms of GDP per capita and below the national average of $59,140 in 2017.



In 2018, Kentucky's population was approximately 4.4 million people, an increase of 14,000 or 0.3% since 2017. From 1960 to 2018, Kentucky's urban population has doubled.

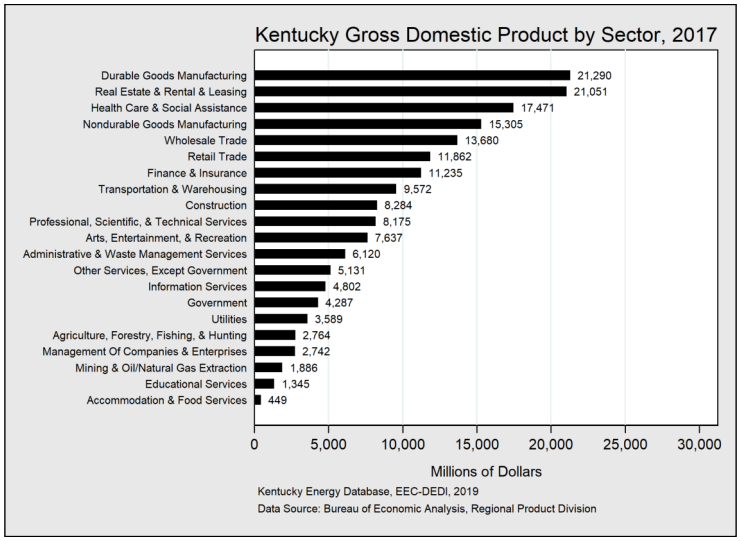
Kentucky's Economy

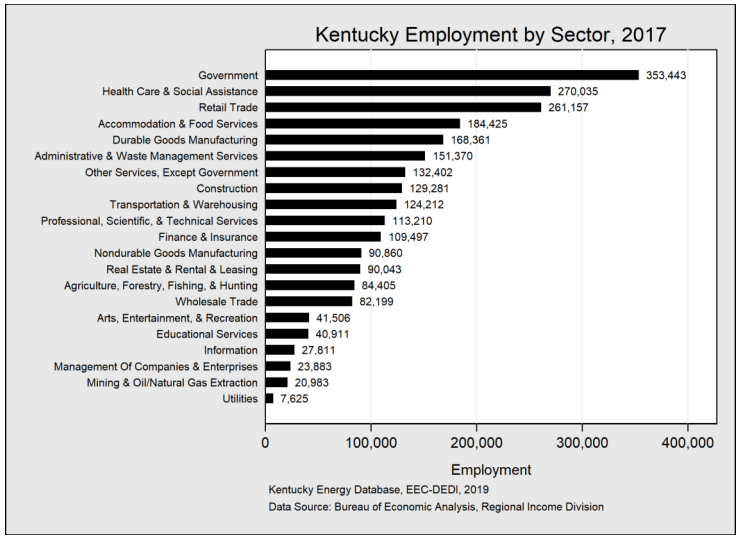




GDP from most sectors has risen gradually in the last 50 years, with output from the service sector rising the most. Manufacturing GDP has been relatively more volatile than that from other sectors, with peaks of output in 1999 and 2006 followed by significant decreases thereafter. After adjusting for inflation, manufacturing output in 2017 grew 5.7% from the previous year.

With the exception of manufacturing, employment in all sectors of the Kentucky economy remained stable until 2008, when most sectors experienced decreases in employment. Manufacturing employment, at 259 thousand, grew by 1.2% from the year prior, but remains 22% below peak manufacturing employment of 310 thousand in 2000.

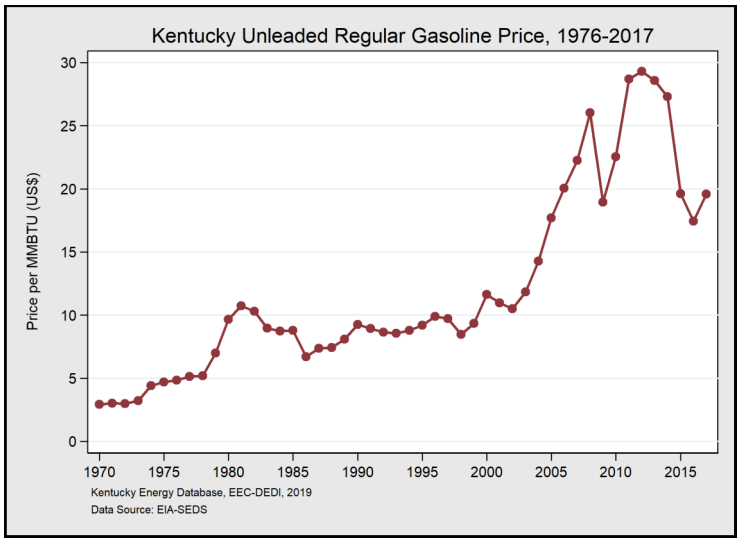




Durable goods manufacturing has the largest portion of state GDP with 10.5%, followed by real estate and rental leasing with approximately 10.5% of the total as well. Nondurable goods manufacturing contributes 7.6%.

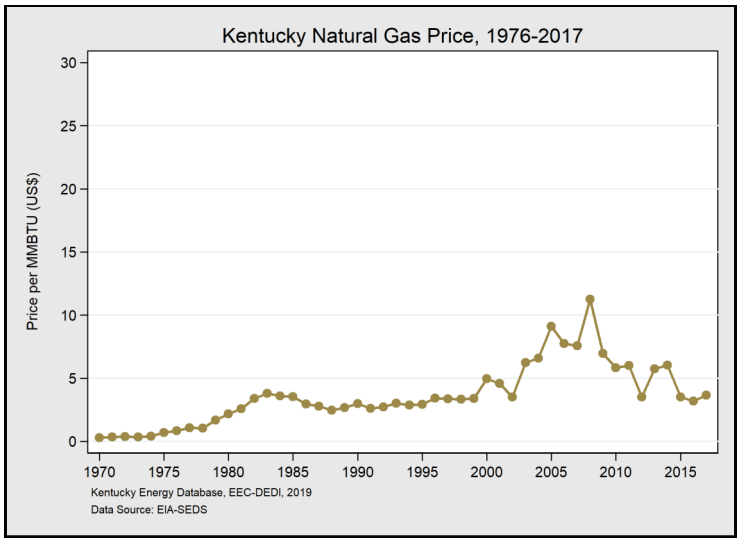
In 2017, the public sector was the single largest employer in Kentucky. Government employment was approximately 14% of total employment, healthcare was 10.7%, and retail trade 10.4%. Employment is defined as the average number of full -time and part-time jobs where wages or salaries are paid.

Kentucky Commodity Prices



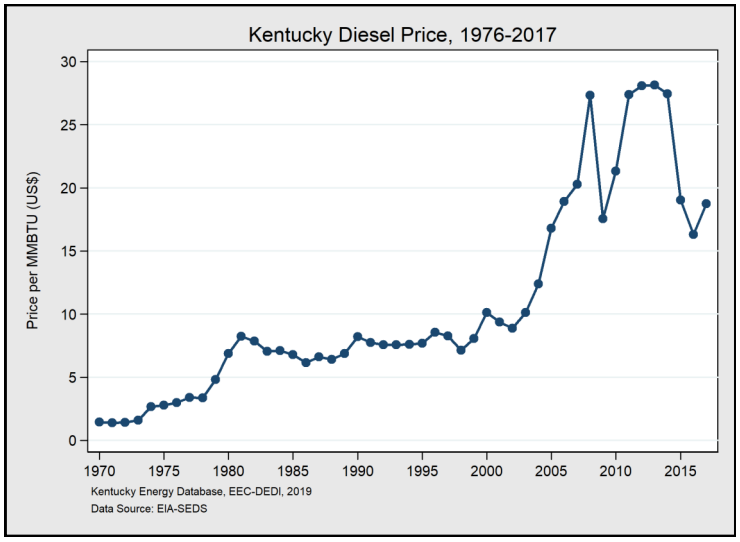
Fuel Type	U.S.$/MMBtu	% Change
Gasoline	19.57	+12.3%

Unleaded gasoline in Kentucky cost $19.57 per MMBtu in 2017, a 12.3% increase from the previous year.



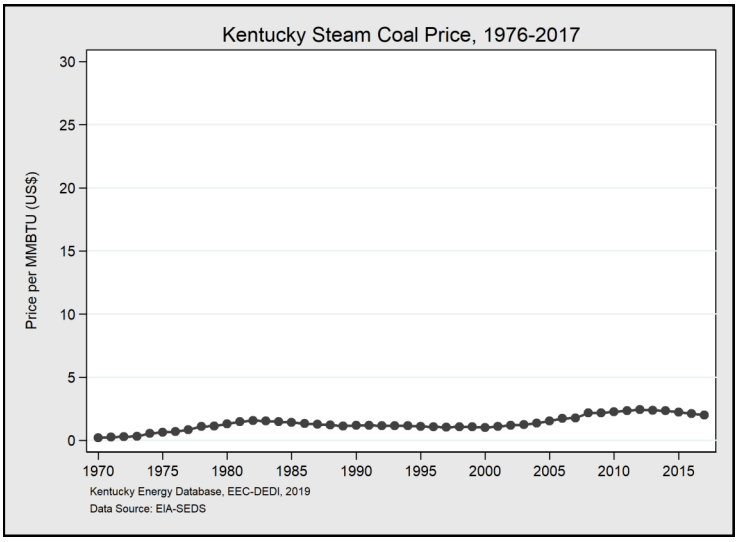
Fuel Type	U.S.$/MMBtu	% Change
Natural Gas	3.64	+14.1%

The average citygate price of natural gas in Kentucky in 2017 was $3.64 per million Btus, a 14.1% increase in the price of natural gas compared with 2016.



Fuel Type	U.S.$/MMBtu	% Change
Diesel	18.74	+15.0%

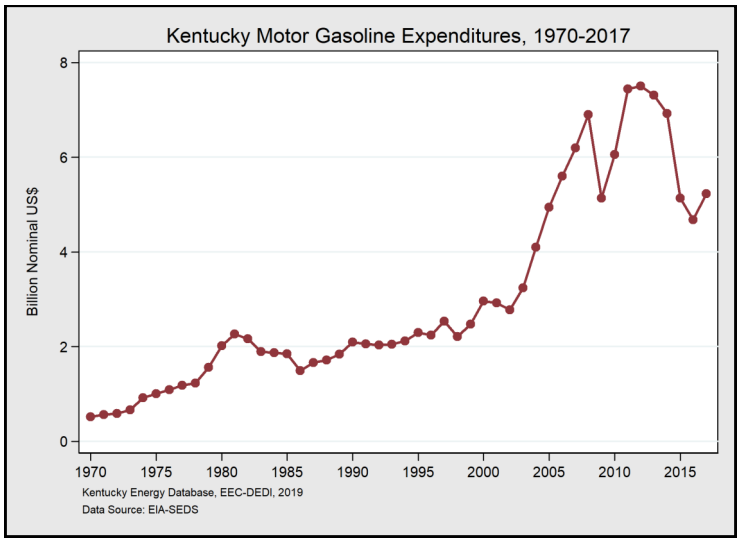
The average retail price of diesel in Kentucky in 2017 was $18.74 per million Btus, a 15% decrease in the price of diesel compared with 2016.



Fuel Type	U.S.$/MMBtu	% Change
Coal	1.99	-5.7%

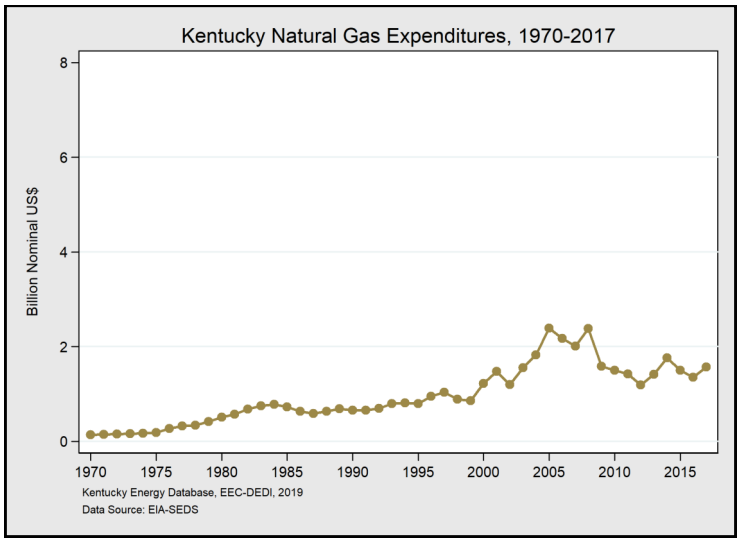
The average price of steam coal in Kentucky in 2017 was $1.99 per million Btus, a 5.7% decrease in the price of steam coal compared with 2016.

Kentucky Commodity Expenditures



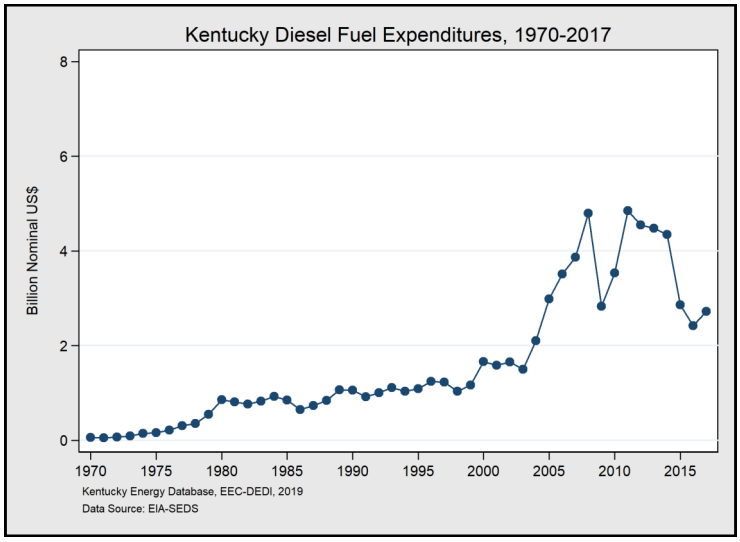
Fuel Type	Million U.S.$	% of Total
Gasoline	5,233	30.2%

Gasoline expenditures in Kentucky were approximately $5.2 billion in 2017; a 11.8% increase in gasoline expenditures compared with 2016, and accounted for 30% of energy expenditures in the state.



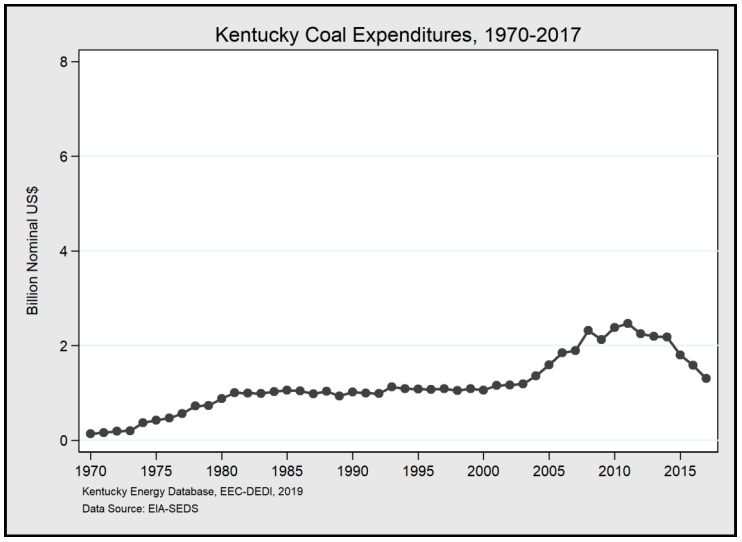
Fuel Type	Million U.S.$	% of Total
Natural Gas	1,507	9%

Total natural gas expenditures in Kentucky were approximately $1.5 billion in 2017; a 16.2% increase in natural gas expenditures compared with 2016, and accounted for 9% of energy expenditures in the state.



Fuel Type	Million U.S.$	% of Total
Diesel	2,861	16%

Approximately $2.8 billion was spent on diesel in Kentucky in 2017, a 12.5% increase in diesel expenditures compared with 2016, and accounted for 16% of energy expenditures in the state.



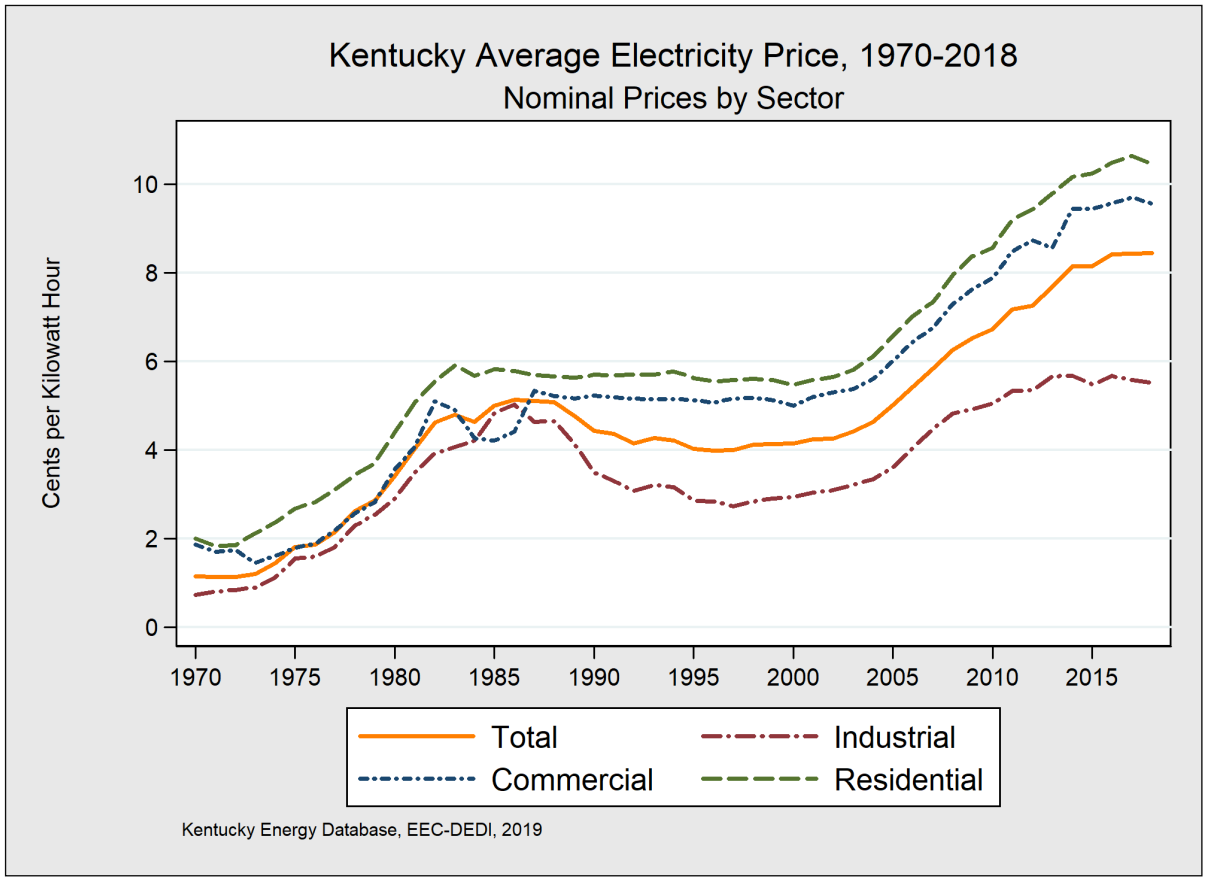
Fuel Type	Million U.S.$	% of Total
Coal	1,303	7.5%

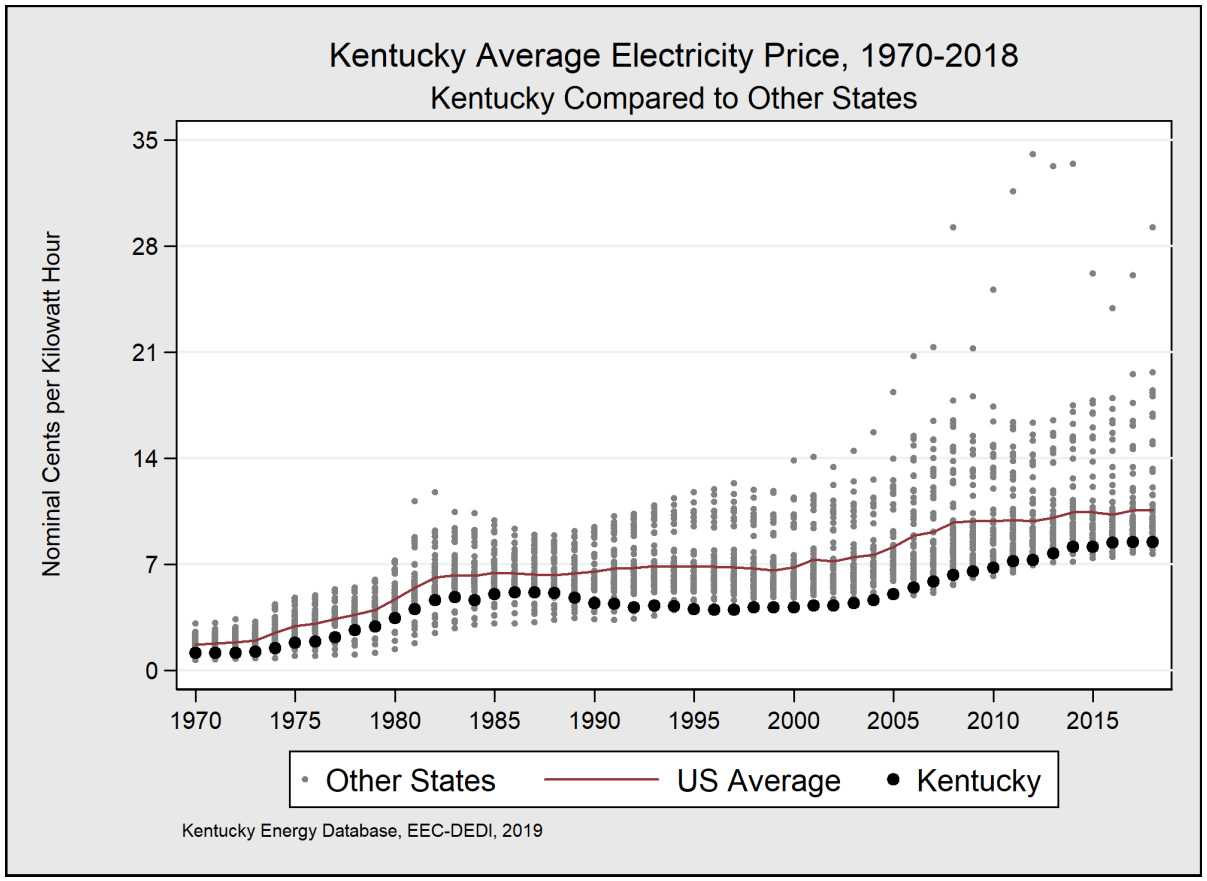
Coal expenditures in Kentucky were approximately $1.3 billion in 2017. Spending on coal decreased by 17.8% from 2016 and accounted for 7.5% of energy expenditures in the state.

Average Price of Electricity by State

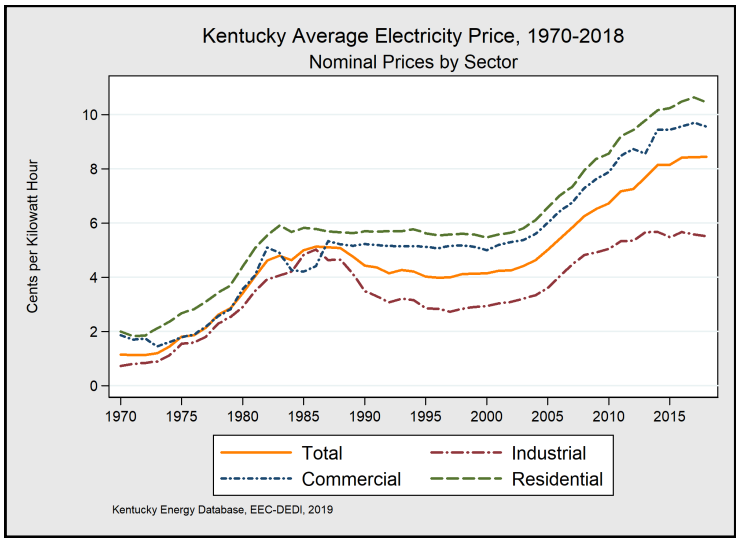
Rank	State	Primary Generation Source	2018 Industrial Price (Cents/kWh)	2018 Total Price (Cents/kWh)	Inflation Adjusted 1 Year Change	Inflation Adjusted 5 Year Change
1	Louisiana	Natural Gas	5.35	7.71	-3.4%	-1.0%
2	Arkansas	Coal	5.64	7.78	-8.1%	+8.9%
3	Washington	Hydroelectric	4.71	8.00	-1.6%	-0.7%
4	Oklahoma	Natural Gas	5.34	8.09	-3.7%	-9.0%
5	Wyoming	Coal	6.71	8.09	-4.6%	+7.6%
6	Idaho	Hydroelectric	6.47	8.17	-3.4%	-5.9%
7	Utah	Coal	5.90	8.21	-6.8%	+9.1%
8	Texas	Natural Gas	5.39	8.48	-1.2%	-10.2%
9	Kentucky	Coal	5.68	8.52	-3.0%	-5.8%
10	Nevada	Natural Gas	6.10	8.67	-3.4%	-6.4%
11	West Virginia	Coal	6.40	8.72	-5.4%	-7.9%
12	Montana	Coal	5.19	8.84	-3.3%	-18.6%
13	Oregon	Hydroelectric	5.86	8.85	-1.9%	+0.1%
14	North Dakota	Coal	7.98	8.91	-0.9%	+7.8%
15	Iowa	Coal	6.45	8.92	-0.3%	+3.6%
16	Nebraska	Coal	7.60	9.02	-3.0%	+2.5%
17	Mississippi	Natural Gas	6.00	9.24	-0.8%	+2.3%
18	North Carolina	Natural Gas	6.33	9.25	-0.1%	+2.8%
19	New Mexico	Coal	5.84	9.35	-4.8%	-11.0%
20	Virginia	Natural Gas	6.86	9.48	+0.8%	+5.1%
21	Tennessee	Nuclear	5.68	9.58	-1.0%	-7.9%
22	Illinois	Nuclear	6.80	9.60	-1.3%	+18.3%
23	Georgia	Natural Gas	6.00	9.62	-4.5%	-5.7%
24	Alabama	Natural Gas	6.01	9.63	-4.4%	2.2%
25	South Carolina	Nuclear	6.10	9.66	-5.4%	-5.9%
26	Indiana	Coal	7.38	9.75	-2.6%	+1.9%
27	Missouri	Natural Gas	7.22	9.93	-3.4%	-4.4%
28	Ohio	Coal	7.01	9.94	-1.4%	-4.3%
29	South Dakota	Hydroelectric	7.77	9.97	-3.2%	-10.9%
30	Colorado	Coal	7.47	10.02	-2.1%	+10.4%
31	Pennsylvania	Nuclear	6.84	10.10	-2.7%	-10.3%
32	Florida	Natural Gas	7.67	10.31	-3.4%	-6.2%
33	Minnesota	Coal	7.53	10.37	-1.4%	-10.9%
	United States	Natural Gas	6.92	10.53	-1.9%	-7.1%
34	Delaware	Natural Gas	7.95	10.55	-5.5%	+0.8%
35	Wisconsin	Coal	7.33	10.58	-4.0%	+0.2%
36	Kansas	Coal	7.60	10.72	-1.3%	-4.5%
37	Arizona	Natural Gas	6.55	10.85	-0.5%	-2.7%
38	Michigan	Coal	7.10	11.40	-1.3%	-4.5%
39	Maryland	Nuclear	8.23	11.57	-5.7%	+22.4%
	District of Columbia	Natural Gas	8.30	12.03	-0.5%	-3.0%
40	New Jersey	Natural Gas	10.07	13.23	-3.0%	+4.4%
41	Maine	Hydroelectric	9.32	13.44	+0.8%	-2.7%
42	New York	Natural Gas	6.02	14.83	-1.8%	-9.2%
43	Vermont	Hydroelectric	10.66	15.13	+1.2%	-3.0%
44	California	Natural Gas	13.20	16.58	+0.8%	-6.5%
45	New Hampshire	Nuclear	13.42	17.01	+2.7%	-3.9%
46	Rhode Island	Natural Gas	15.39	18.10	+7.6%	-1.8%
47	Connecticut	Natural Gas	13.77	18.41	+2.4%	+4.7%
48	Massachusetts	Natural Gas	14.89	18.50	+5.5%	+2.3%
49	Alaska	Natural Gas	17.10	19.36	-1.1%	-6.6%
50	Hawaii	Petroleum	26.10	29.18	+9.3%	-0.6%

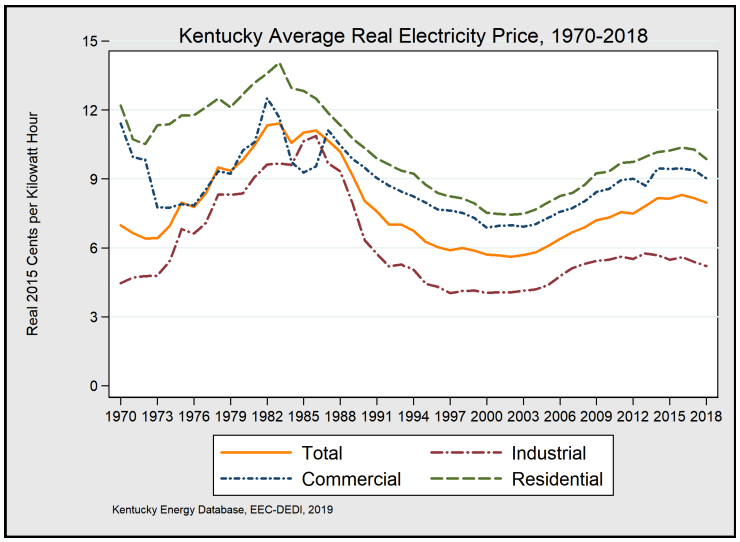
Average Price of Electricity by State





Kentucky Electricity Prices





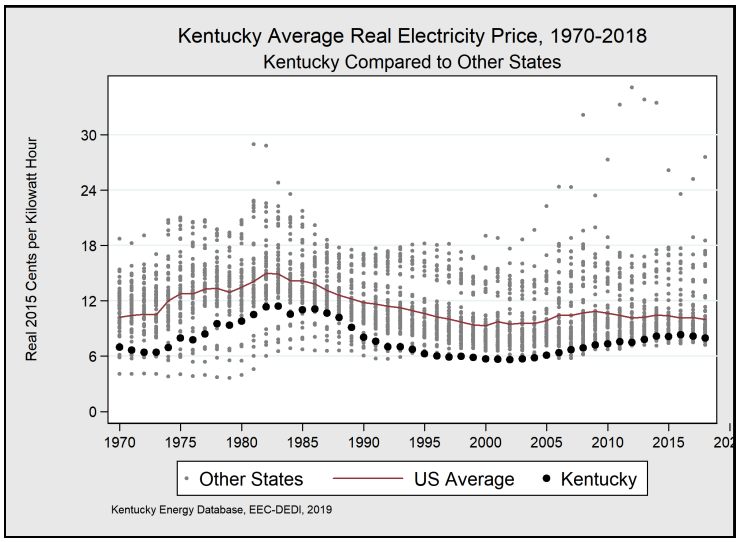
Sector	Nominal Cents/kWh	Since 2010
Average	8.52	+26.6%
Residential	10.60	+23.7%
Commercial	9.74	+23.6%
Industrial	5.68	+12.5%

Sector	Real* Cents/kWh	Since 2010
Average	8.04	+9.9%
Residential	10.00	+7.4%
Commercial	9.19	+7.3%
Industrial	5.36	-2.3%

*Real 2015 $US

Retail electricity rates are set by either the PSC, the owner or board governing a municipal utility, or TVA. Rates are generally established to cover the operating expenses and the capital costs of the utilities to maintain generation infrastructure and supply electricity. Operating expenses typically include personnel costs, fuel costs, generation costs, and maintenance costs. Capital costs typically include the costs to construct facilities, environmental equipment, and transmission & distribution lines, service the outstanding interest on debt, and earn a scheduled return on equity.

In 2018, the average price of electricity across economic sectors in Kentucky was 8.52¢ per kilowatt-hour. This average price ranked Kentucky electricity prices the ninth lowest in the country. The residential sector paid the highest price for electricity at 10.60¢ per kilowatt-hour, followed by the commercial sector at 9.74¢ per-kilowatt hour, and the industrial sector at 5.68¢ per kilowatt-hour, the seventh lowest in the country. Since 1970, the average price of electricity in Kentucky has been among the lowest in the United States and well below the national average.



In inflation-adjusted dollars, the price of electricity in Kentucky actually decreased from 1980 through 2002. However, the real price of electricity in Kentucky in inflation-adjusted dollars has been increasing since 2002. A major factor driving real electricity prices in Kentucky up from 2002-2015 has been the rising price of steam coal used by electric utilities. Though since 2016, real electricity prices have trended downward.

Kentucky Utility Prices

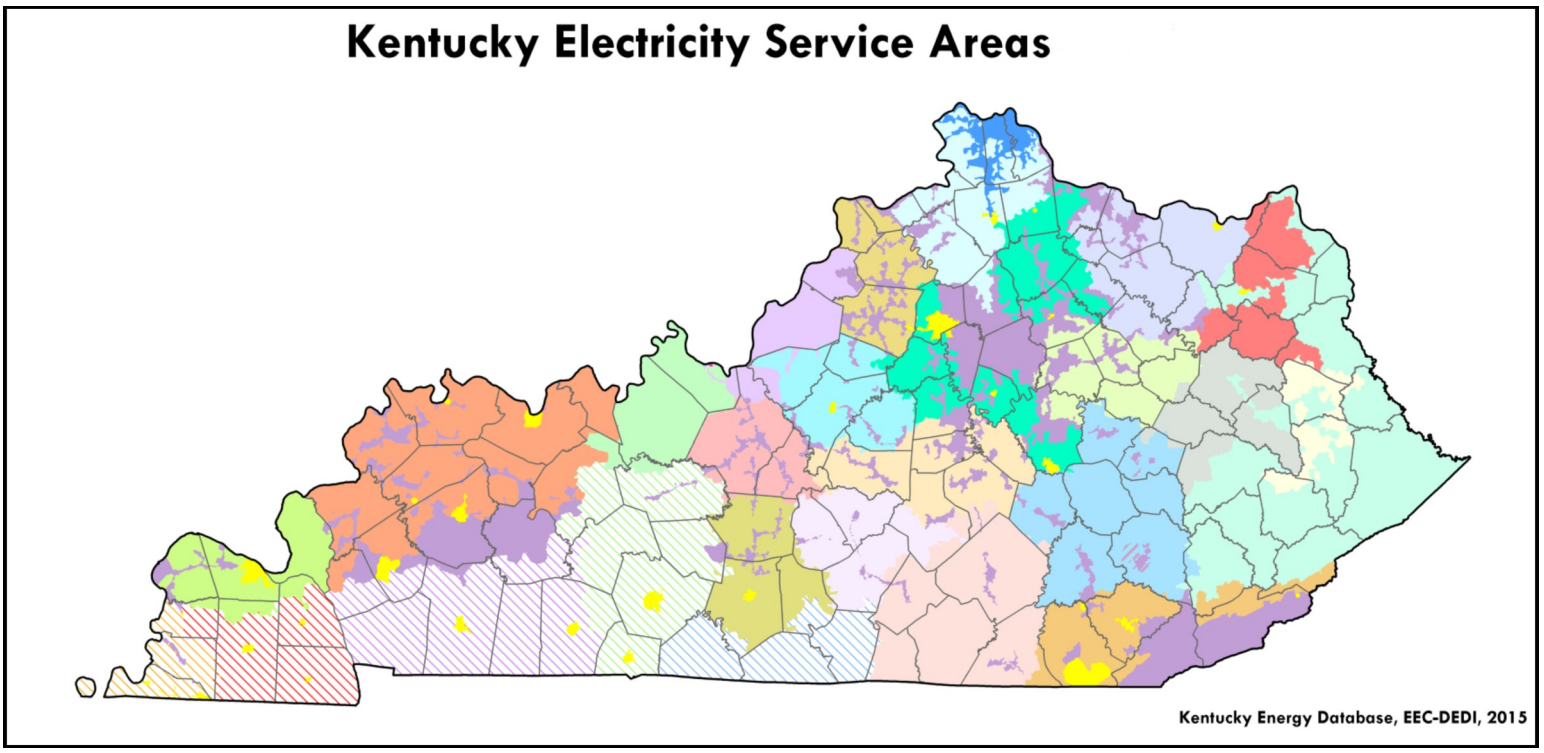
Utility	Average	Commercial	Industrial	Residential	Residential Bill
Barbourville	9.50	9.50	8.51	10.58	$104.74
Big Sandy Rural Elec Co-op	10.86	10.41	7.59	11.26	$136.79
Blue Grass Energy Co-op	9.25	9.90	5.91	10.45	$139.49
City of Bardstown	8.61	9.10	8.03	9.19	$107.16
City of Benton	11.06	11.35	8.03	12.02	$141.65
City of Berea Municipal Utility	8.23	8.62	7.15	8.84	$100.22
City of Bowling Green	9.45	9.64	6.28	10.44	$102.44
City of Frankfort	9.46	10.13	8.59	10.43	$118.78
City of Franklin	8.84	11.20	6.33	11.19	$129.04
City of Fulton	10.17	10.92	7.62	11.51	$121.73
City of Glasgow	10.19	10.59	6.99	12.10	$120.35
City of Hickman	13.29	14.38	-	12.51	$132.85
City of Hopkinsville	9.54	11.20	4.96	10.75	$118.21
City of Jellico	10.89	12.53	-	10.56	$121.18
City of Mayfield Plant Board	11.14	11.06	8.82	11.77	$114.12
City of Murray	9.53	9.94	6.10	11.99	$113.40
City of Nicholasville	8.41	10.01	7.57	8.71	$100.17
City of Owensboro	11.91	10.82	11.02	14.23	$120.60
City of Paducah	13.16	13.21	9.21	13.68	$131.00
City of Princeton	14.86	16.33	14.54	14.87	$149.09
City of Russellville	9.53	11.01	7.20	10.52	$107.84
Clark Energy Coop, Inc.	10.84	10.91	8.34	10.90	$128.66
Cumberland Valley Electric, Inc.	9.82	11.10	7.66	10.40	$124.33
Duke Energy Kentucky	8.46	8.39	7.17	9.21	$93.47
Farmers Rural Electric Co-op	9.75	10.11	7.26	10.60	$122.76
Fleming-Mason Energy Co-op, Inc.	7.39	8.63	5.33	10.40	$116.39
Grayson Rural Electric Co-op	11.92	11.10	6.29	13.10	$136.93
Henderson City	7.24	8.22	6.30	8.70	$94.67
Inter County Energy Co-op	10.16	9.77	6.64	10.79	$132.83
Jackson Energy Co-op	11.15	10.44	6.99	11.72	$144.00
Jackson Purchase Energy Corporation	11.45	10.47	11.46	11.96	$152.76
Kenergy Corp	5.36	11.93	4.21	12.47	$165.23

Source : EIA Form 861Monthly (Formerly EIA Form 826). Utility Sales and Revenue Tables.

Kentucky Utility Prices

Utility	Average	Commercial	Industrial	Residential	Residential Bill
Kentucky Power	9.93	12.37	6.67	12.10	$161.27
Kentucky Utilities	8.25	9.32	5.88	9.70	$118.34
Licking Valley RECC	11.21	10.89	8.06	11.50	$113.18
Louisville Gas & Electric	9.01	9.20	6.46	10.32	$103.83
Madisonville Municipal	9.98	9.30	-	11.89	$104.67
Meade County RECC	12.30	12.27	-	12.31	$133.53
Nolin RECC	9.60	9.41	5.52	10.92	$139.47
Owen Electric Co-op	7.31	8.86	4.79	10.75	$127.36
Pennyrile Rural Electric Co-op	10.25	12.17	6.47	11.44	$153.83
Salt River Electric Co-op	8.58	8.91	6.40	9.13	$121.66
Shelby Energy Co-op	9.17	8.93	6.60	10.97	$142.99
South Kentucky RECC	9.75	12.18	7.94	10.35	$117.23
Taylor County RECC	8.36	8.95	4.62	9.56	$110.33
Tennessee Valley Authority	4.50	7.27	4.22	-	-
Tri-County Elec Member	9.53	9.10	5.69	11.06	$140.08
Warren Rural Elec Coop Corp	9.07	11.35	6.13	10.61	$151.01
West Kentucky Rural E C C	11.79	13.69	5.87	11.92	$155.49

Kentucky Electric Service Areas

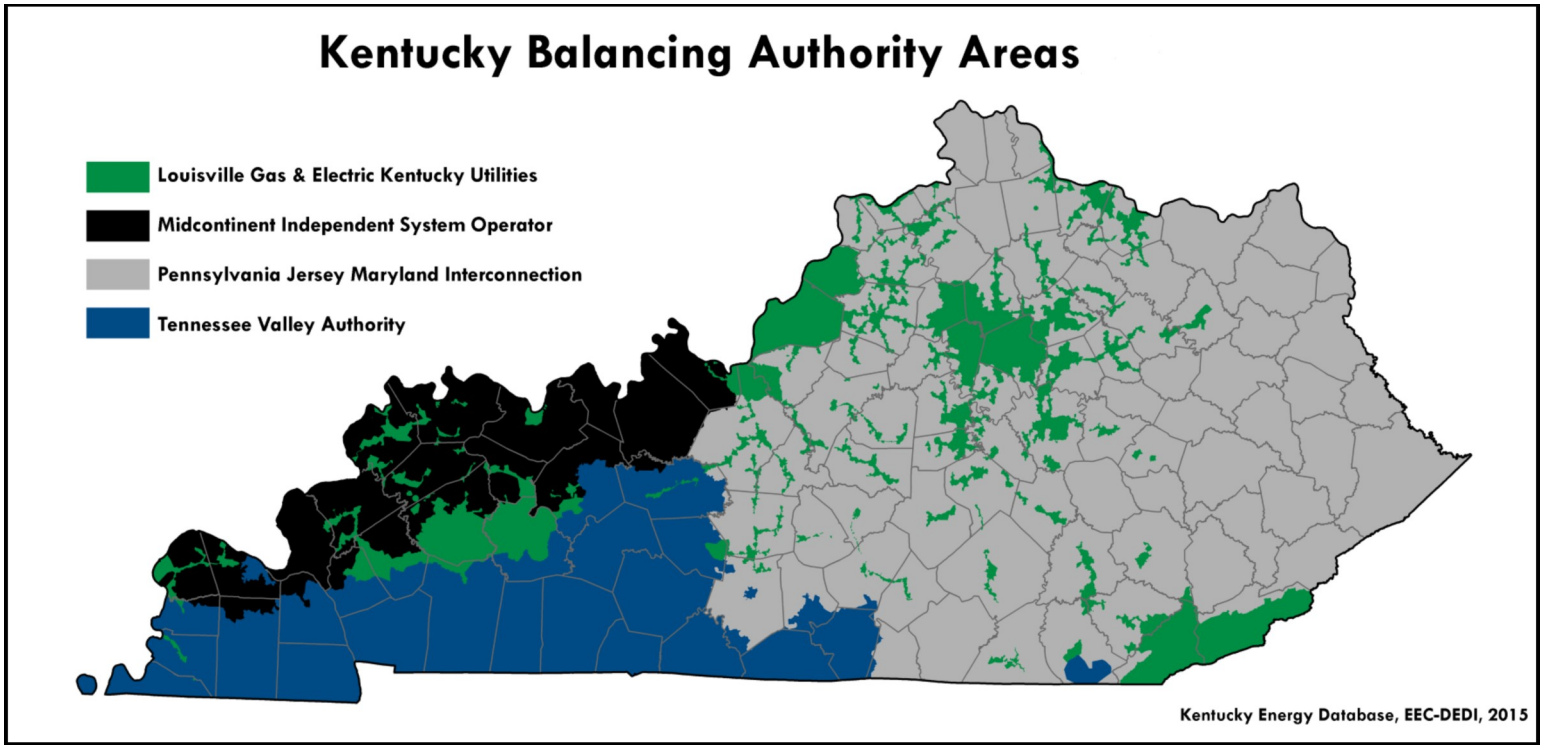


All Municipal Utilities		Kentucky Utilities*	
Big Sandy RECC†		Licking Valley RECC†	
Blue Grass ECC†		Louisville Gas & Electric*	
Clark ECC†		Meade County RECC‡	
Cumberland Valley RECC†		Nolin RECC†	
Duke Energy Kentucky*		Owen ECC†	
Farmers RECC†		Pennyrile RECC§	
Fleming-Mason ECC†		Salt River ECC†	
Grayson RECC†		Shelby ECC†	
Gibson Electric Members Corp RECC§		South Kentucky RECC†	
Inter-County ECC†		Taylor County RECC†	
Jackson ECC†		Tri-County Electric Member Corporation§	
Jackson Purchase Energy Corporation ‡		Warren RECC§	
Kenergy Corporation‡		West Kentucky RECC§	
Kentucky Power*			

The Commonwealth of Kentucky is divided into certified electric service territories as determined by the Kentucky Public Service Commission (KRS 278.016). Within these certified electric service areas, electricity service and delivery is restricted to one electricity provider per service area. Providers of electricity in Kentucky are either Investor-Owned Utilities (IOU), Municipal Utilities, Electric Cooperative Corporations (ECC), or Rural Electric Cooperative Corporations (RECC). Municipal Utilities and TVA Distributors are not subject to Kentucky Public Service Commission regulation.

*Investor-Owned Utilities
†EKPC Owner-Member Cooperative
‡BREC Member Cooperative
§TVA Distributor

Kentucky Balancing Authority Areas



Local electricity grids are interconnected to form larger networks for reliability and commercial purposes. The actual operation of the electric system is managed by entities called balancing authorities. A balancing authority ensures, in real time, that power system demand and supply are finely balanced. Balancing authorities are responsible for maintaining operating conditions under mandatory reliability standards issued by the North American Electric Reliability Corporation and approved by the U.S. Federal Energy Regulatory Commission.

Retail Service:

Electricity in Kentucky is provided to customers by one of the following types of entities that have the exclusive right to serve the customers within its territory:

- Retail electric suppliers that are regulated by the Kentucky Public Service Commission (PSC) include: Investor-Owned Utilities (IOUs) and Rural Electric Cooperative Companies (RECCs)
- Municipal Utilities
- The Tennessee Valley Authority (TVA) and its associated distributors within the state

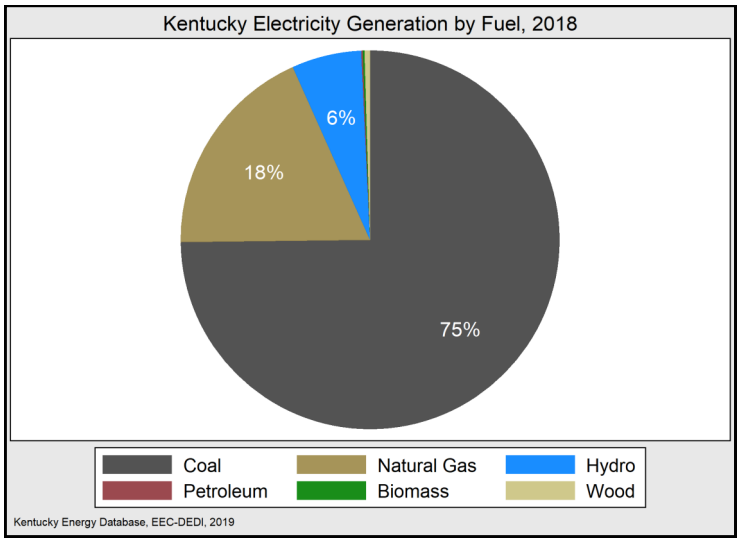
Electric suppliers fall into two categories: IOUs and RECCs. There are four investor-owned companies in Kentucky: Duke Energy Kentucky, Kentucky Power Company (aka. American Electric Power), Kentucky Utilities (KU), and Louisville Gas and Electric (LG&E). Each of these companies generates or purchases the power required to meet its respective customers' electricity demands. RECCs are owned by their individual ratepayers and are non-profit entities that reinvest profits into energy infrastructure or return profits to ratepayers.

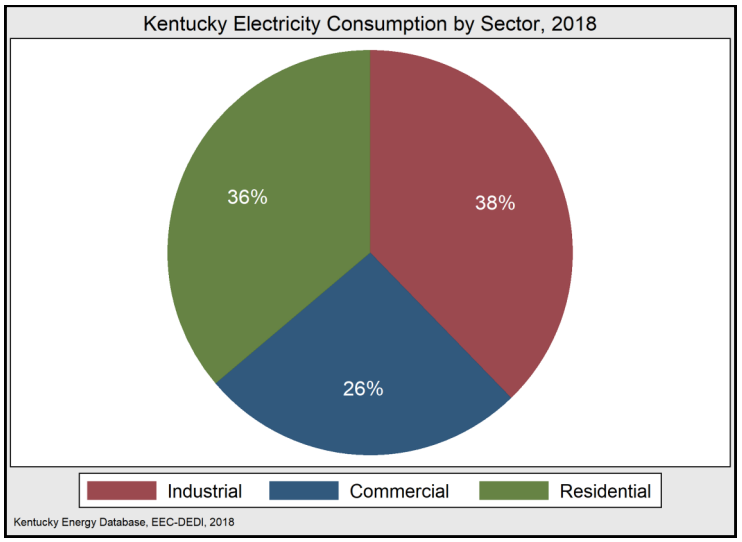
There are 24 RECCs in the state, 19 RECCs that are regulated by the PSC. A distribution cooperative typically receives power from its respective generation and transmission cooperative at a substation in the distributor's service territory. Five RECCs and ten municipal utilities purchase electricity from TVA. These RECCs and municipalities then resell and distribute electricity to customers within their service territories. TVA also directly serves several large industrial customers within Kentucky.

Eighteen municipal electric suppliers purchase power from various sources or self-generate electricity by owning and/or operating generating facilities.

*The Tennessee Valley Authority sets the wholesale rate for electricity supplied to its distributors, and approves the distributors' retail rate.

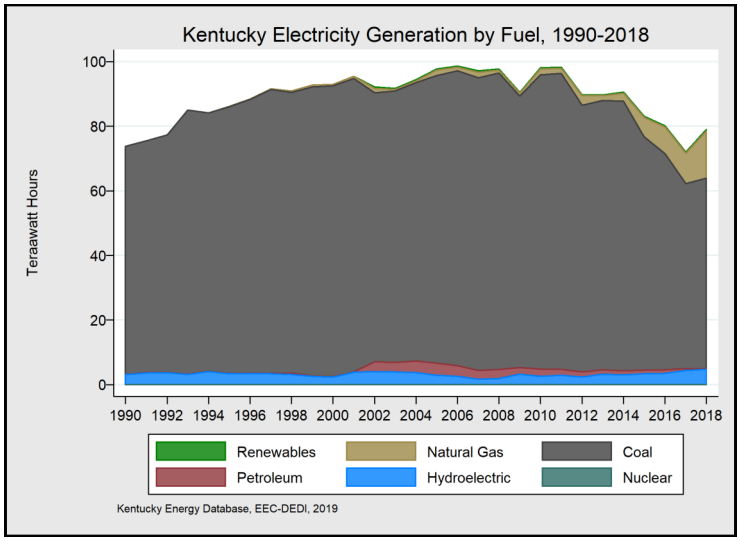
Kentucky Electricity

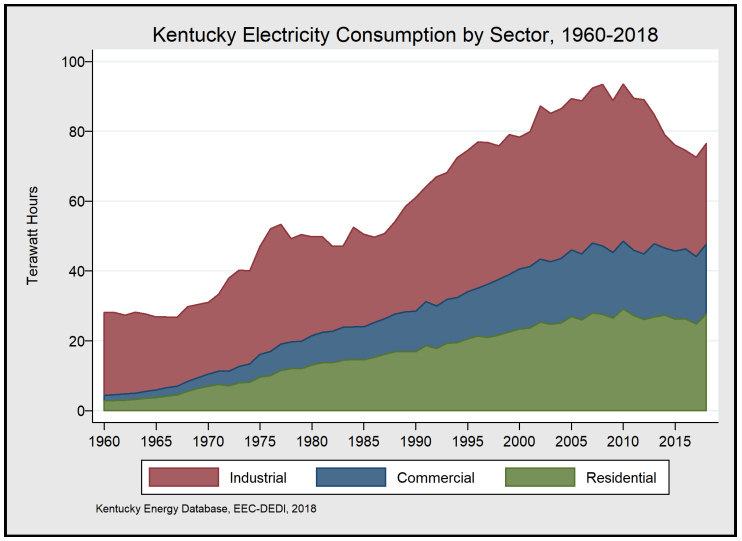




Fuel Type	Gigawatt Hours	1 Year Change
Total	79,191	+9.8%
Coal	59,168	+3.4%
Hydro	4,723	+5.8%
Natural Gas	14,606	+55.5%
Petroleum	88	-83.0%
Wood & Biomass	375	+7.9%

Sector	Gigawatt Hours	1 Year Change
Total*	76,611	+5.5%
Industrial	28,917	+1.6%
Residential	27,713	+11.4%
Commercial	19,980	+3.6%



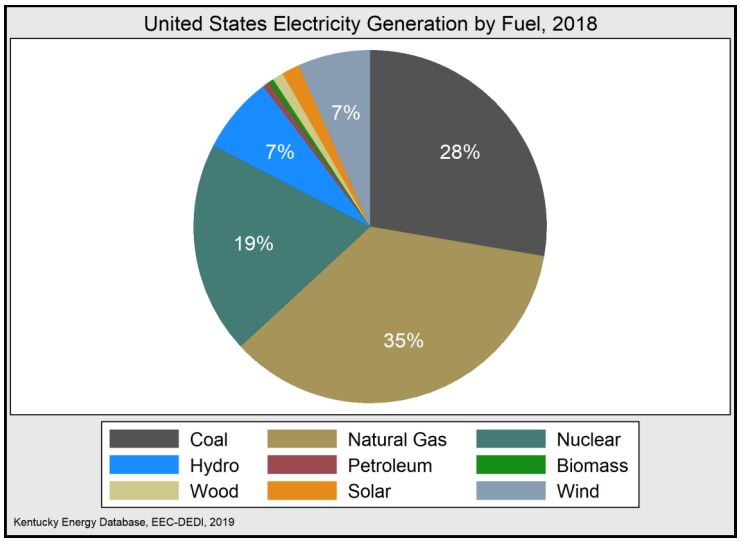


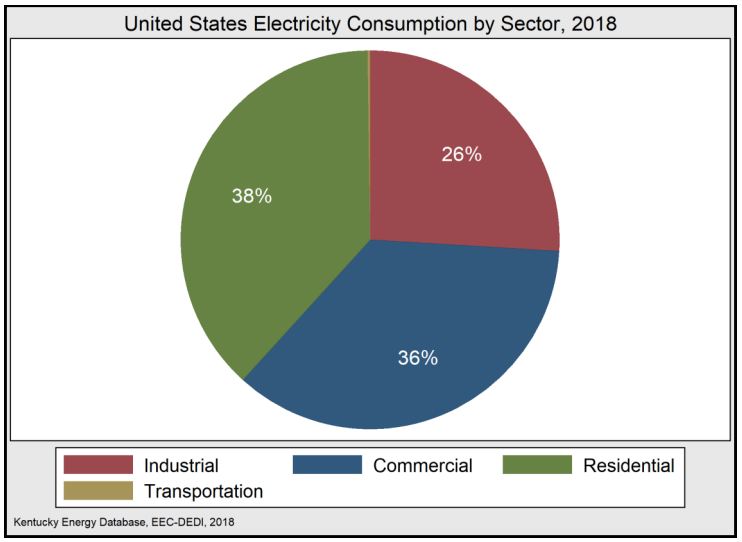
Of the electricity generated in Kentucky in 2018, 75% was derived through the combustion of coal. Coal-fired electricity generation decreased substantially. Natural gas facilities were the second-largest source of electricity. Hydroelectric power increased slightly and produced the third most of all fuels.

**The difference between generation and consumption are exports and transmission losses.*

Electricity consumption in Kentucky during 2018 totaled 76 terawatt-hours, an increase of 5.5% compared with 2017. The industrial sector remained a large consumer of electricity in Kentucky, representing 38% of total electricity consumption while the national average was 25% in 2018. The residential sector was the largest consumer of electricity with 37% of consumption, followed by the commercial sector with 27%. While the residential and commercial sector experienced growth in consumption, the industrial sector experienced an increase of 1.6%.

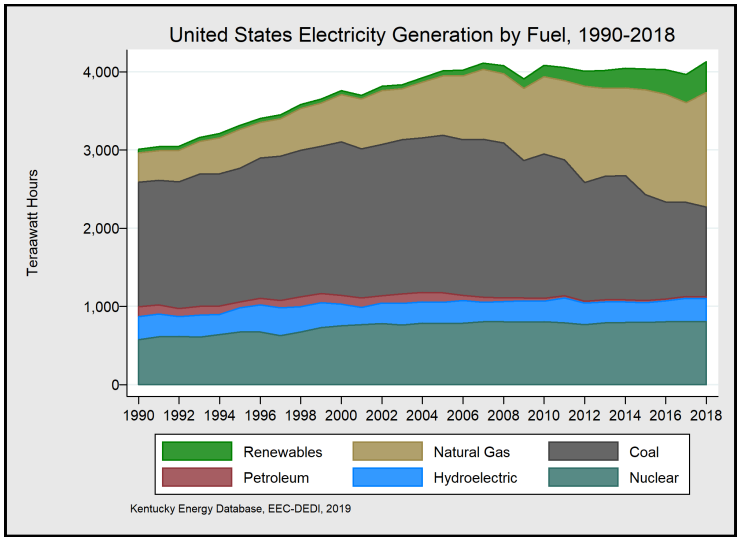
United States Electricity

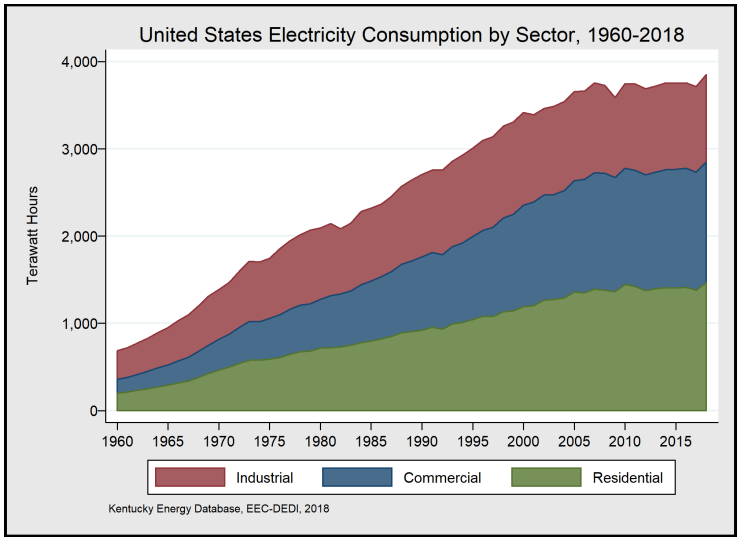




Fuel Type	Gigawatt Hours	1 Year Change
Total	4,177,810	+4.1%
Natural Gas	1,468,013	+15.3%
Coal	1,146,393	-5.1%
Nuclear	807,078	+0.3%
Hydro	291,724	-2.8%
Wind	274,952	+8.1%

Sector	Gigawatt Hours	1 Year Change
Total	3,860,119	+3.7%
Residential	1,469,096	+6.6%
Commercial	1,381,761	+2.1%
Industrial	1,001,597	+1.8%

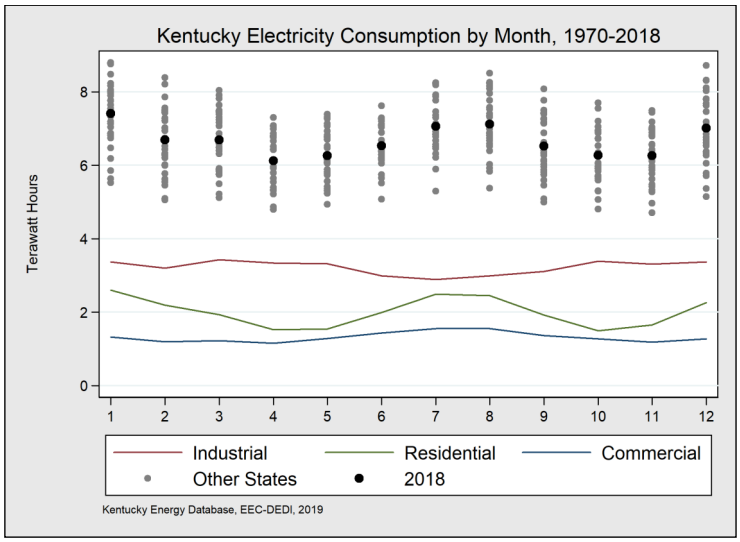




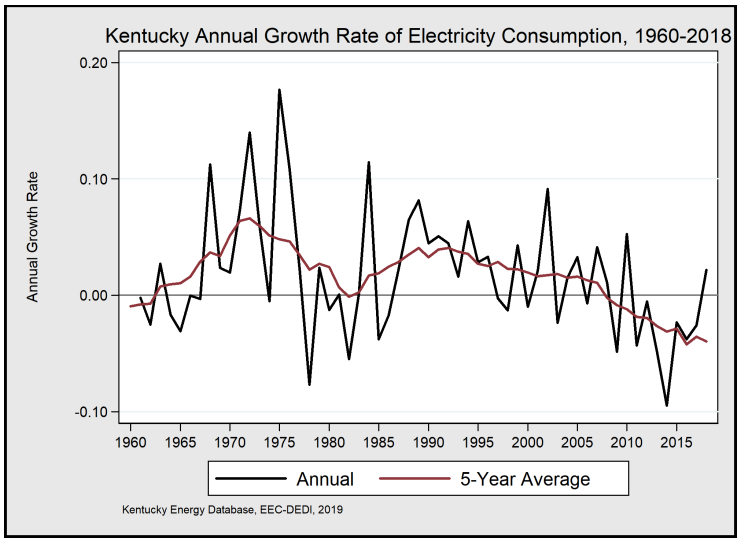
The United States generated more than four petawatt-hours in 2018, an increase of 4.1%. Electricity generation from natural gas became the largest source of electricity at 35% of total, and increased by 15.3% compared to 2017. Wind electricity generated 7% of total electricity requirements. Nuclear and hydroelectricity generation have remained relatively constant for decades, supplying 19% and 7% respectively.

Total electricity consumption increased by 3.7% in 2018 to 3.8 petawatt-hours. Nationally, residential consumers are the largest share of electricity demand, 38% in 2018. Residential, which is highly responsive to changes in weather, grew by 6.6% in 2018. Industrial demand increased by 3.2% to 1 terawatt-hours.

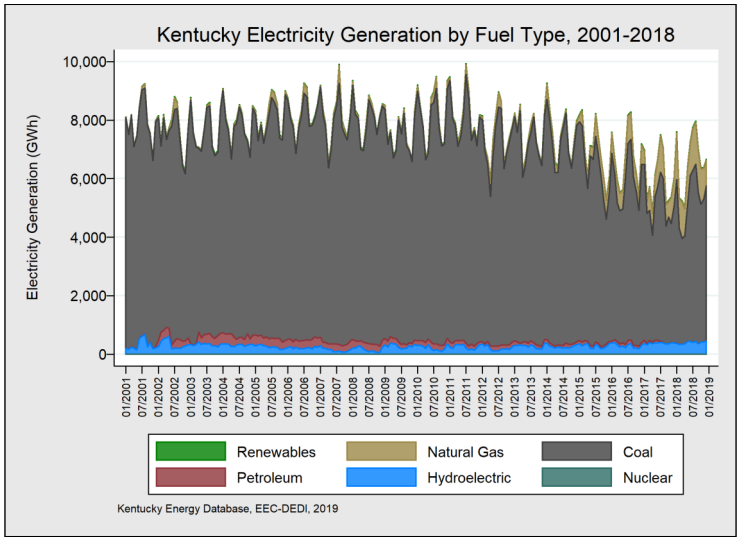
Kentucky Monthly Electricity



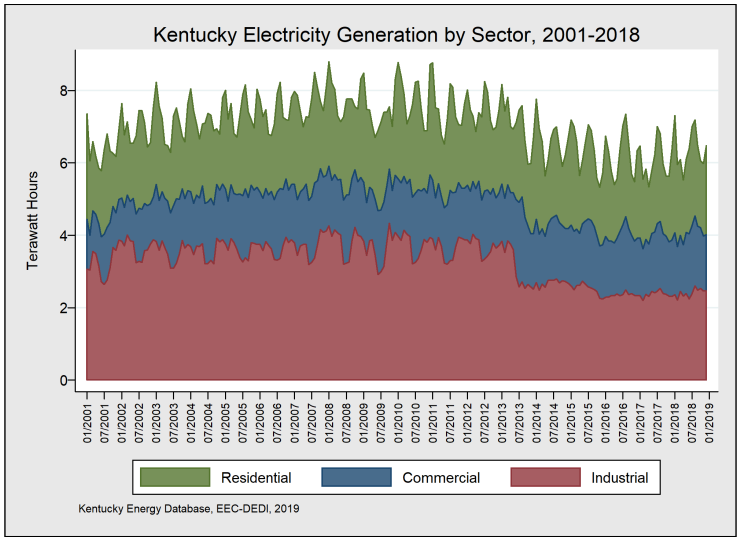
Seasonal fluctuations in Kentucky's electricity consumption are largely the result of the residential sector, which utilizes electricity for air conditioning in the summer and heating in the winter. On average, the highest demand for electricity in Kentucky occurs in summer and winter.



Kentucky electricity demand grew rapidly in the late 1960s to the early 1970s and again from the late 1980s to the early 1990s, but has decreased overall since 2008.

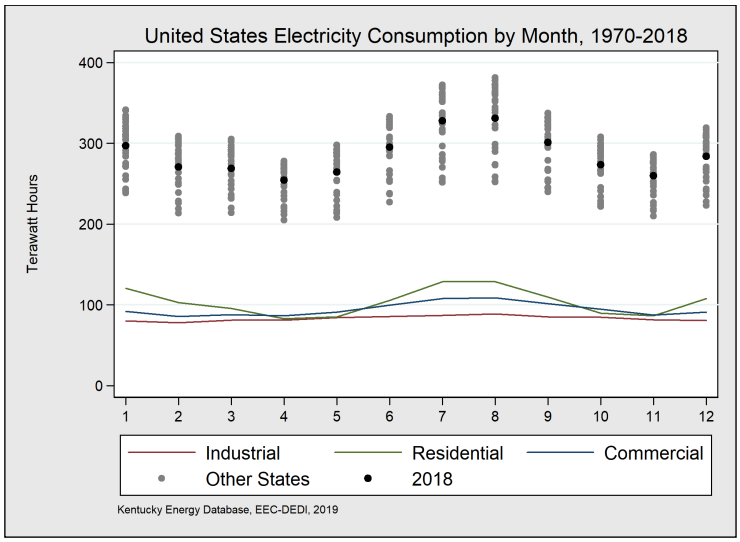


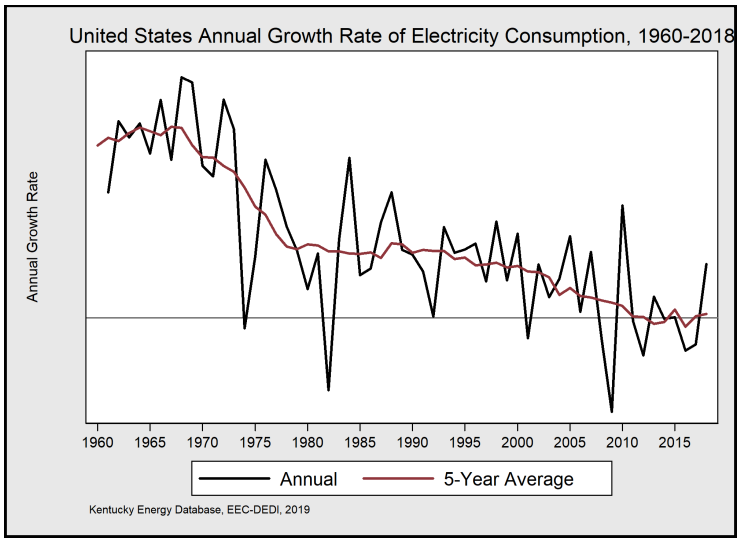
Coal-fired generation supplies the vast majority of electricity in Kentucky. During the spring and fall, electricity demand is lower and some coal plants go offline for maintenance.



Industrial electricity demand in Kentucky tends to vary little relative to the residential sector. Industrial electricity demand had decreased between June and August, when the United States Enrichment Corporation in Paducah—approximately 15% of Kentucky's total electricity demand—would shut down for annual maintenance. However, since the facility's closure in May, 2013 industrial sales have remained steady.

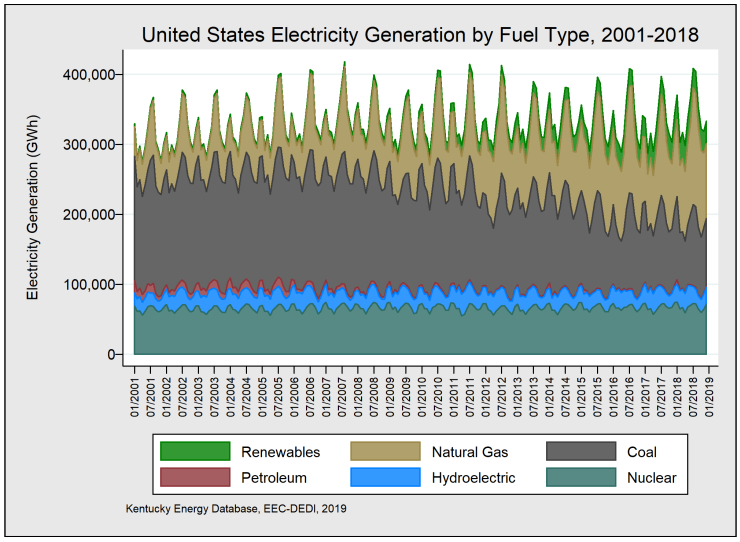
United States Monthly Electricity

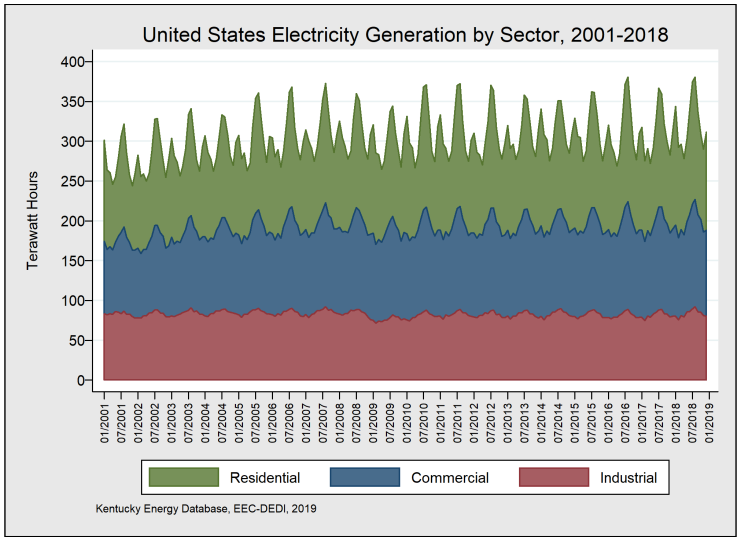




Electricity demand in the United States is approximately the same across all sectors during spring and fall, but demand for heating and air conditioning increases residential and commercial electricity demand in the summer and winter. In contrast, industrial demand is fairly constant throughout the year. The United States consumed less electricity than average in 2018, with a warmer winter decreasing consumption relative to other years.

Although, electricity demand has grown in the United States for decades, the rate at which electricity demand has grown has decreased over time—from an average of 7% in the 1960s to less than one percent over the last 10 years. Since 2005, many states have experienced no growth or even decreases in electricity consumption.





Nuclear generation is relatively constant with the exception of regular shutdowns for maintenance, but renewable generation facilities depend on the presence of their respective resources. Coal and natural gas tend to make up the difference between electricity demand and electricity generated by renewables, nuclear, and hydroelectric generation. The United States has natural gas simple cycle turbines as well as combined cycle units, which are flexible and can be quickly ramped up during periods of peak electricity demand.

United States electricity demand is highest during the hotter summer, though there is a smaller increase in demand during colder winter months. Whereas summer heat can only be met with air conditioning, winter heating requirements can be remedied with a variety of non-electric fuels such as natural gas, wood, propane, and diesel fuel. Industrial demand varies somewhat, with increases in the summer months.

Kentucky Generation Infrastructure

Electricity Generating Capacity

Capacity is the maximum amount of electricity that can be produced at any one moment in time and is measured in watts, or joules per second. Kentucky has 51 power plants that operate 169 individual electricity generating units. There are approximately 22.3 gigawatts of electric generation capacity in Kentucky, with 1.4 GW of coal-fired capacity to be retired in 2020. Of the current operating units in Kentucky, 56.5% of capacity if coal-fired, 37.9% is natural gas, 4.9% is hydroelectric. Petroleum, solar and biomass resources make up the remaining capacity (< 1%).

Generation

Of the electricity generated in Kentucky in 2018, 75% was derived through the combustion of coal. The amount of coal-based electricity generation decreased in 2018. Natural gas facilities were the second-largest source of electricity. Due to the presence of coal resources, and the low price of coal, Kentucky has consistently used coal to meet the vast majority of electricity demand within the Commonwealth.

Capacity Factor

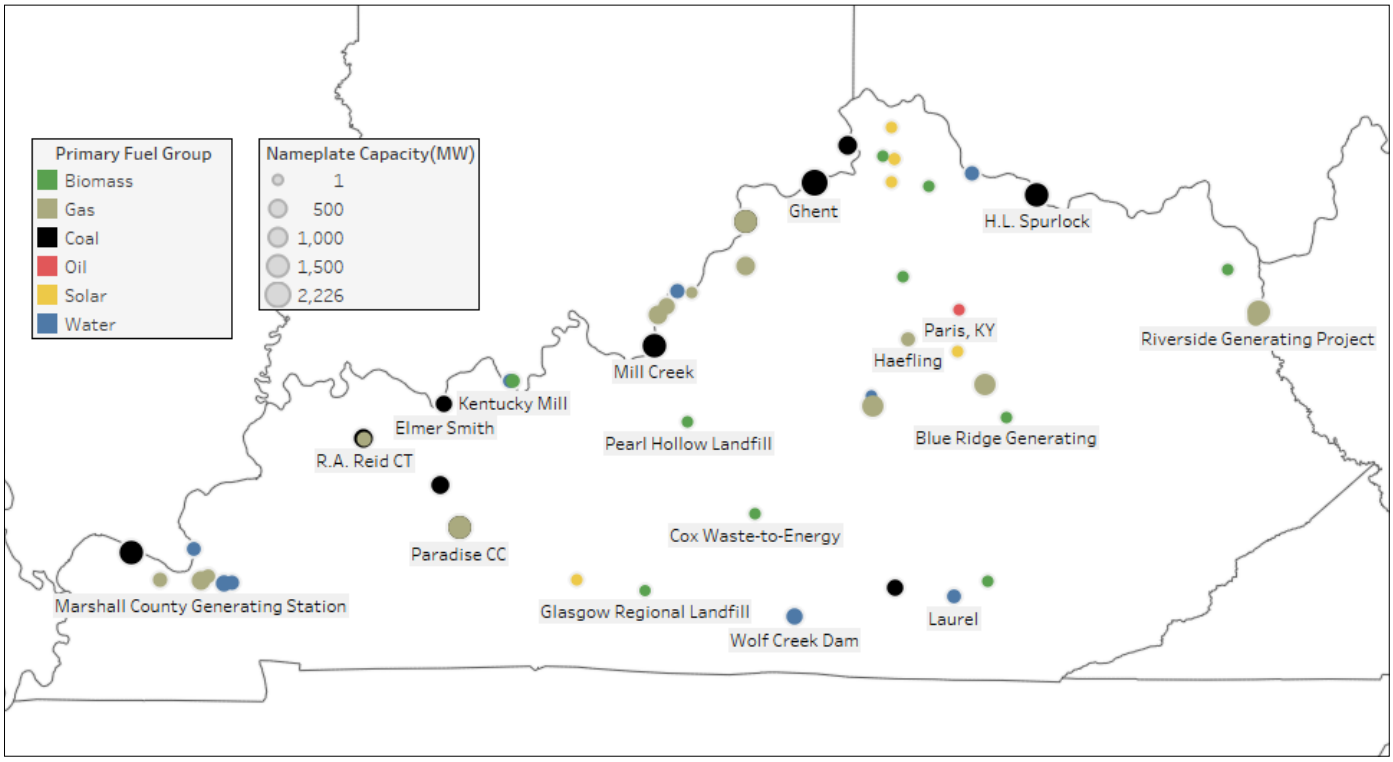
The capacity factor of a generating unit is a ratio of actual power output from a unit versus the maximum possible output from a unit over a period of time. To calculate the maximum possible output of a unit, the rated nameplate capacity (MW) is multiplied by time (typically, hours per year). The actual output (MWh) is then divided by the maximum possible output (MWh) to determine the capacity factor of the unit.

Many variable factors influence the actual capacity factor of a given generating unit including operational costs, operational design, age of a unit, emissions of criteria pollutants, electricity demand fluctuations, and the particular generation and environmental plans of individual power producers.

	Name	Initial Year of Operation	Owner
1	Big Sandy	1963	Kentucky Power
2	Cox Waste-to-Energy	1995	Cox Waste-to-Energy
3	D B Wilson	1984	Big Rivers
4	E W Brown	1957	LG&E-KU
5	East Bend	1981	Duke Energy
6	Elmer Smith	1964	City of Owensboro
7	Ghent	1974	Kentucky Utilities
8	H L Spurlock	1977	EKPC
9	Cooper (KY)	1965	EKPC
10	Kentucky Mill	2001	Domtar Paper
11	Mill Creek	1972	LG&E-KU
12	Paradise	1963	TVA
13	R D Green	1979	Big Rivers
14	Shawnee (KY)	1953	TVA
15	Trimble County	1990	Indiana Municipal Power
16	Bowling Green Solar	2011	Scotty's Development Co.
17	Community Solar Project	2019	LG&E-KU
18	Clark County Solar	2017	EKPC
19	Crittenden Solar Facility	2017	Duke Energy
20	L'Oreal Solar - Florence	2017	L'Oreal USA
21	Walton Solar Facility	2017	Duke Energy
22	Bavarian Landfill	2003	EKPC
23	Blue Ridge Generating	2013	Advanced Disposal Services
24	Central KY Landfill	2016	Waste Services of the Bluegrass

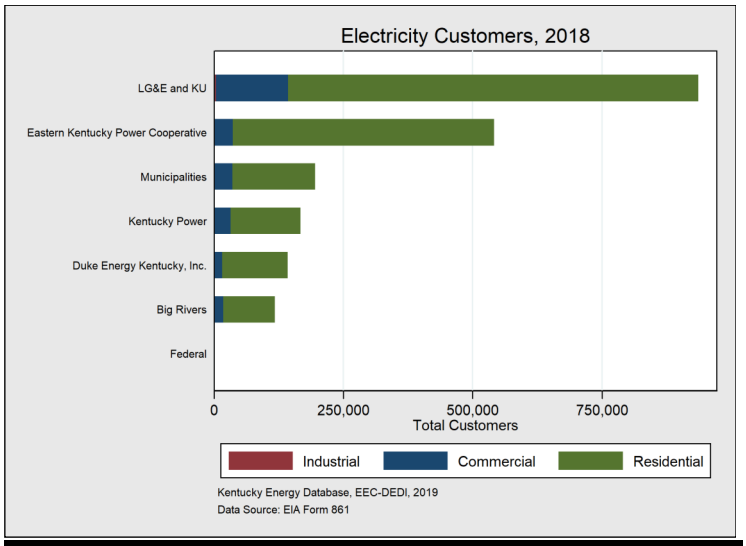
	Name	Online Year	Owner
25	Glasgow Regional Landfill	2015	EKPC
26	Green Valley Landfill	2003	EKPC
27	Laurel Ridge Landfill	2003	EKPC
28	City of Paris	1934	City of Paris
29	Pearl Hollow Landfill	2006	EKPC
30	Pendleton County Landfill	2007	EKPC
31	Barkley	1966	USCE - Nashville District
32	Cannelton Dam	2016	American Municipal Power
33	Dix Dam	1925	LG&E-KU
34	Kentucky	1944	TVA
35	Laurel	1977	USCE
36	Meldahl Hydropower Project	2016	Hamilton City of (OH)
37	Lock 7	1927	Shaker Landing Hydro Associates
38	Ohio Falls	1928	LG&E-KU
39	Smithland Lock and Dam	2017	American Municipal Power
40	Wolf Creek Dam	1951	USCE - Nashville District
41	Bluegrass Generation Project	2002	EKPC
42	Calvert City	2000	DTE Energy Services, Inc.
43	Haefling	1970	LG&E-KU
44	J K Smith	1999	EKPC
45	Marshall County Generating Station	2002	TVA
46	Paddy's Run	1968	LG&E-KU
47	PPS Power Plant No 1	2010	Paducah Power System
48	R A Reid	1976	Big Rivers Electric
49	Riverside Generating Project	2001	LS Power Development, LLC
50	Zorn	1969	LG&E-KU
51	Cane Run	2015	LG&E-KU

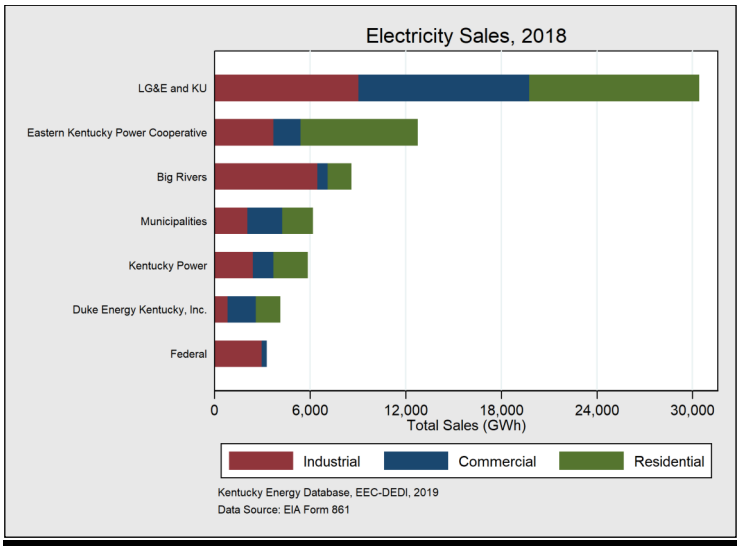
Power Plants in Kentucky



Coal-fired, natural gas, hydroelectric, and biomass-fired generators provide all of the baseload electricity in Kentucky because of their low operating costs. The coal fleet consists of large generators that were constructed between the mid-1950s and 2010. Most of these plants have been retrofitted with environmental controls to meet air quality emissions standards but many may need further upgrades as the standards have become more stringent. Peaking power—the additional electricity needed for short periods of high demand—is generated by natural gas and petroleum. Utilities typically satisfy these short periods of high demand (peaks) with simple cycle natural gas or petroleum generators because they are relatively cheap to build, and can rapidly power up and power down to balance electricity demand. However, peaking units are costlier to operate than baseload generators due to their designs, and are not optimized for baseload generation.

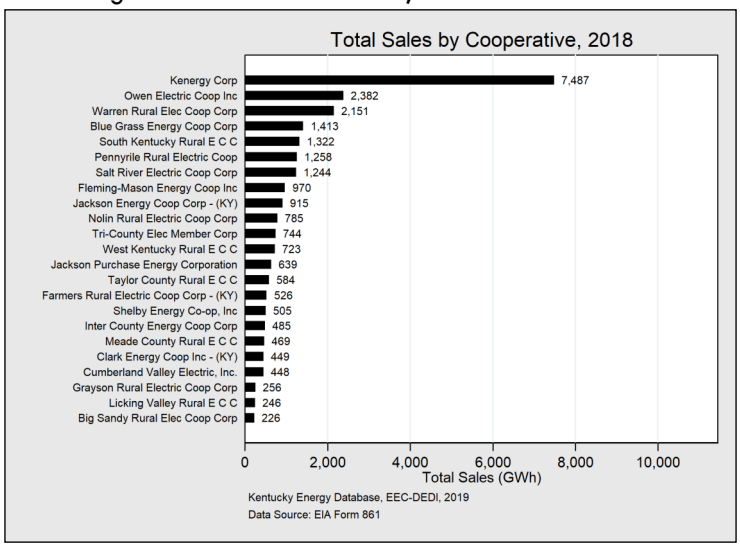
Electricity Utilities in Kentucky

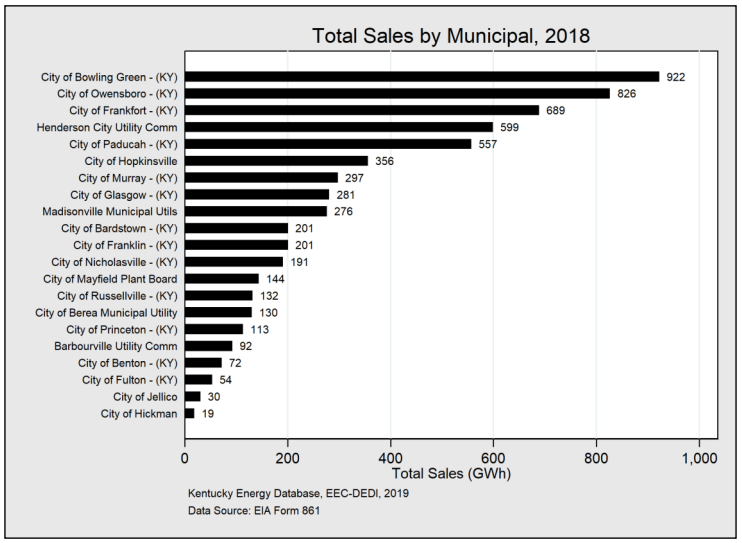




Entity	Consumers	Percentage
Total	2,273,234	100%
LG&E and KU	936,698	41.2%
EKPC	541,504	23.8%
Municipalities	194,964	8.6%
TVA	173,701	7.6%
Kentucky Power	166,603	7.3%
Duke Energy	142,393	6.3%
Big Rivers	117,371	5.2%

Entity	Sales (GWh)	Percentage
Total	76,089	100%
LG&E and KU	30,432	40.0%
EKPC	12,754	16.8%
Big Rivers	8,594	11.3%
TVA	8,145	10.7%
Municipalities	6,184	8.1%
Kentucky Power	5,847	7.7%
Duke Energy	4,133	5.4%

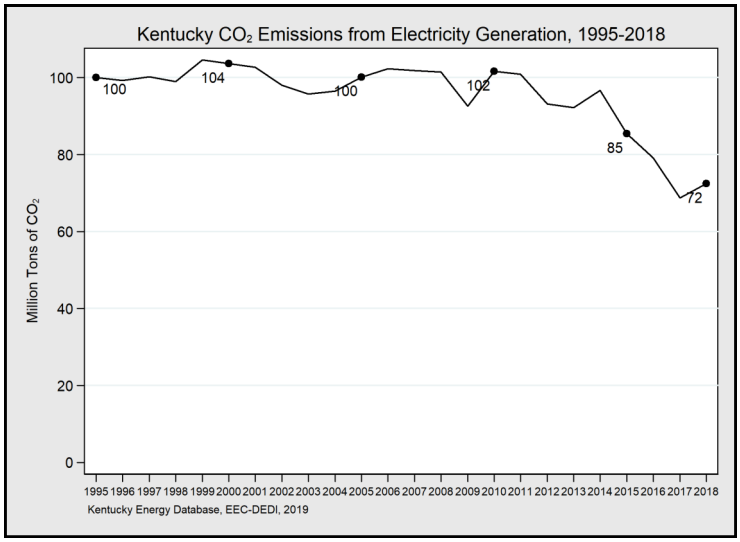


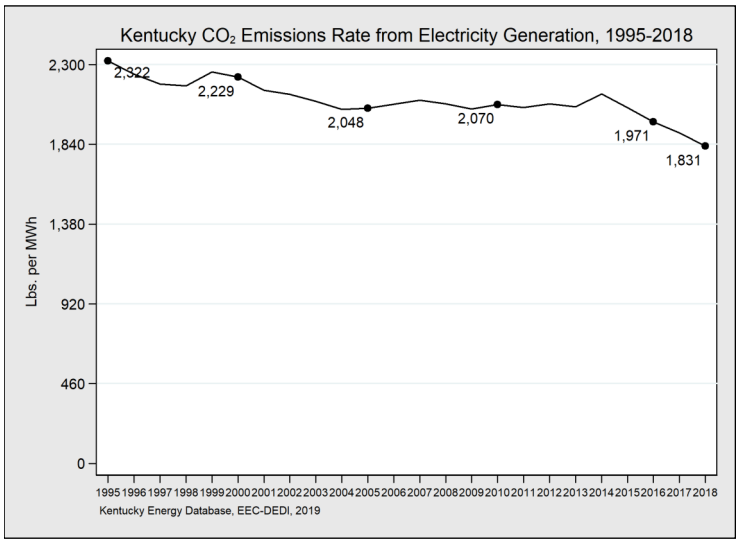


Utilities in Kentucky sold 76 TWh to 2.2 million consumers in 2018. Households accounted for 87% of consumers, but were 36% of consumption. The 6,749 industrial firms are less than 1% of total customers, but used 38% of all electricity consumed in Kentucky in 2018. LG&E and KU sell to 41.2% of consumers in the Commonwealth, while East Kentucky Power Cooperative sells to 23.8%, and the rest 35%.

All of the sales from the Big Rivers Electric Corporation, East Kentucky Power Cooperative, and the majority from the Tennessee Valley Authority, are to RECCs and municipalities. Together, cooperatives consume more than all investor-owned corporations except LG&E and KU. Kenergy Corporation, a cooperative, sells 10% of Kentucky's total—more electricity than Kentucky Power, all municipalities, and Duke Energy.

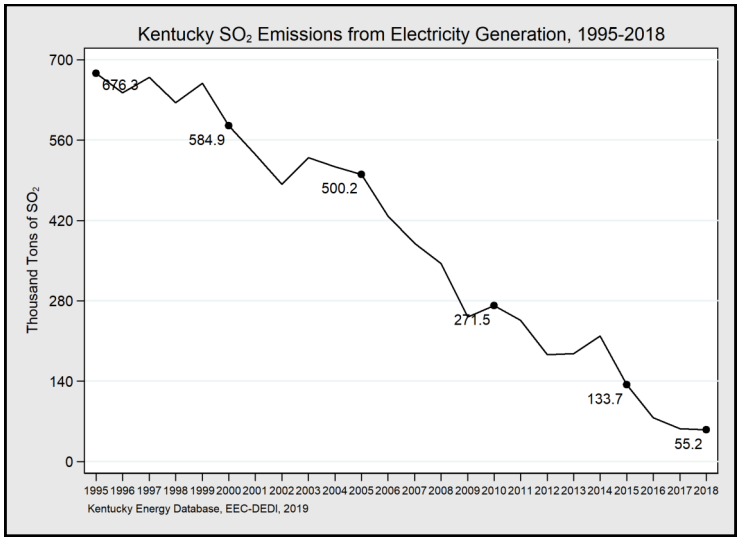
Kentucky Electric Power Emissions



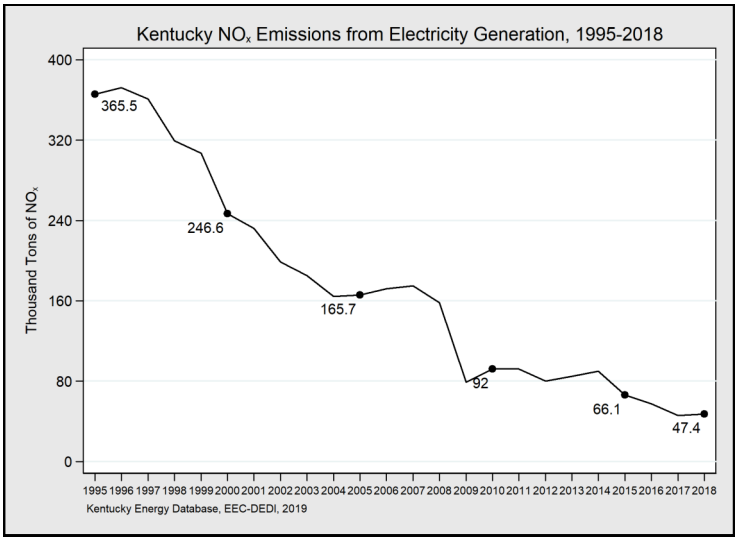


Emission	Tons	Since 1995
Carbon Dioxide	72,481,578	-27.5%
Sulfur Dioxide	55,159	-91.8%
Nitrogen Oxides	47,380	-87.0%

In 2018, power plants in Kentucky emitted 72.4 million tons of carbon dioxide, an increase of 5.4% compared with 2017. In terms of emissions rate, power plants emit almost 21% less carbon dioxide as they did in 1995.

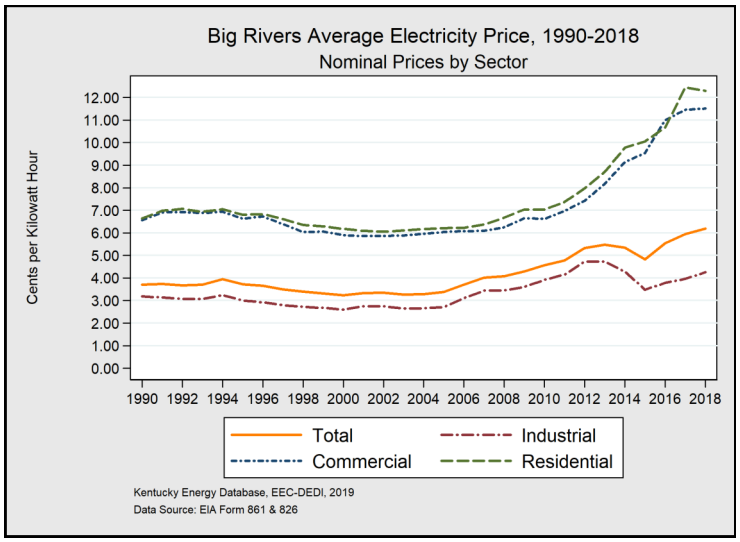


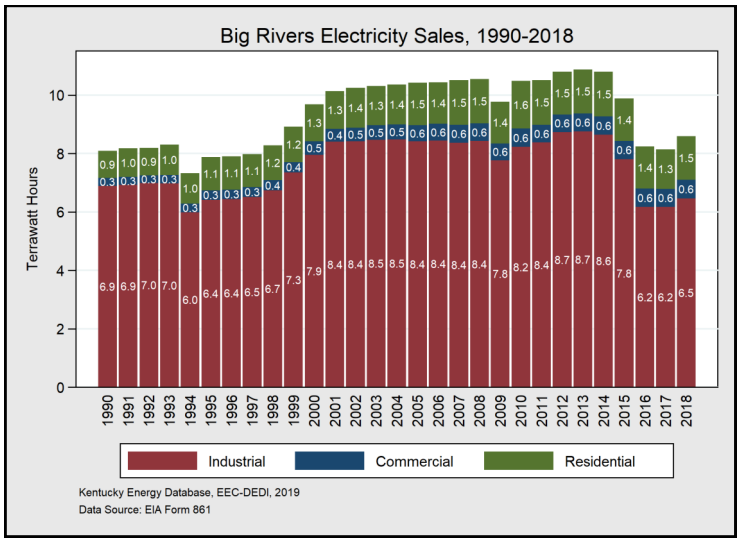
Sulfur dioxide (SO_2) is a highly reactive gas and major pollutant that is monitored and regulated by the state and federal government due to its connection to acid rain, incidence of asthma, and other respiratory problems. In 2018, the electric power sector of Kentucky emitted 55,159 tons of sulfur dioxide, a 91.8% decrease from 1995 and a 3.4% decrease from 2017.



Nitrogen oxides (NO_x) are a group of highly reactive regulated pollutants: Nitric oxide (NO), Nitrogen dioxide (NO_2), and Nitrous oxide (N_2O). Nitrogen oxide, which is displayed here, has been shown to cause acid rain and exacerbate respiratory disease, while nitrous oxide, or laughing gas, is a greenhouse gas 312 times more potent than carbon dioxide. In 2018, the electric power sector of Kentucky emitted 47,380 tons of nitrogen oxides, a decrease of 87% from 1995 and a 3% increase from 2017.

Big Rivers



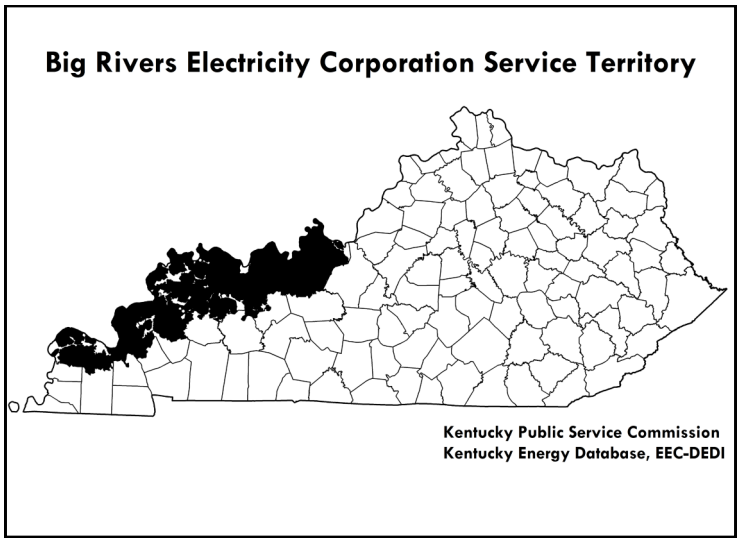


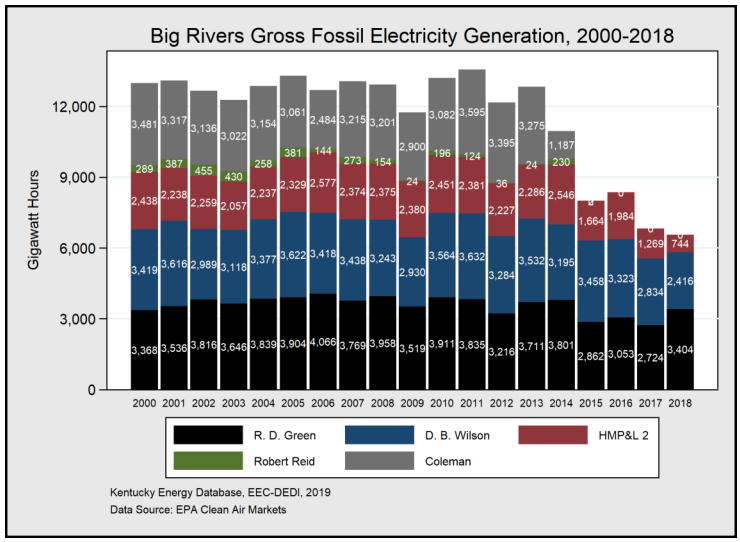
Sector	Price (Cents/kWh)	Since 2010*
Total†	6.19	+24.6%
Residential	12.30	+51.2%
Commercial	11.51	+50.1%
Industrial	4.26	-5.87%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total†	8,594	100%
Industrial	6,464	75.2%
Residential	1,491	17.4%
Commercial	639	7.4%

†Includes direct sales and sales to rural electric cooperatives



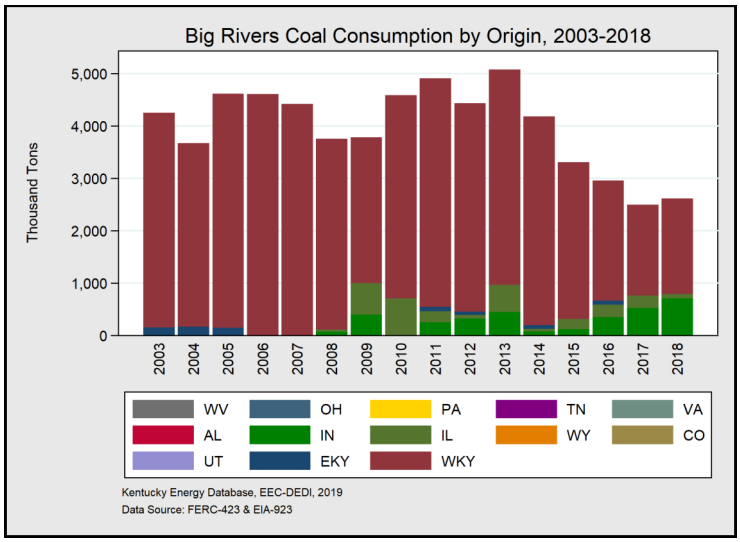


Big Rivers Electric Corporation generates and sells electricity in northwestern Kentucky. Total electricity prices in 2018 were 6.19 cents per kWh and have increased by 11% since 2015 in inflation-adjusted dollars. Big Rivers serves three RECCs: Kenergy Corporation, Meade County RECC, and Jackson Purchase Energy Corporation. Big Rivers operates five coal-fired generating stations.

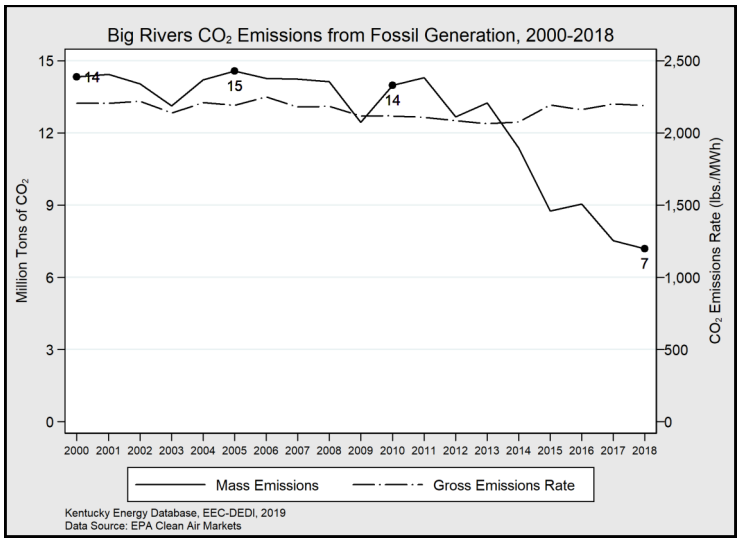
Electricity Generation	2018	Since 2010
Gigawatt Hours	6,564	-50.3%

Big Rivers generated 6.5 TWh and sold 8.5 TWh of electricity in 2018. Big Rivers has sold the bulk of its electricity load to industrial firms. Whenever a utility has purchased more electricity than it has sold, it is assumed the difference is made up by the purchase of electricity on the open market.

Big Rivers

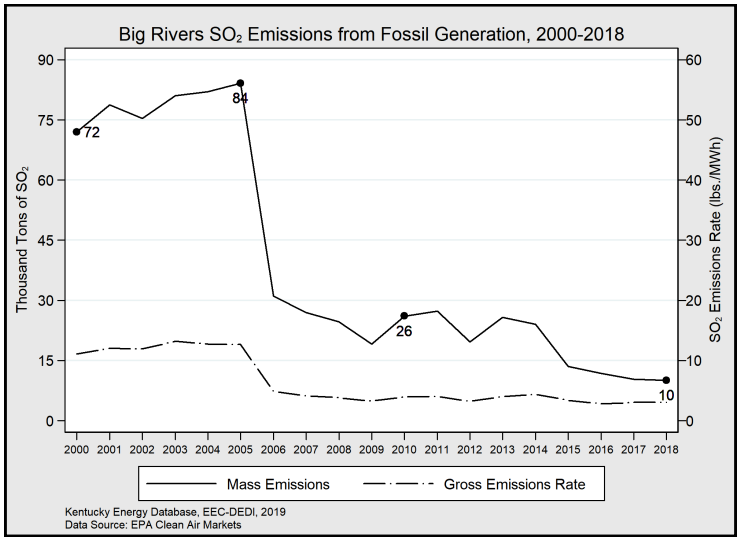


State	2018 Tons	Percentage
Total	2,613,921	100%
Western Kentucky	1,823,740	69.8%
Indiana	709,324	27.1%
Illinois	80,857	3.1%



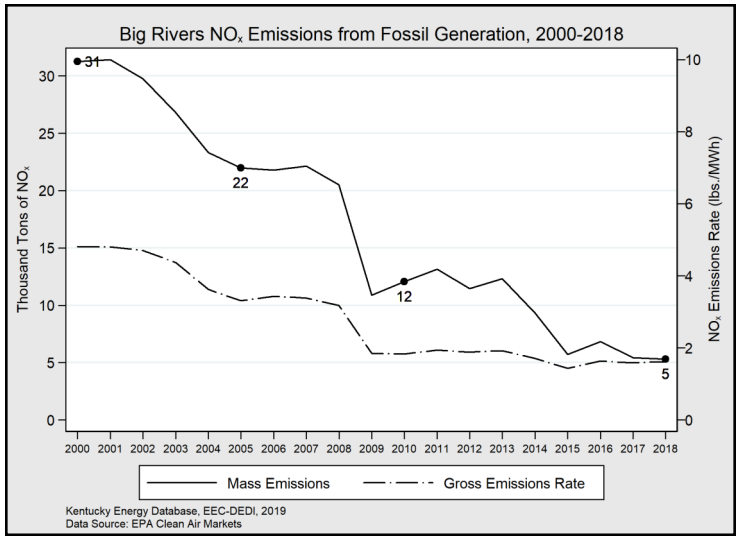
Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	7,185,669	-48.6%
Rate (lbs./MWh)	2,189	+3.4%

Big Rivers Electric Corporation emitted 7 million tons of CO_2 in 2018, a decrease of 48% since 2010. The rate of CO_2 emissions has increased by 3% during that period.



Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	10,042	-61.5%
Rate (lbs./MWh)	3.06	-23%

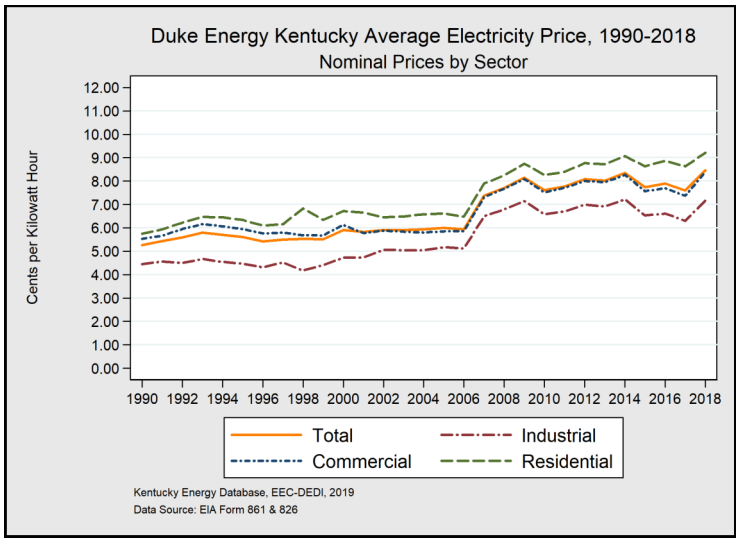
Big Rivers Electric Corporation emitted 10,000 tons of SO_2 in 2018, a decrease of 61.5% since 2010. The rate of SO_2 emissions decreased by 23% during that period.

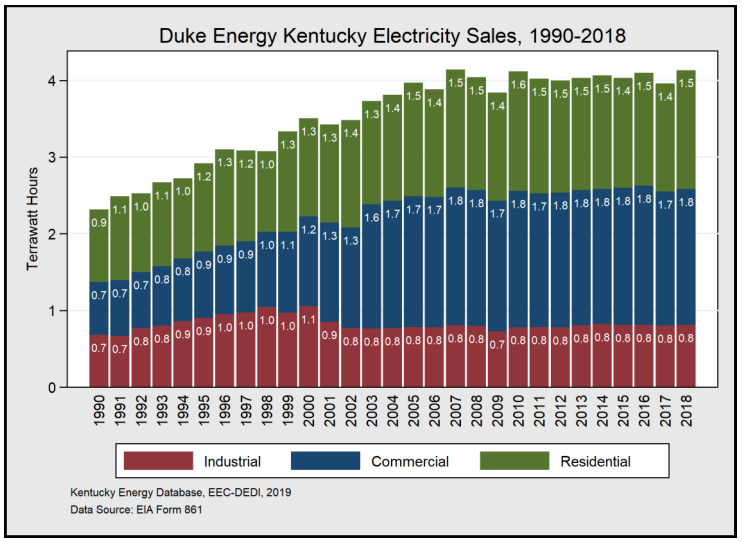


Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	5,311	-56%
Rate (lbs./MWh)	1.62	-16.6%

Big Rivers Electric Corporation emitted 5,000 tons of NO_x in 2018, a reduction of 56% since 2010. The rate of NO_x emissions decreased by 16.6% during that period.

Duke Energy Kentucky

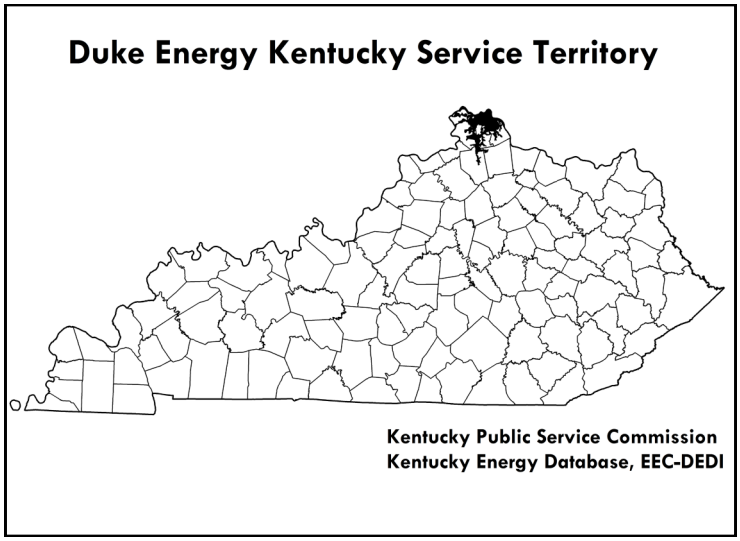


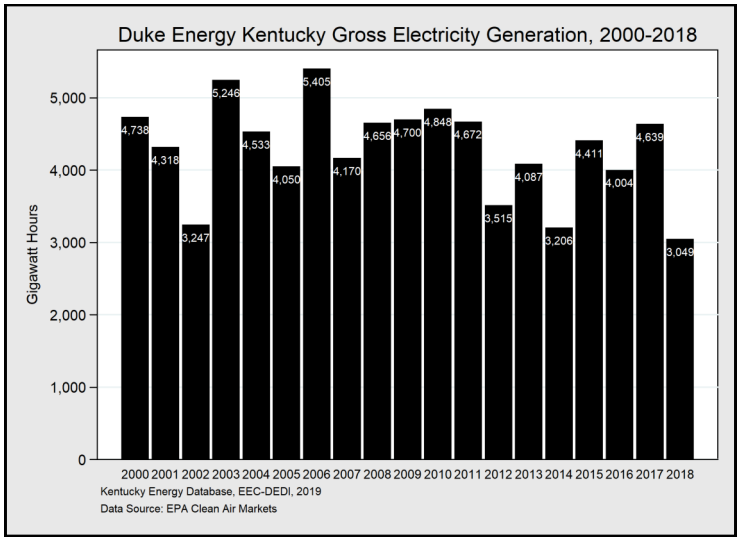


Sector	Price (Cents/kWh)	Since 2010*
Total†	8.46	-3.6%
Residential	9.21	-3.2%
Commercial	8.39	-3.1%
Industrial	7.17	-5.4%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total†	4,133	100%
Commercial	1,773	42.9%
Residential	1,547	37.4%
Industrial	813	19.7%



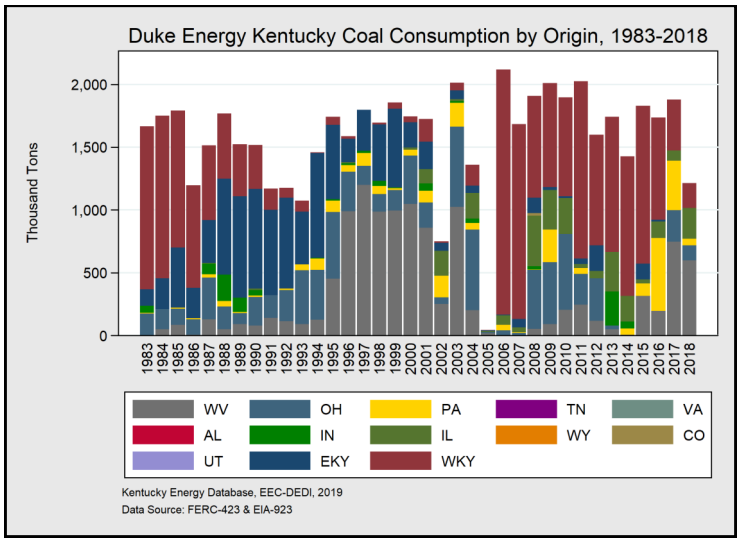


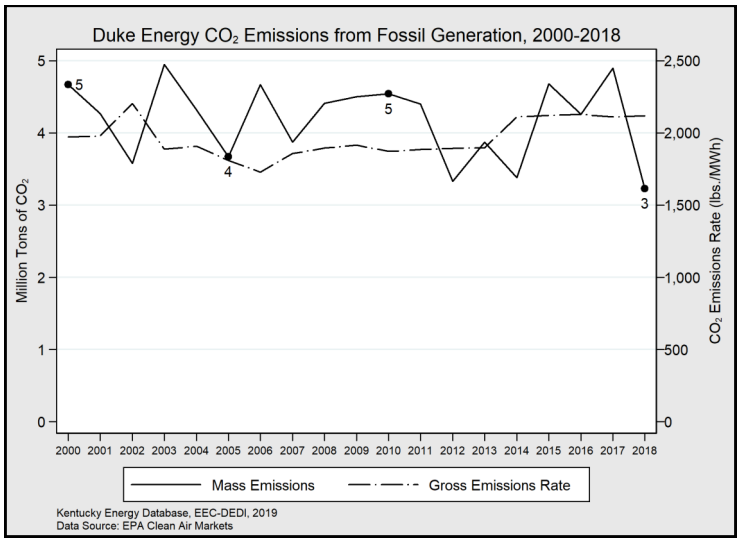
Duke Energy Kentucky generates and sells electricity in northern Kentucky and is owned and operated by Duke Energy. Total electricity prices in 2018 were 8.46 cents per kWh and have decreased by 3.6% since 2010 in inflation-adjusted dollars. Duke Energy owns and operates the East Bend coal-fired power plant in Boone County. Duke Energy also sells electricity throughout North and South Carolina, Indiana, and southwest Ohio.

Electricity Generation	2018	Since 2010
Gigawatt Hours	3,049	-37.1%

Duke Energy Kentucky generated 3 TWh of electricity in 2018, a decrease of 34.7% from 2017, when it generated 4.6 TWh.

Duke Energy Kentucky

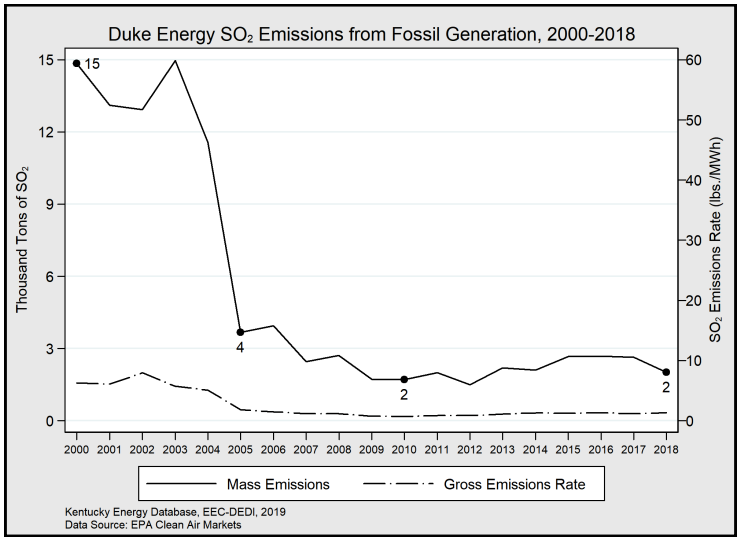


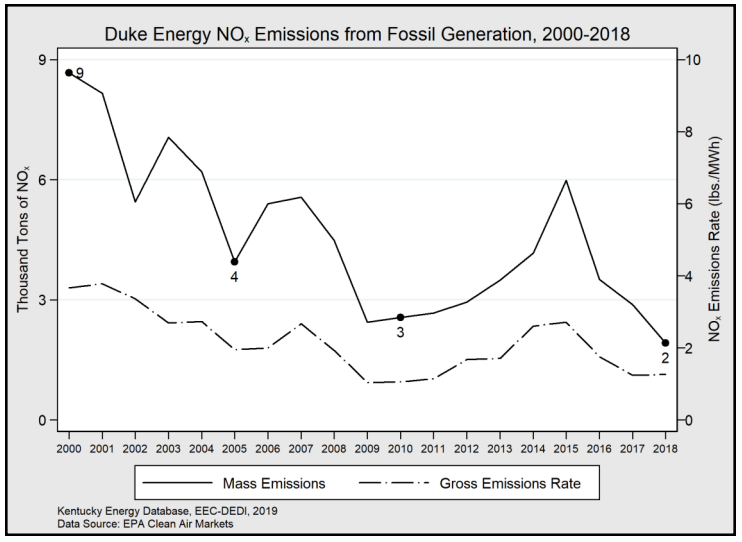


State	2018 Tons	Percentage
Total	1,094,483	100%
Western Kentucky	198,686	18.2%
Illinois	246,668	22.5%
Pennsylvania	50,642	4.6%
West Virginia	598,487	54.7%

Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	3,228,074	-28.9%
Rate (lbs./MWh)	2,117	+13.1%

Duke Energy Kentucky emitted 3.2 million tons of CO_2 in 2018, a decrease of 28.9% since 2010. The rate of CO_2 emissions has increased by 13.1% during that period, and had the highest rate of CO_2 emissions in 2018.





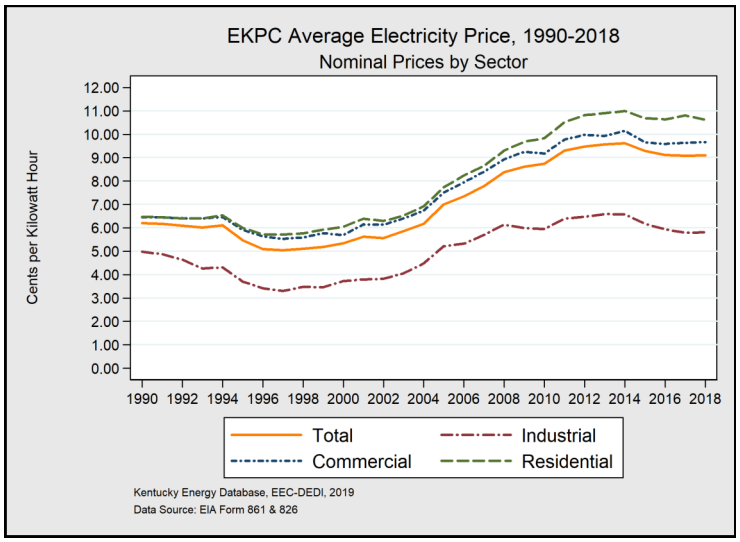
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	2,012	+17.6%
Rate (lbs./MWh)	1.32	+88%

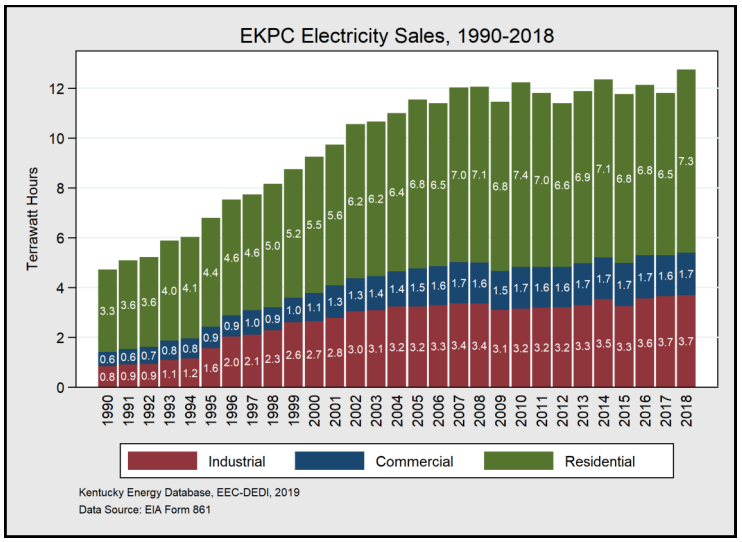
Duke Energy Kentucky emitted 2,012 tons of SO_2 in 2018, an increase of 17.6% since 2010. The rate of SO_2 emissions increased by 88% during that period while still remaining within the range of rates emitted by other utilities.

Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	1,919	-25.1%
Rate (lbs./MWh)	1.26	+18.9%

Duke Energy Kentucky emitted 2,000 tons of NO_x in 2018, a reduction of 25.1% since 2010. The rate of NO_x emissions increased by 18.9% during that period.

East Kentucky Power Cooperative



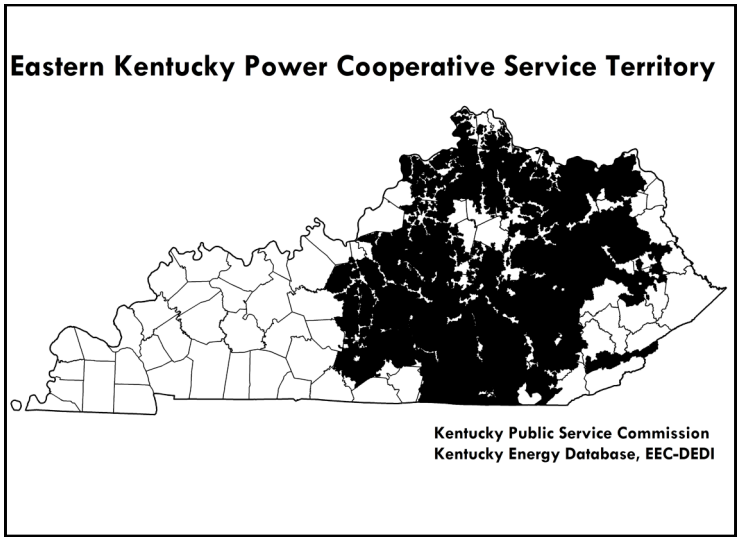


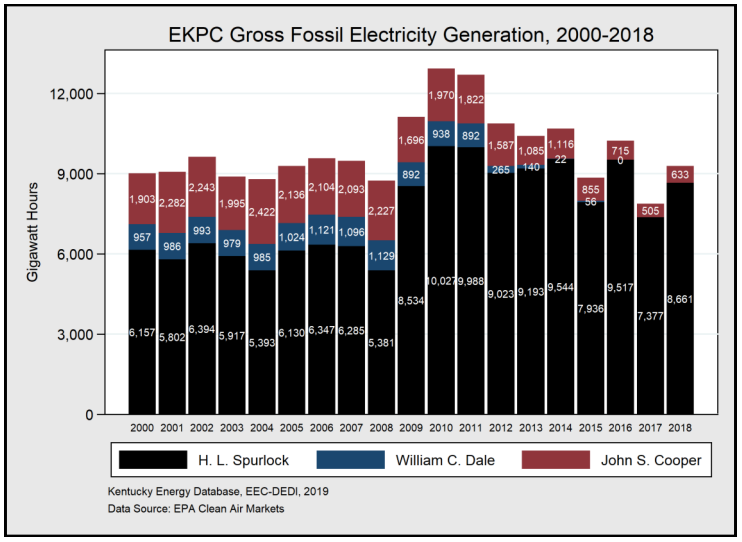
Sector	Price (Cents/kWh)	Since 2010*
Total	9.10	-9.6%
Residential	10.62	-6.2%
Commercial	9.67	-8.5%
Industrial	5.81	-15.3%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total	12,754	100%
Residential	7,347	57.6%
Industrial	3,692	28.9%
Commercial	1,715	13.4%

†Includes direct sales and sales to rural electric cooperatives



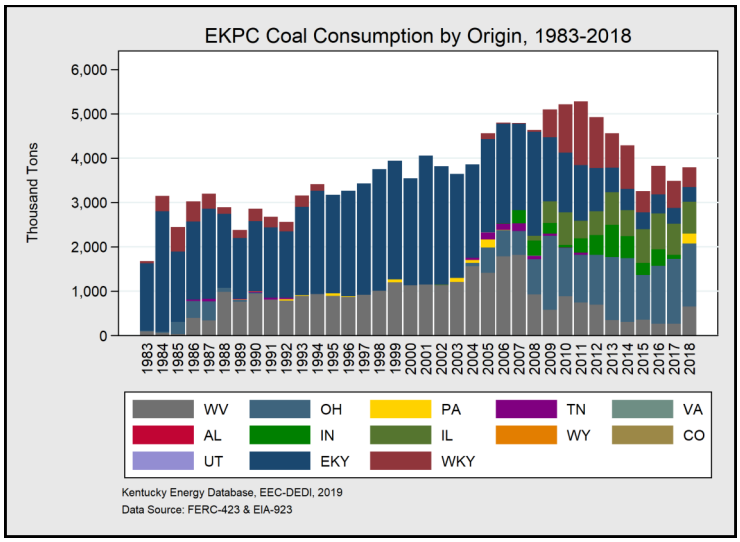


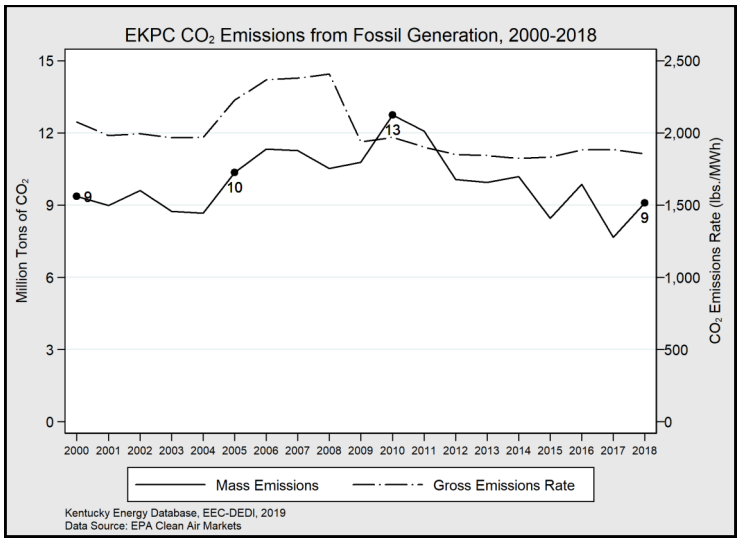
East Kentucky Power Cooperative serves central and eastern Kentucky where 16 RECCs jointly own and purchase electricity from EKPC. Total electricity prices in 2016 were 9.46 cents per kWh and have decreased by 1% since 2010 in inflation-adjusted dollars. EKPC owns and operates two coal-fired power plants, two natural gas electricity generating stations, and six landfill gas generating stations.

Electricity Generation	2018	Since 2000
Gigawatt Hours	9,294	+3.1%

East Kentucky Power Cooperative generated 9.2 TWh but sold 12.7 TWh of electricity in 2018. When electricity sales are greater than generation, it means that the utility purchased power from another source. In many cases this includes a Regional Transmission Organization which serves as a market for generated power among its members.

East Kentucky Power Cooperative

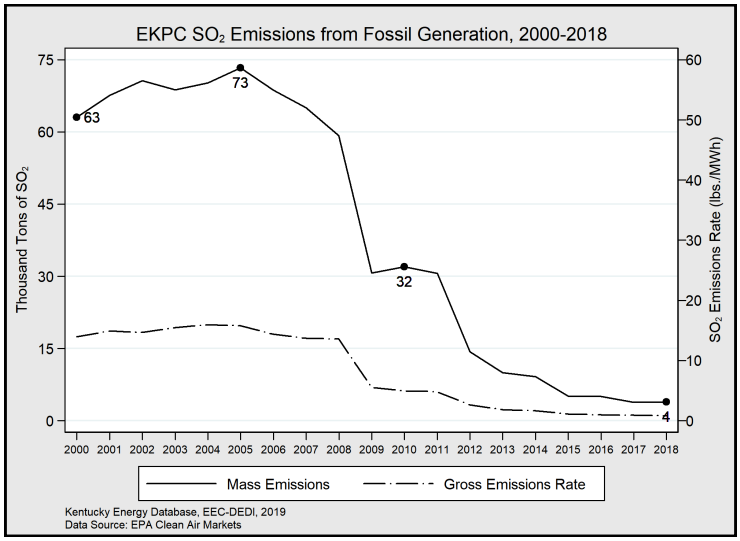


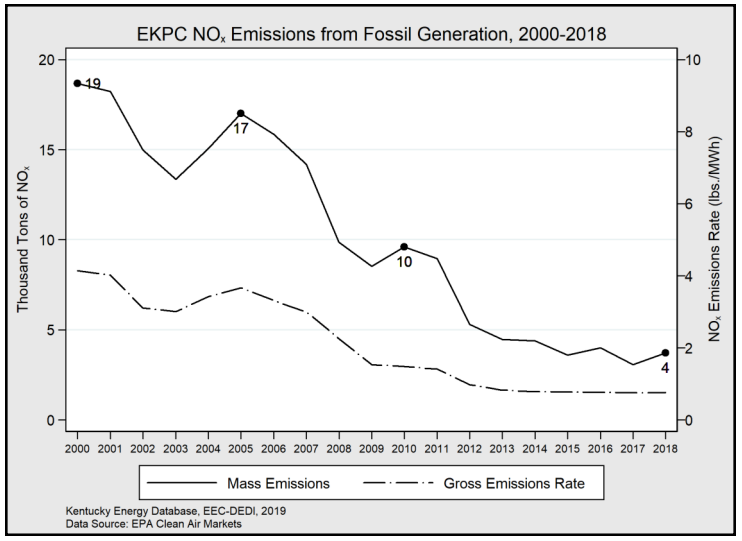


State	2018 Tons	Percentage
Total	3,795,927	100%
Ohio	1,425,414	37.6%
Western Kentucky	451,553	11.9%
Illinois	720,115	19.0%
Eastern Kentucky	325,744	8.6%
West Virginia	650,795	17.1%
Pennsylvania	222,306	5.9%

Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	9,094,535	-28.6%
Rate (lbs./MWh)	1,855	-5.8%

East Kentucky Power Cooperative emitted almost 9 million tons of CO_2 in 2018, a decrease of 28.6% since 2010. The rate of CO_2 emissions has decreased by 5.8% during that period.





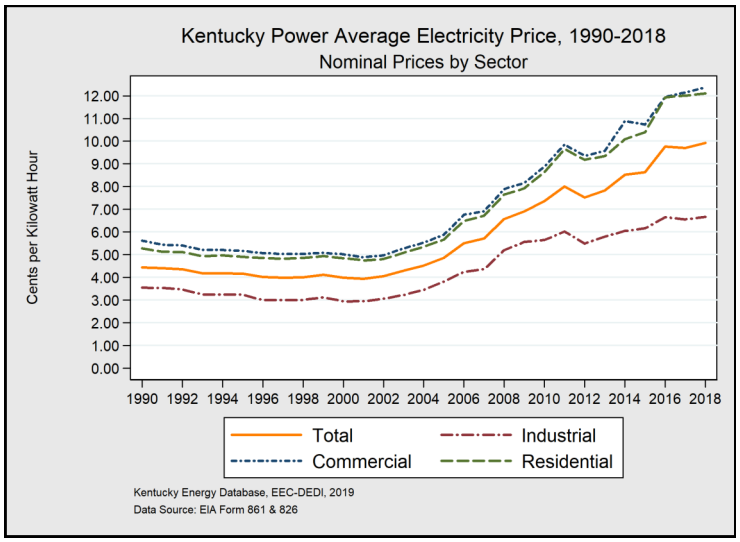
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	3,887	-87.8%
Rate (lbs./MWh)	0.79	-84%

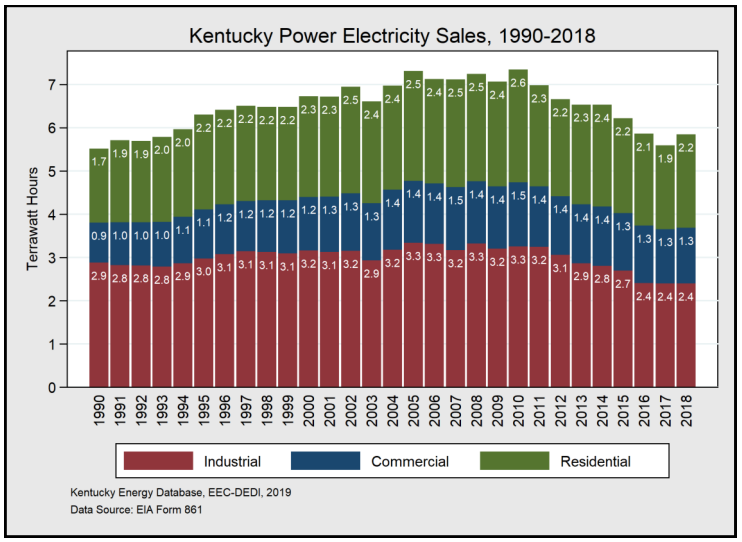
East Kentucky Power Cooperative emitted 3,887 tons of SO_2 in 2018, a decrease of 87.8% since 2010. The rate of SO_2 emissions decreased by 84% during that period.

Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	3,717	-61.3%
Rate (lbs./MWh)	0.76	-48.7%

East Kentucky Power Cooperative emitted 3,717 tons of NO_x in 2018, a reduction of 61.3% since 2010. The rate of NO_x emissions decreased by 48.7% during that period and is the lowest in Kentucky.

Kentucky Power

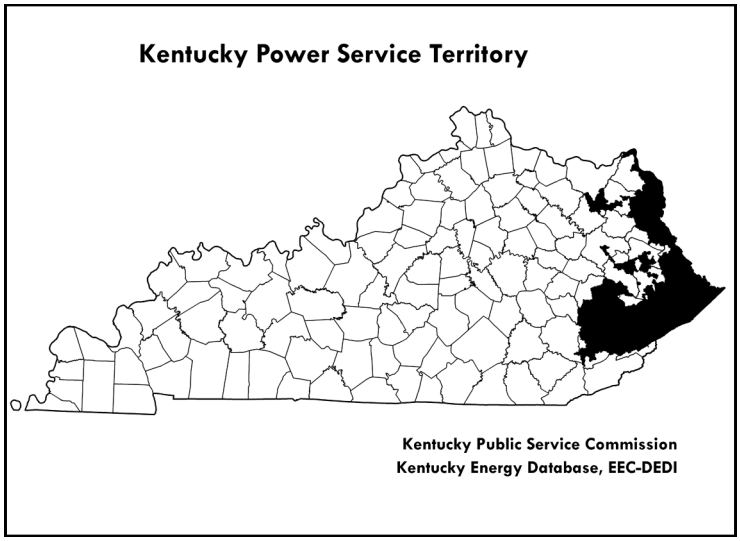


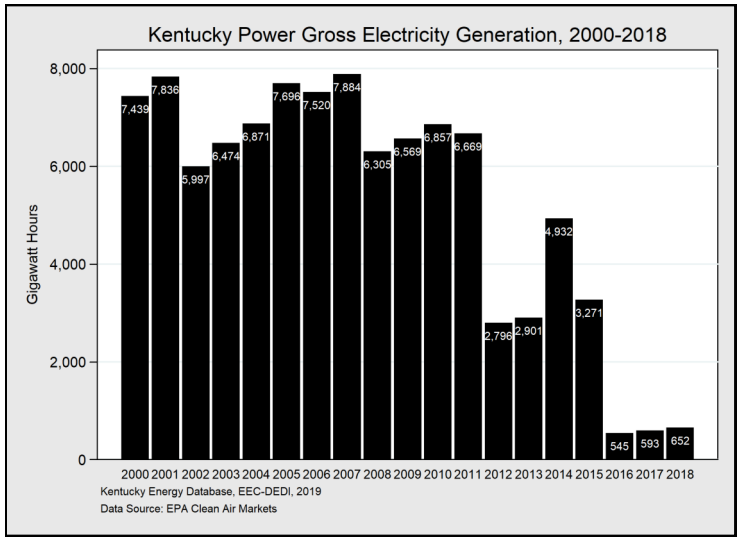


Sector	Price (Cents/kWh)	Since 2010*
Total	9.93	+17.1%
Residential	12.10	+2.6%
Commercial	12.37	+21.5%
Industrial	6.67	+20.9%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total†	5,847	100%
Industrial	2,398	41%
Residential	2,158	37%
Commercial	1,290	22%



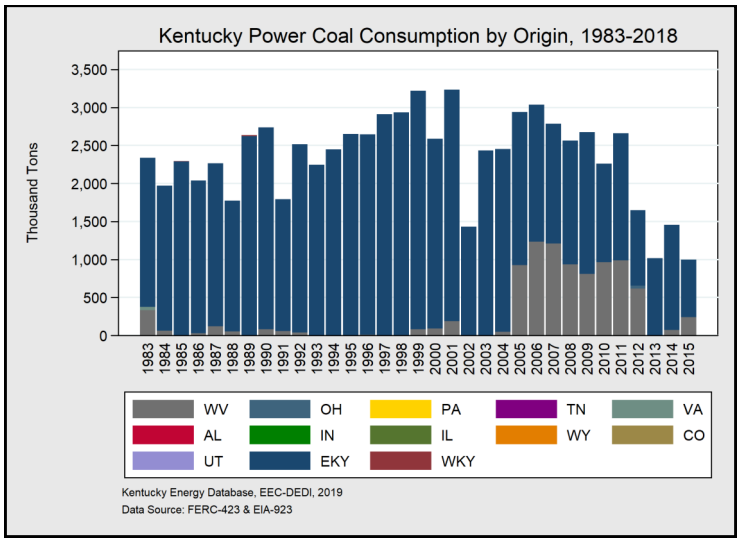


Kentucky Power, a subsidiary of American Electric Power, generates and distributes electricity in eastern Kentucky. Total electricity prices in 2016 were 9.7 cents per kWh and have increased by 33% since 2010 in inflation-adjusted dollars. Kentucky Power operates the Big Sandy power plant in Louisa Kentucky.

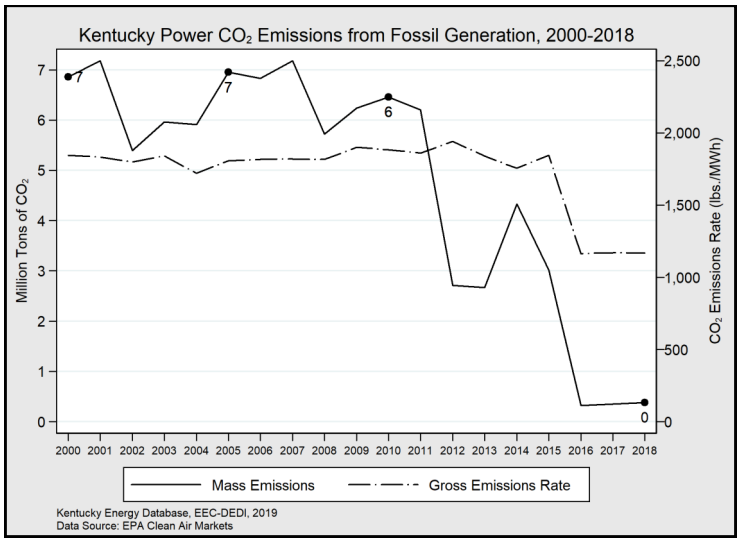
Electricity Generation	2018	Since 2010
Gigawatt Hours	652	-90.5%

Kentucky Power generated almost 652 GWh and sold 6.5 TWh of electricity in 2018. Since 2010 generation has decreased by 90%. Unit 1 was retired in 2015 and converted to natural gas.

Kentucky Power

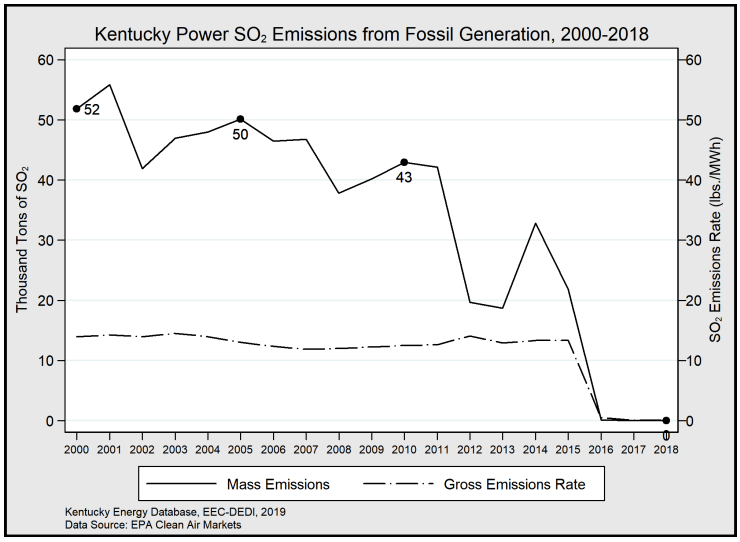


All units for the Big Sandy were retired in May of 2015 except unit 1, which was converted to natural gas.



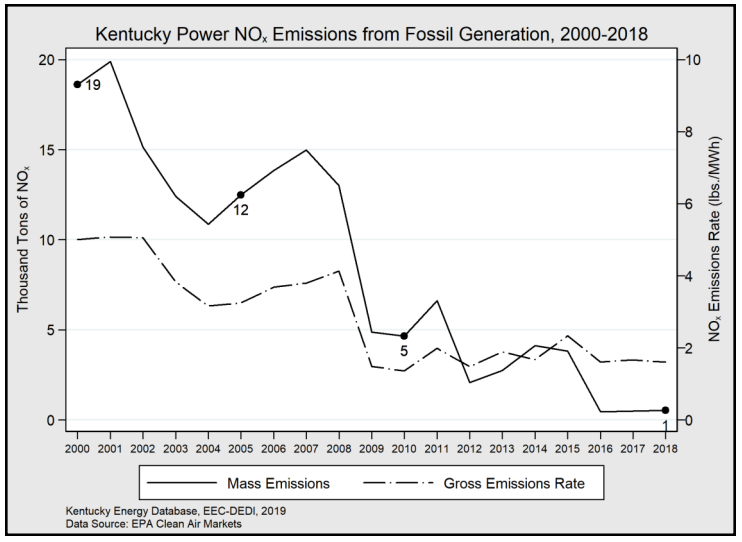
Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	380,764	-94.1%
Rate (lbs./MWh)	1,168	-37.8%

Kentucky Power emitted 380 thousand tons of CO_2 in 2018, a decrease of 94.1% since 2010. The rate of CO_2 emissions is relatively unchanged, but is the lowest rate in the Commonwealth.



Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	16.50	-99.9%
Rate (lbs./MWh)	0.05	-99.6%

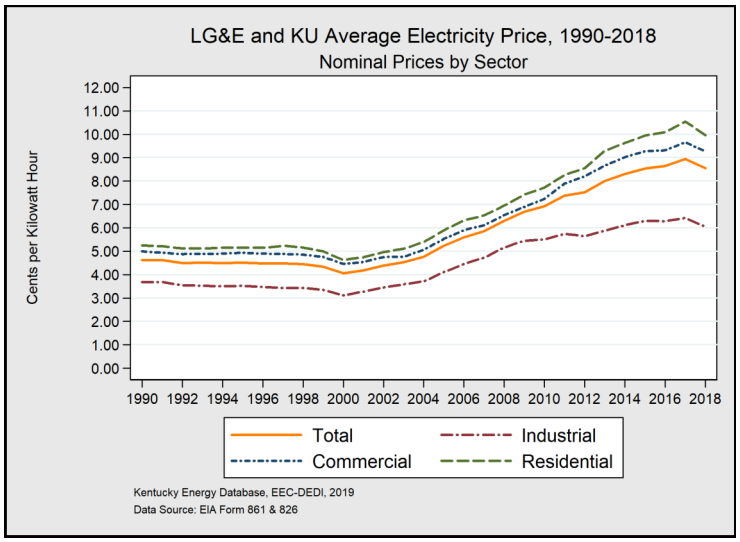
Kentucky Power emitted 16.5 tons of SO_2 in 2018, a decrease of 99.9% since 2010. The rate of SO_2 emissions reduced by 99% during that period.

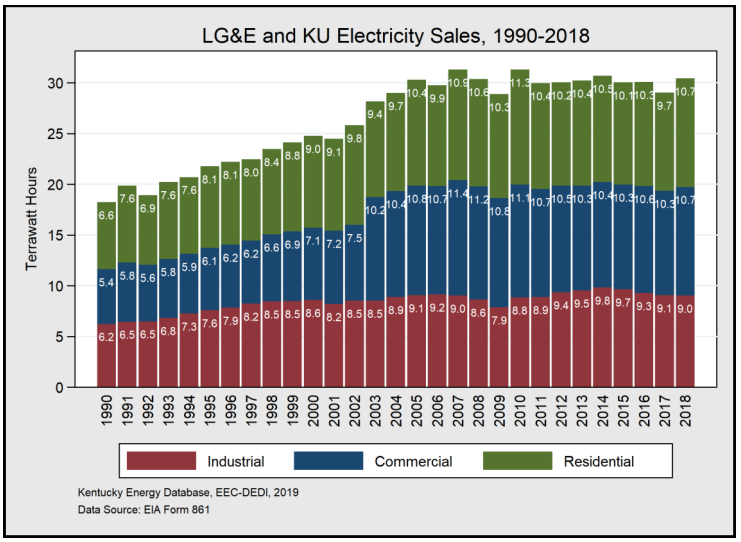


Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	521	-88.8%
Rate (lbs./MWh)	1.6	+17.7%

Kentucky Power emitted 521 tons of NO_x in 2018, a reduction of 88.8% since 2010. The rate of NO_x emissions increased by 17.7% during that period. This is due to the unit's conversion to natural gas in 2016.

LG&E and KU

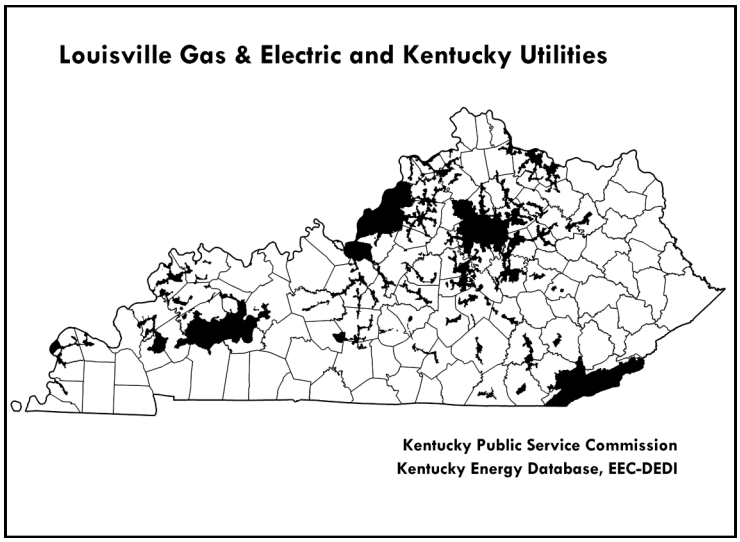


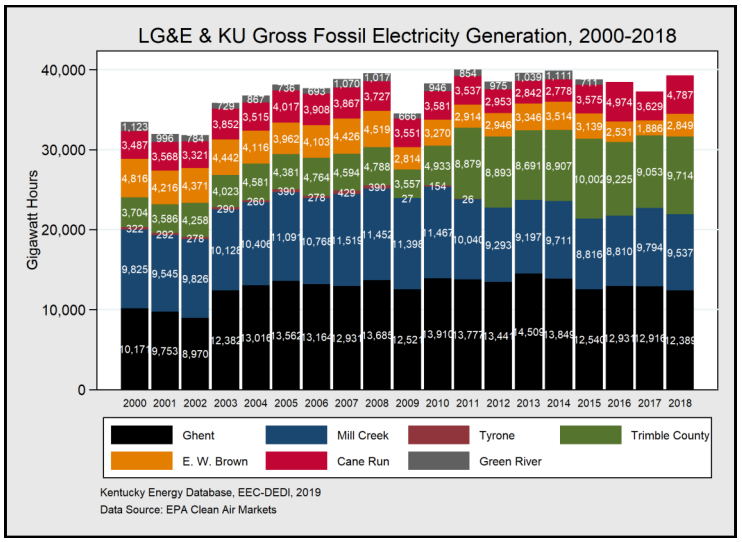


Sector	Price (Cents/kWh)	Since 2010*
Total	8.55	+7.2%
Residential	9.95	+12.0%
Commercial	9.26	+11.1%
Industrial	6.04	-4.8%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total	30,431	100%
Residential	10,690	35.1%
Commercial	10,705	35.2%
Industrial	9,035	29.7%



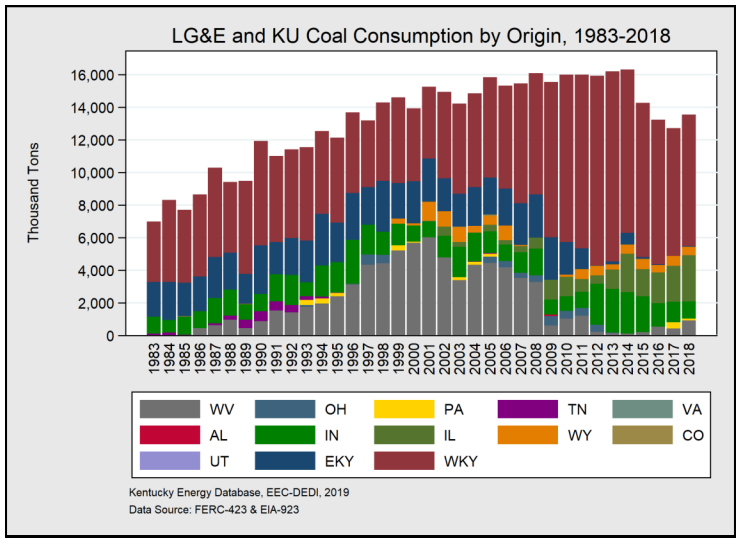


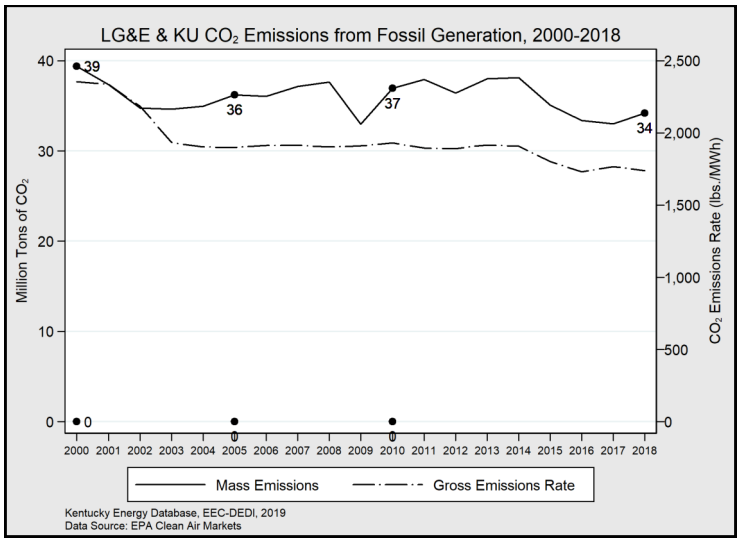
LG&E and KU is the single largest utility by sales in Kentucky and sells electricity throughout the state, primarily in densely populated areas. Total electricity prices in 2018 were 8.55 cents per kWh and have increased by 14% since 2010 in inflation-adjusted dollars. LG&E and KU operate numerous electricity generation facilities throughout the state including four coal-fired power plants, two hydroelectric dams, and four natural gas facilities.

Electricity Generation	2018	Since 2010
Gigawatt Hours	39,276	+3.4%

LG&E and KU generated just over 39 TWh and sold just over 30 TWh of electricity in 2018. Since 2015, generation has decreased by less than 1%. The utility is the largest utility in the state and sells 39% of all investor owned or federal utilities in the state.

LG&E and KU

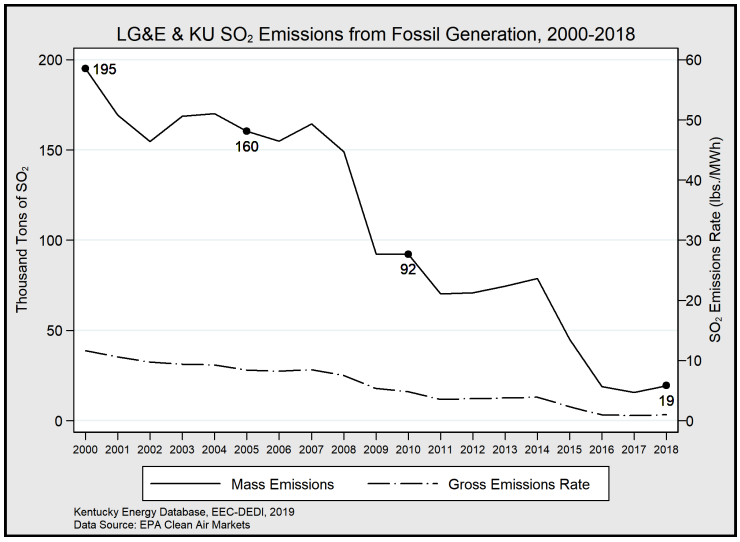


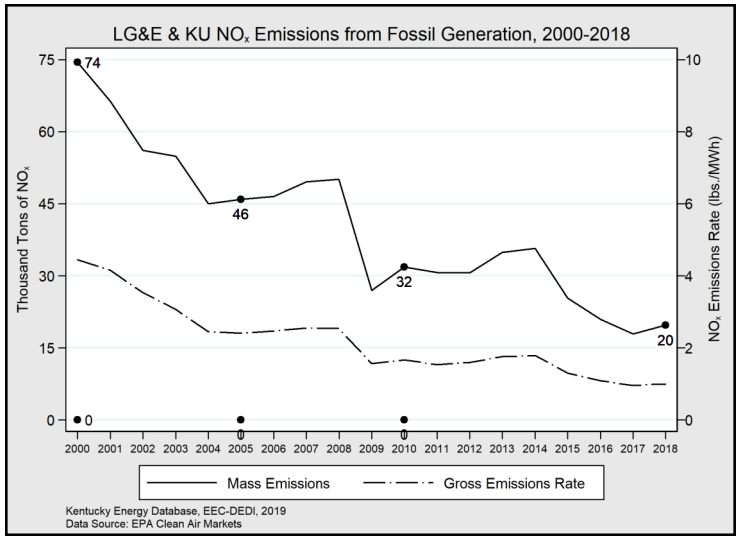


State	2018 Tons	Percentage
Total	13,461,043	100%
Western Kentucky	8,082,948	60.0%
Indiana	1,066,363	7.9%
Illinois	2,834,058	21.1%
Wyoming	514,561	3.8%
Eastern Kentucky	32,975	0.2%
West Virginia	930,138	6.9%

Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	34,194,308	-7.5%
Rate (lbs./MWh)	1,737	-10%

LG&E and KU emitted 34 million tons of CO_2 in 2018, a decrease of 7.5% since 2010. The rate of CO_2 emissions decreased by almost 10% during that period.





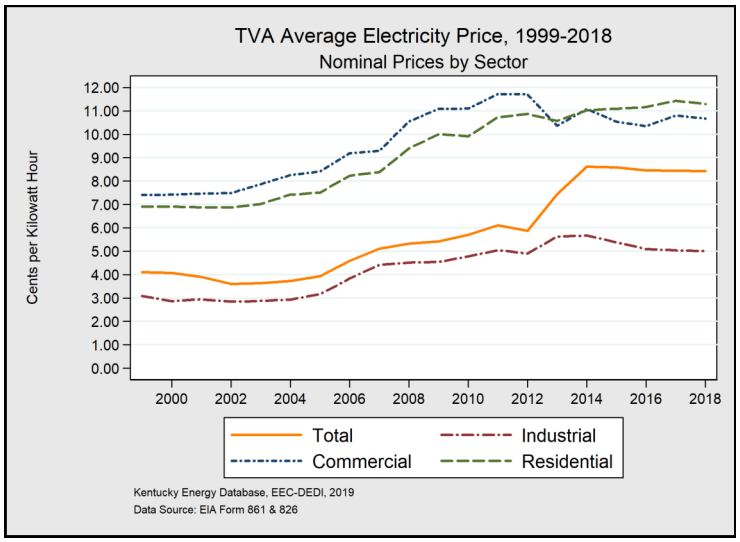
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	19,406	-78.9%
Rate (lbs./MWh)	0.99	-79.5%

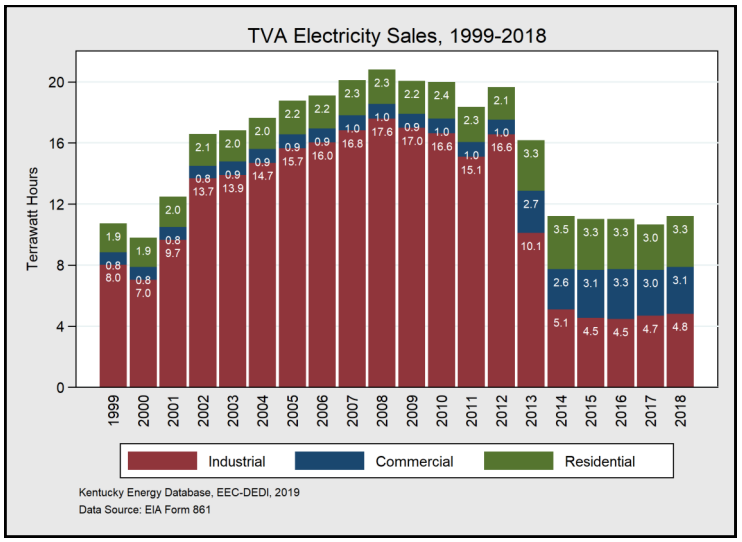
LG&E and KU emitted 19,000 tons of SO_2 in 2018, a decrease of 78.9% since 2010. The rate of SO_2 emissions reduced by 79.5% during that period.

Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	19,691	-38.5%
Rate (lbs./MWh)	1.00	-39.8%

LG&E and KU emitted 21,000 tons of NO_x in 2018, a reduction of 71% since 2000. The rate of NO_x emissions decreased by 76% during that period.

Tennessee Valley Authority



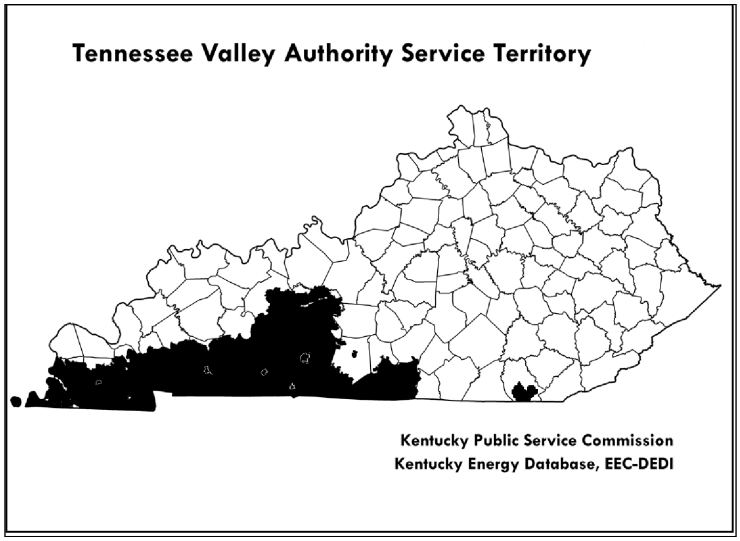


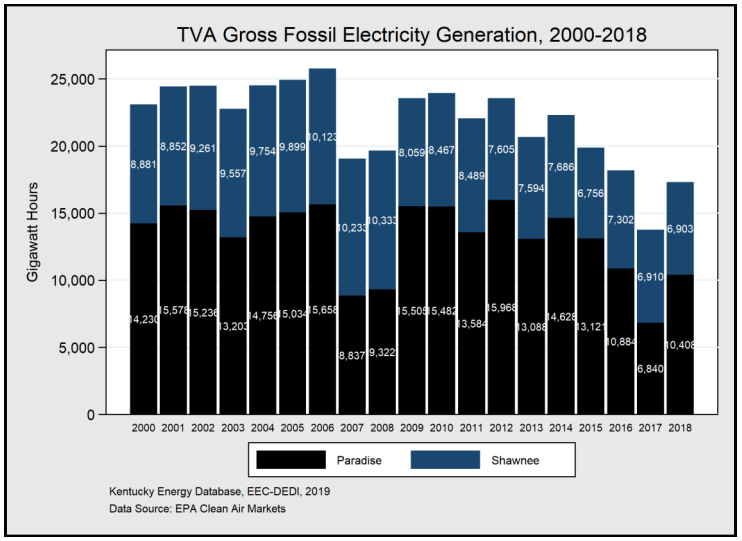
Sector	Price (Cents/kWh)	Since 2010*
Total†	8.42	+28.3%
Residential	11.29	-1.1%
Commercial	10.67	-16.5%
Industrial	5.01	-9.0%

*Change in real 2015 U.S.$

Sector	Sales (GWh)	Percentage
Total†	11,211	100%
Industrial	4,817	43%
Residential	3,326	30%
Commercial	3,068	27%

†Includes direct sales and sales to rural electric cooperatives



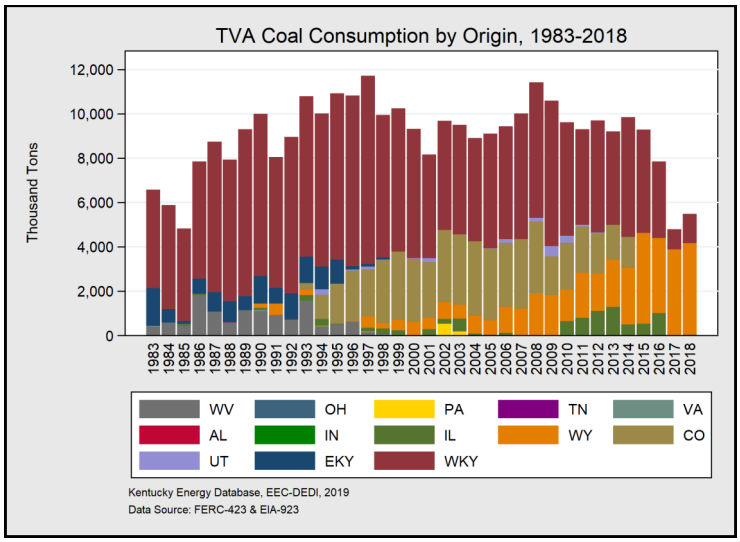


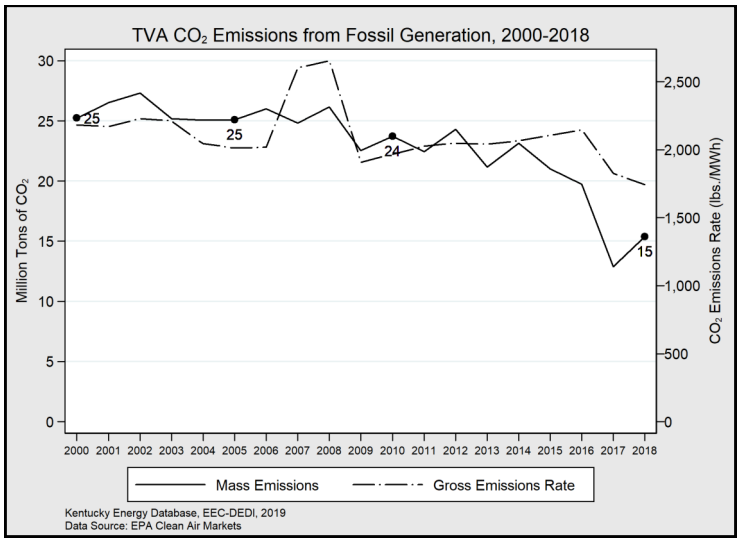
The Tennessee Valley Authority generates and sells electricity to five RECCs, 10 municipalities, and several industrial consumers in southwest Kentucky. Total electricity prices in 2018 were 8.42 cents per kWh and have increased by 28.3% since 2010 in inflation-adjusted dollars. In Kentucky, TVA operates the Marshall Combustion Turbine Plant near Calvert City as well as the coal-fired power plants of Paradise and Shawnee. Paradise Units 1 and 2 were retired in spring of 2017 and replaced with a natural gas combined cycle unit. Paradise Unit 3 is scheduled to retire in 2020.

Electricity Generation	2018	Since 2010
Gigawatt Hours	17,311	-27.7%

TVA generated 17 TWh and sold 11.2 TWh of electricity in 2018. Since 2010, generation has decreased by 27.7% and sales have decreased by 44%. TVA directly sells electricity to a number of industrial manufacturers and five RECCs. The 10 municipalities TVA supplies are not shown in the figures above.

Tennessee Valley Authority

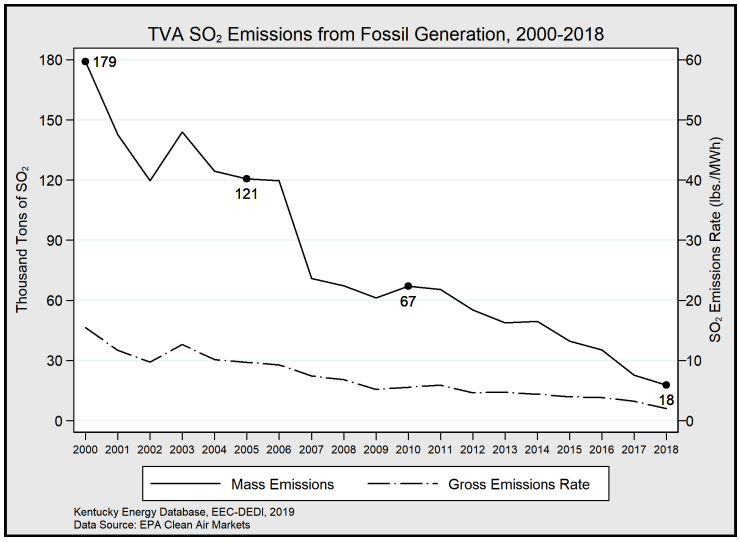


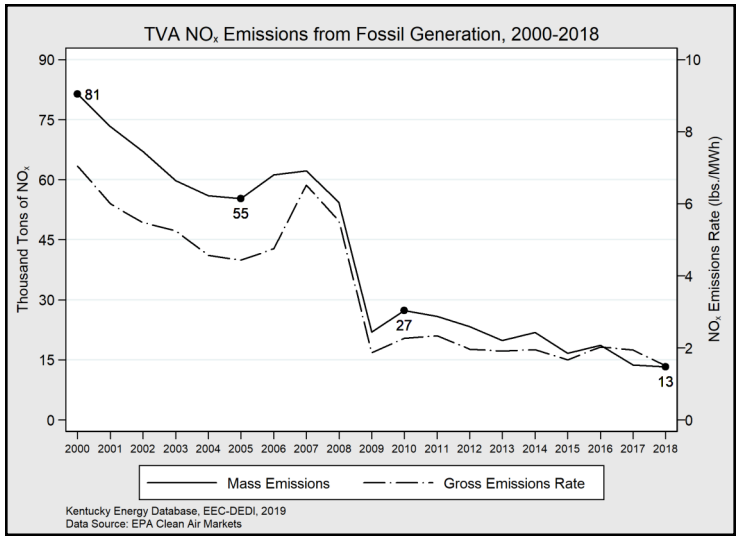


State	2018 Tons	Percentage
Total	5,482,270	100%
Western Kentucky	1,321,965	24.1%
Wyoming	4,121,752	75.2%
Illinois	38,553	0.7%

Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	15,385,727	-35.1%
Rate (lbs./MWh)	1,744	-11.3%

The Tennessee Valley Authority emitted nearly 15.3 million tons of CO_2 in Kentucky in 2018, a decrease of 35.1% since 2010. The rate of CO_2 emissions has decreased by 11.3% during that period.





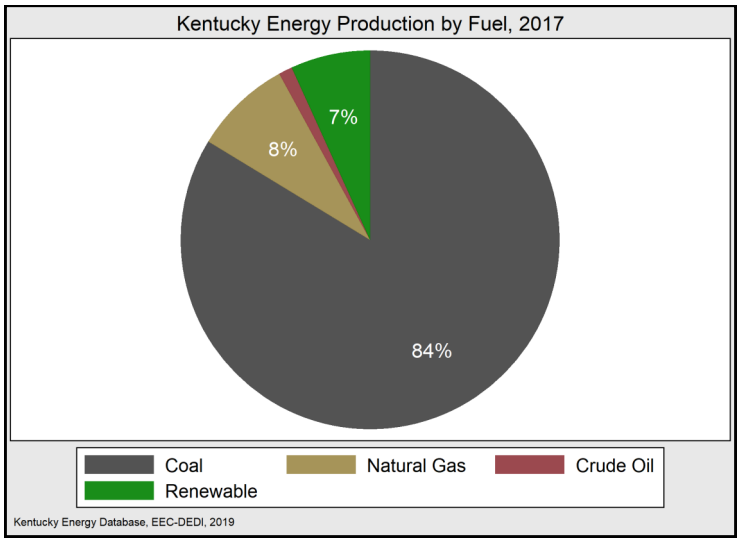
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	17,701	-73.6%
Rate (lbs./MWh)	2.00	-64.0%

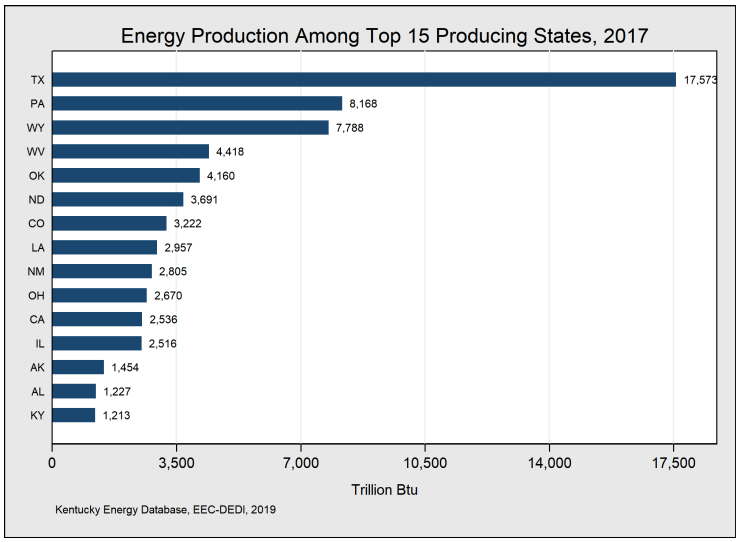
The Tennessee Valley Authority emitted 17,000 tons of SO_2 in 2018, a decrease of 73% since 2010. The rate of SO_2 emissions reduced by 64% during that period.

Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	13,239	-51.6%
Rate (lbs./MWh)	1.50	-33.9%

The Tennessee Valley Authority emitted 13,000 tons of NO_x in 2018, a reduction of 51.6% since 2010. The rate of NO_x emissions decreased by 33.9%% during that period.

Kentucky Energy Production

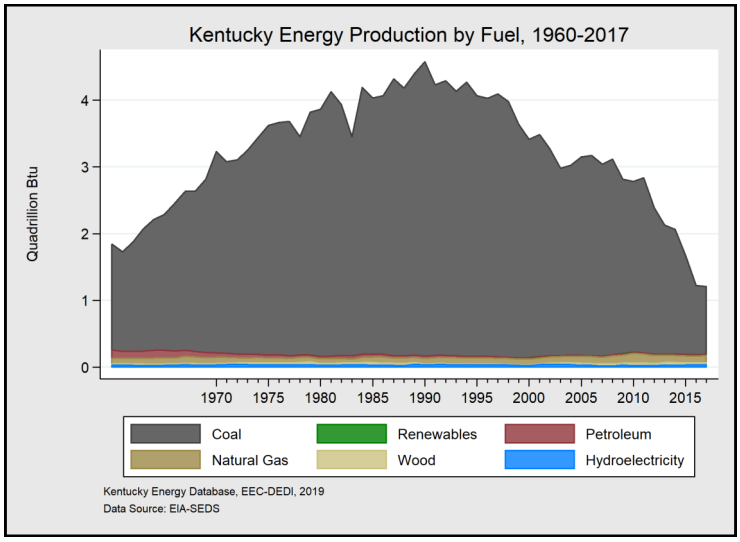


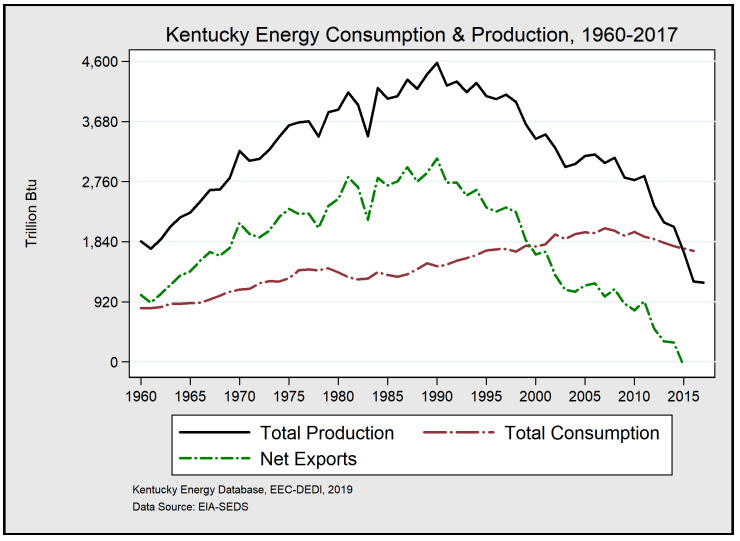


Fuel Type	Billion Btu	1 Year Change
Total	1,212,860	-1.5%
Coal	1,015,108	-2.5%
Natural Gas	101,231	-1.3%
Renewable	82,345	+13.9%
Crude Oil	14,176	-4.5%

State	Quadrillion Btu	Rank
Texas	17.57	1st
Kentucky	1.2	15th

Kentucky was the 15th largest producer of energy in 2017. As recently as 2009, Kentucky ranked 4th among all states; however, the increased adoption of horizontal hydraulic fracturing has increased production in other states and the decline of coal mining has decreased production in Kentucky.

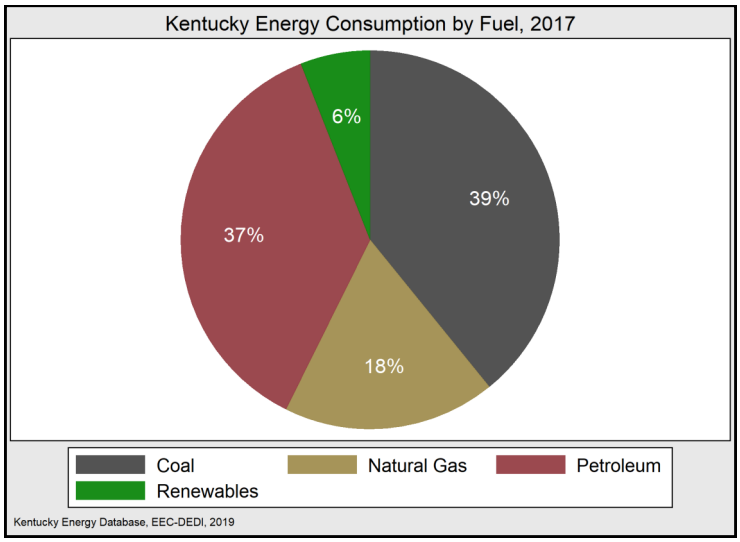


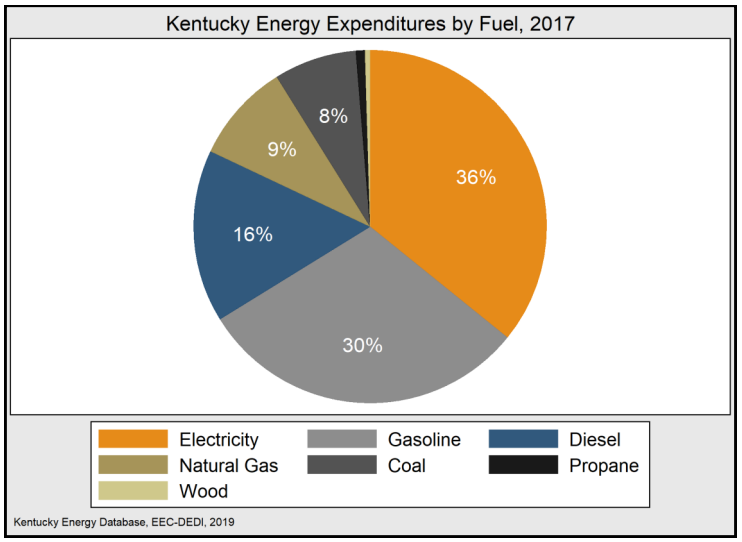


Kentucky produced 1.21 quadrillion Btu of energy in 2017. Despite declining production since 1990, coal supplies the vast majority of energy production in Kentucky at 1.01 quadrillion Btu, or 84% of all energy produced. Natural gas, renewable resources, and crude oil—despite significant growth in recent years—combined only account for 16% of energy production.

Due to abundant coal resources, Kentucky has historically been a net exporter of energy. The trend in coal production in Kentucky has always driven the trend in overall energy production. However, with decreasing coal production and stable demand, Kentucky's net exports of energy have declined since 1990.

Kentucky Energy Consumption

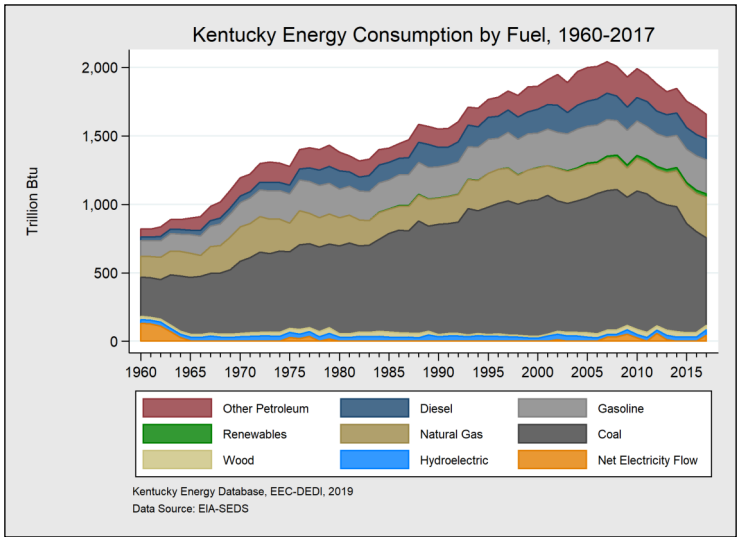


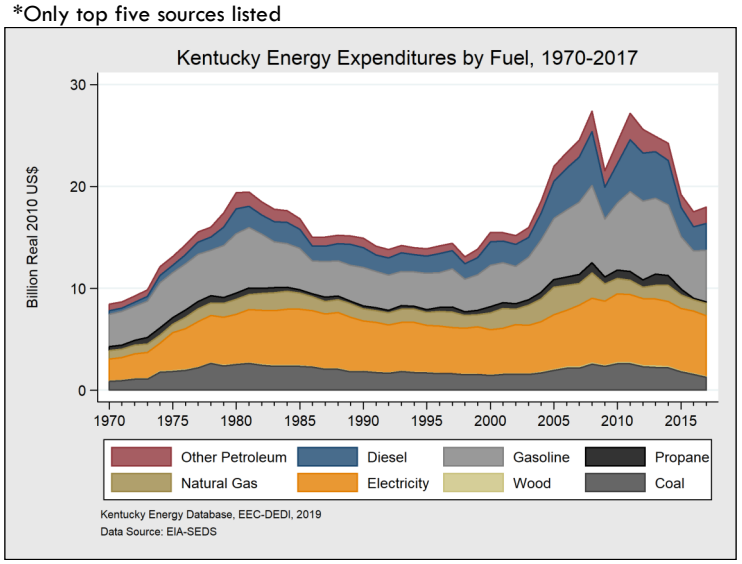


Fuel Type	Billion Btu	1 Year Change
Total	1,632,847	-5.5%
Coal	639,356	-13.2%
Petroleum	296,965	+6.1%
Natural Gas	599,225	-4.1%
Renewables	97,301	+11.8%

Fuel Type*	Million ($ US)	1 Year Change
Total	17,001	+4.6%
Gasoline	5,233	+11.8%
Electricity	6,172	-0.8%
Diesel	2,722	+12.5%
Coal	1,303	-17.8%
Natural Gas	1,571	+16.2%

*Only top five sources listed

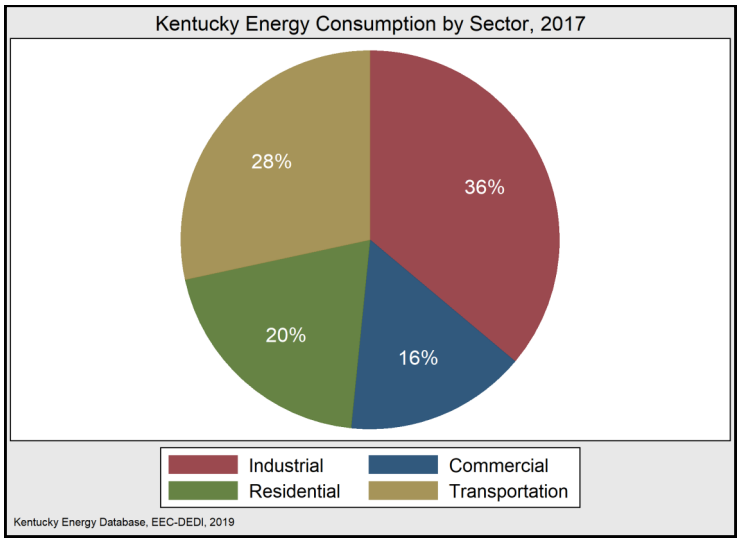


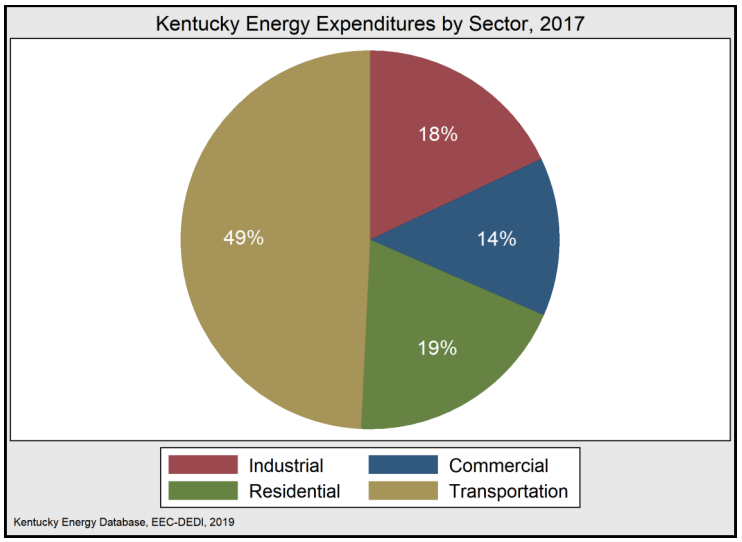


During 2017, Kentucky consumed 1.63 quadrillion Btu of energy, a decrease of 5.5% compared with 2016. The combustion of coal for electricity remained Kentucky's primary energy source, providing 39% of the state's energy requirements. Petroleum products were the second largest source of energy at 37%. The remainder of energy consumption was supplied by natural gas, at 18%, and renewable energy sources at 6%.

More than $17 billion was spent on energy in Kentucky in 2017, a significant increase in energy expenditures compared with 2016. During the year, gasoline was 30% of energy expenditures and electricity was 36%. Diesel fuel accounted for 16% of energy expenditures. Coal and natural gas consumption, other than electricity, together accounted for approximately 18% of energy expenditures.

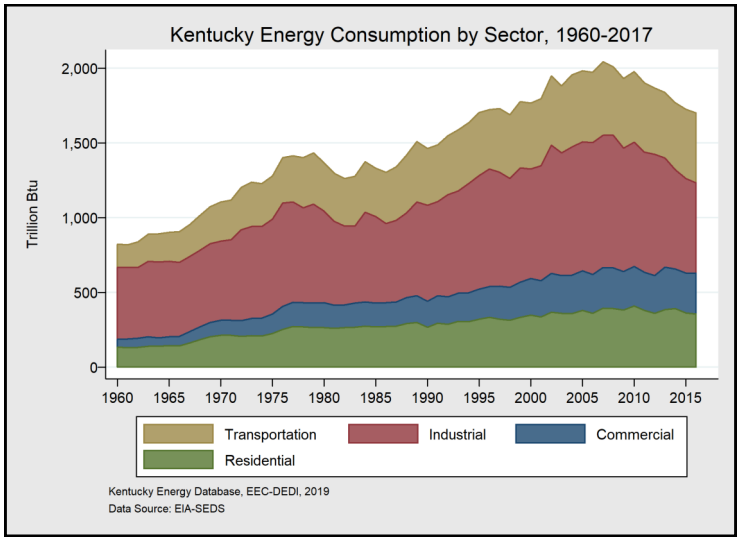
Kentucky Energy Consumption

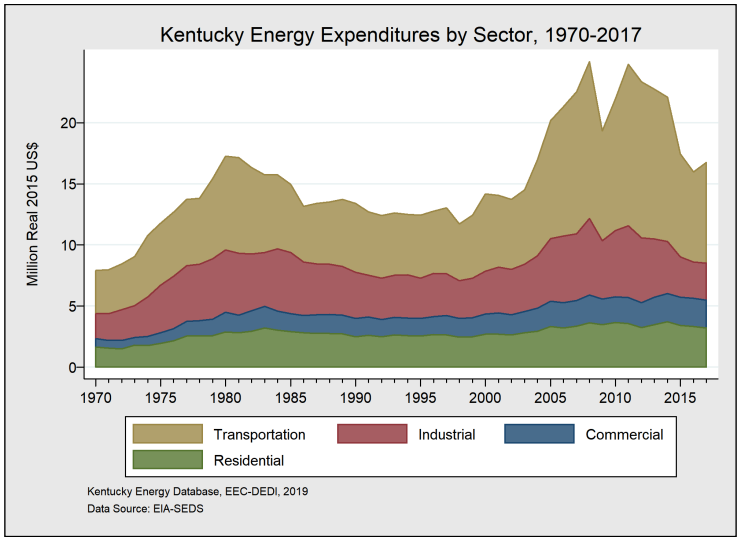




Sector	Billion Btu	1 Year Change
Total	1,658,207	-2.7%
Industrial	598,457	-2.4%
Transportation	470,715	+1.0%
Residential	331,991	-6.3%
Commercial	257,046	-4.9%

Sector	Million Dollars	1 Year Change
Total	17,338	+7.1%
Transportation	8,536	+14.0%
Industrial	3,113	+4.0%
Residential	3,337	-0.9%
Commercial	2,352	+0.4%

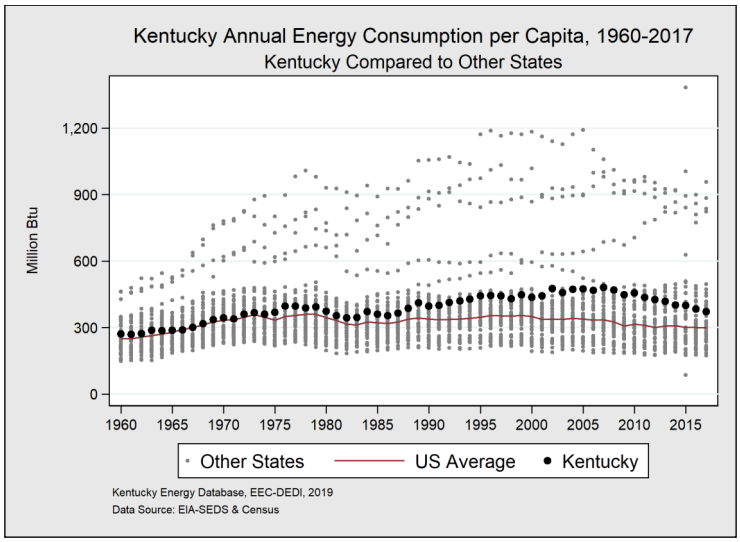


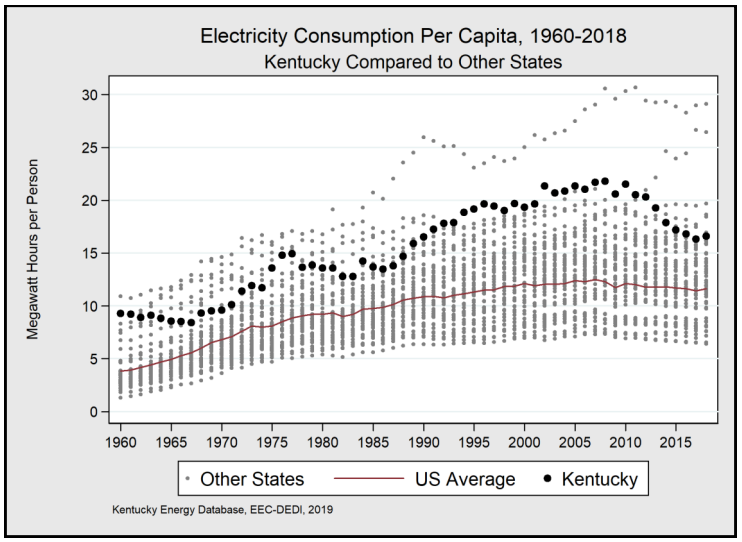


During 2017, manufacturing operations in Kentucky consumed 36% of all energy consumed within the Commonwealth. Kentucky's industrial energy use was proportionally larger than the national average of 33% in 2017. After manufacturing, transportation was the second largest use of energy, with 28% of total energy demand, followed by residential energy use at 20%. The commercial sector accounted for 16% of energy consumption.

The Kentucky transportation energy use was the majority of energy expenditures in the state during the year. A total of $8.5 billion was spent in 2017 on transportation fuels—primarily on gasoline and diesel. Manufacturers spent $3.3 billion on various energy commodities, while the residential and commercial sectors spent $3.3 billion and $2.3 billion, respectively.

Kentucky Energy Intensity



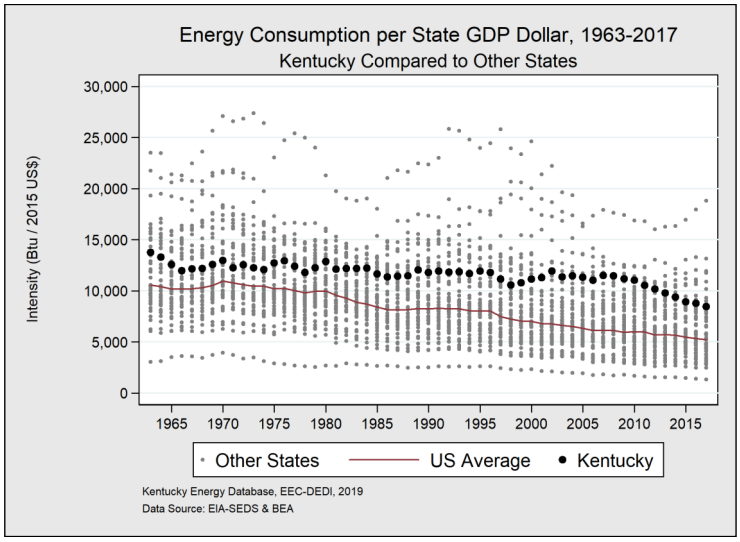


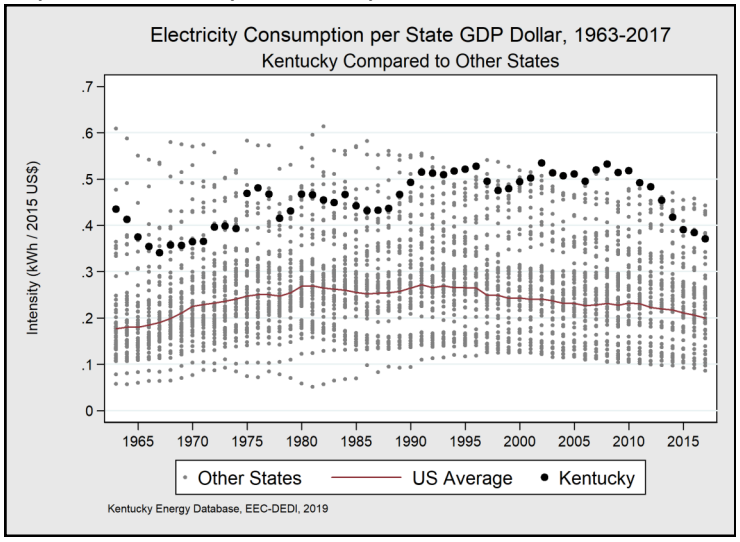
State	MMBtu per Capita	Rank
Louisiana	884.21	1st
Kentucky	372.28	15th
U.S. Average	299.71	-
California	199.34	49th

Kentucky total energy consumption per capita decreased by 2.97% compared in 2017, which is 15th highest of all states.

State	MWh per Capita	Rank
Wyoming	29.1	1st
Kentucky	16.61	7th
U.S. Average	11.62	-
California	6.00	52nd

In 2018, Kentucky ranked 7th in terms of total electricity consumption per capita. Total electricity consumption per capita increased by 1.8% compared with 2017.





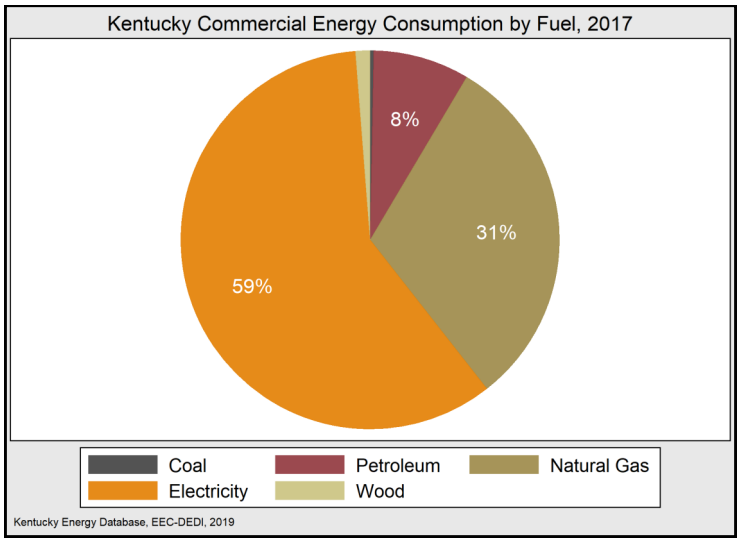
State	Btu/$U.S. GDP	Rank
Louisiana	18,821	1st
Kentucky	8,468	11th
U.S. Average	5,421	-
Maine	2,792	50th

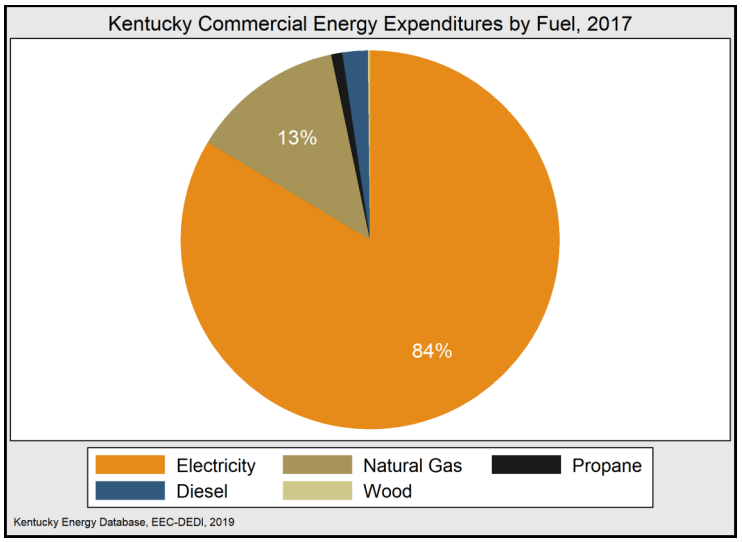
Kentucky ranked 11th in terms of total energy consumption per dollar of state GDP in 2017. Total energy intensity decreased by 3.4% compared with 2016.

State	kWh/$U.S. GDP	Rank
Mississippi	0.44	1st
Kentucky	0.37	8th
U.S. Average	0.20	-
California	0.10	50th

In 2017, Kentucky had the 8th most electricity-intensive economy in the United States, and total electricity intensity decreased by 3.4% compared with 2016.

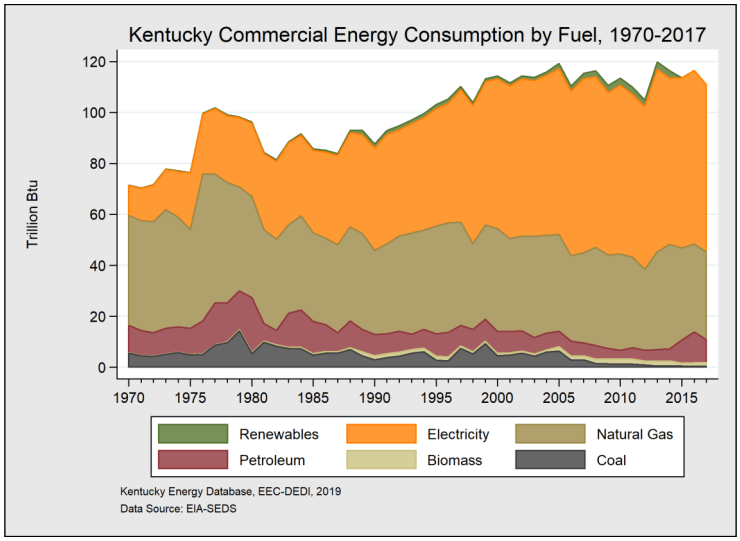
Commercial Energy Consumption

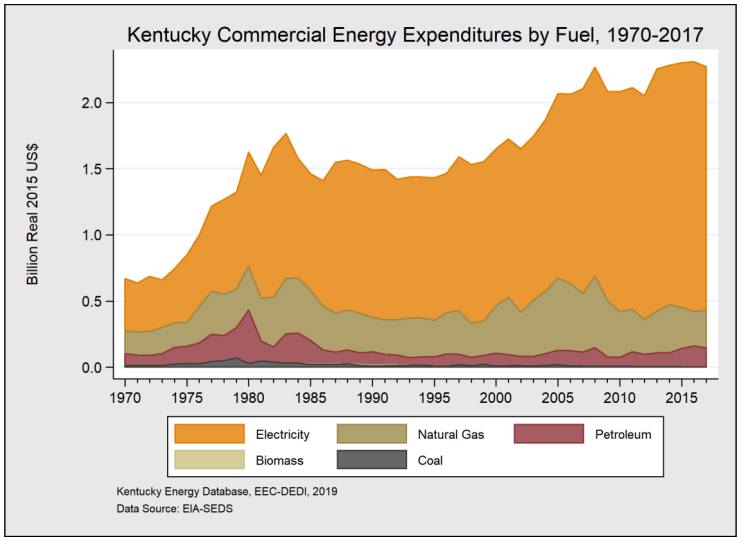




Fuel Type	Billion Btu	1 Year Change
Total Net	110,965	-4.7%
Electricity	65,826	-3.4%
Natural Gas	34,306	-0.6%
Petroleum	9,091	-24.9%
Wood	1,384	+4.1%
Coal	358	-1.4%

Fuel Type	Million Dollars	1 Year Change
Total	2,272	+0.04%
Electricity	1,900	-0.6%
Natural Gas	297	+12.3%
Diesel	49	-35.7%
Propane	21	+49.3%
Wood	4.3	+16.2%

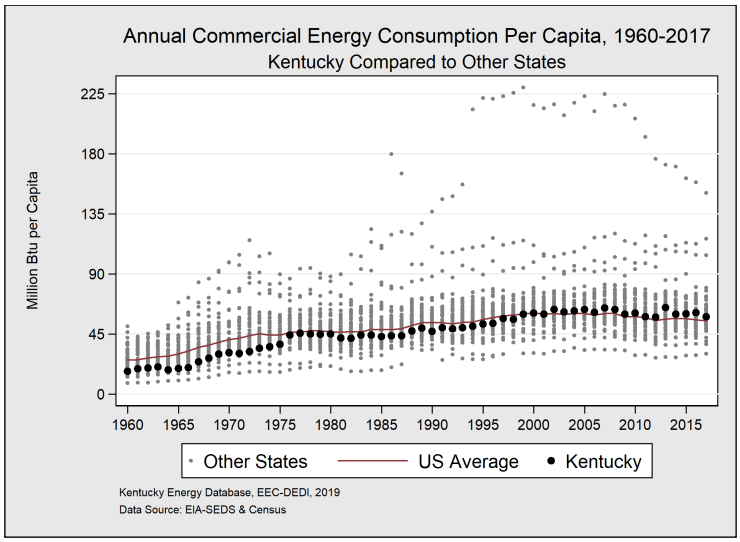




In 2017, non-manufacturing businesses in Kentucky consumed 110,965 billion Btu of energy, a 4.7% increase in net commercial energy consumption compared with 2016. Electricity constituted 59% of commercial energy consumption, followed by natural gas at 31%. Other commodities such as petroleum products, wood, coal, and ethanol accounted for approximately 8% of commercial energy consumption in 2017. The commercial sector, which includes service industries, primarily uses natural gas for heating during the winter and cooking.

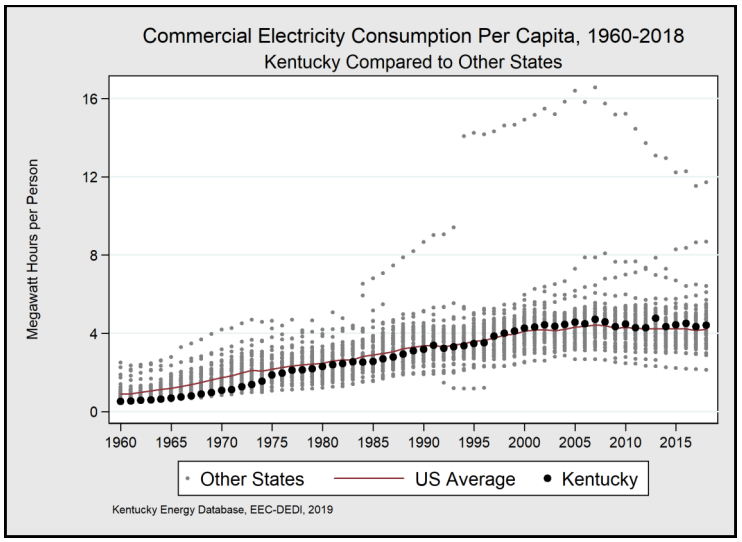
In 2017, non-manufacturing businesses in Kentucky spent more than $2.2 billion on energy consumption—a 0.04% increase in commercial energy expenditures compared with 2016. Electricity was the largest energy expenditure, at 84%. Natural gas was 13% of commercial energy expenditures.

Commercial Energy Intensity



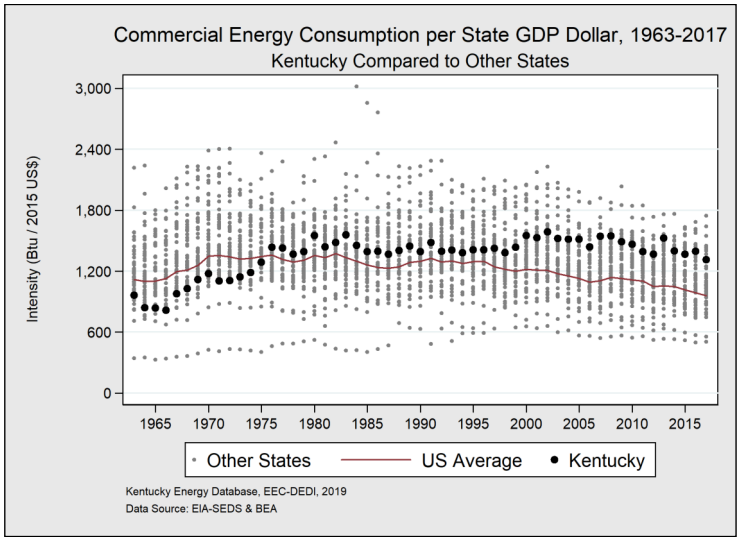
State	MMBtu per Capita	Rank
North Dakota	116.4	1st
Kentucky	57.7	25th
U.S. Average	54.8	-
Hawaii	30.1	52nd

Kentucky commercial energy consumption per capita decreased by 5.3% compared with 2016, and ranks 25th of all states.



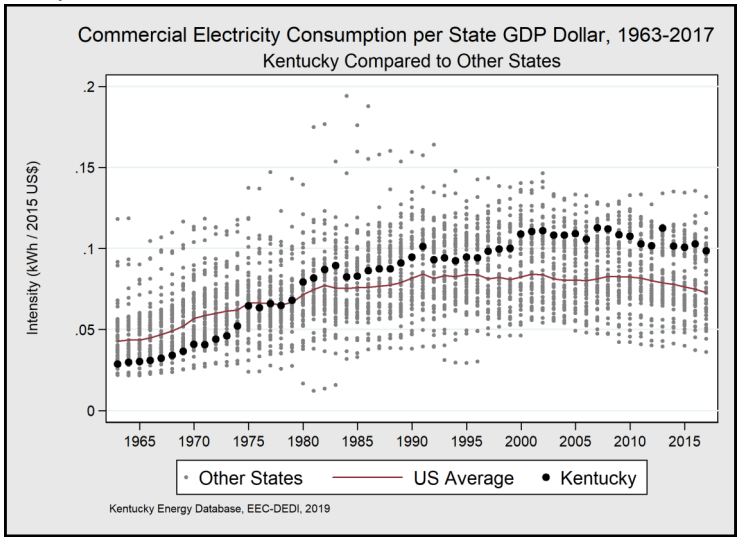
State	MWh per Capita	Rank
North Dakota	8.64	1st
Kentucky	4.33	21st
U.S. Average	4.15	-
Hawaii	2.16	52nd

Kentucky ranked 21st in terms of commercial electricity consumption per capita in 2017, an increase of 1.9% compared with 2017.



State	Btu/$U.S. GDP	Rank
Montana	1,746	1st
Kentucky	1,313	11th
U.S. Average	959	-
Hawaii	504	52nd

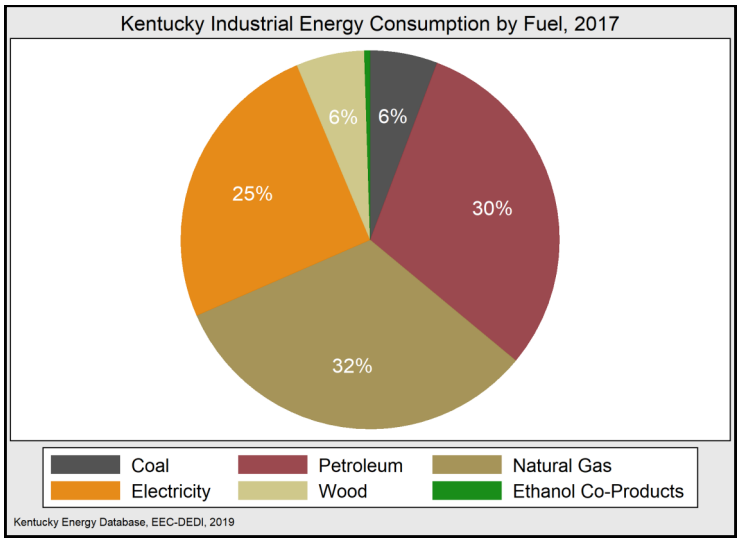
Kentucky ranked 11th highest in terms of commercial energy consumption per dollar of state GDP in 2017. Commercial energy intensity decreased by 5.9% compared with 2016.

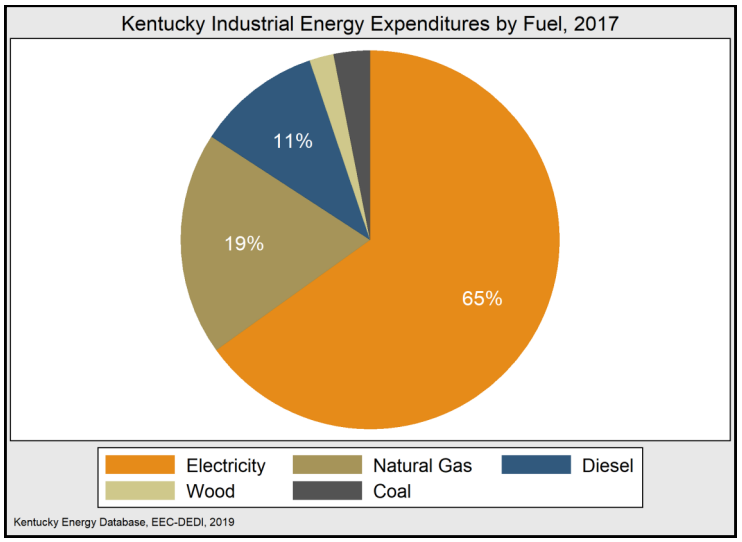


State	kWh/$U.S. GDP	Rank
Mississippi	0.13	1st
Kentucky	0.10	15th
U.S. Average	0.07	-
Hawaii	0.04	52nd

In 2017, Kentucky ranked 15th in terms of commercial electricity use per dollar of state GDP. Commercial electricity intensity decreased by 3.8% compared with 2017.

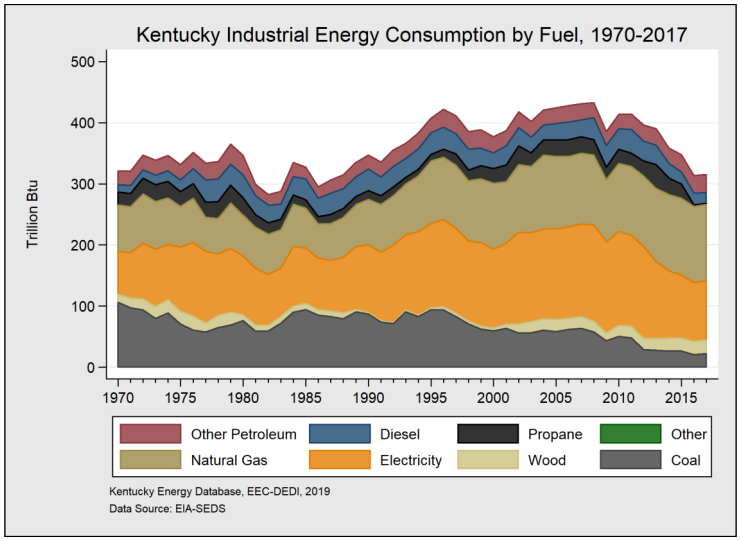
Industrial Energy Consumption

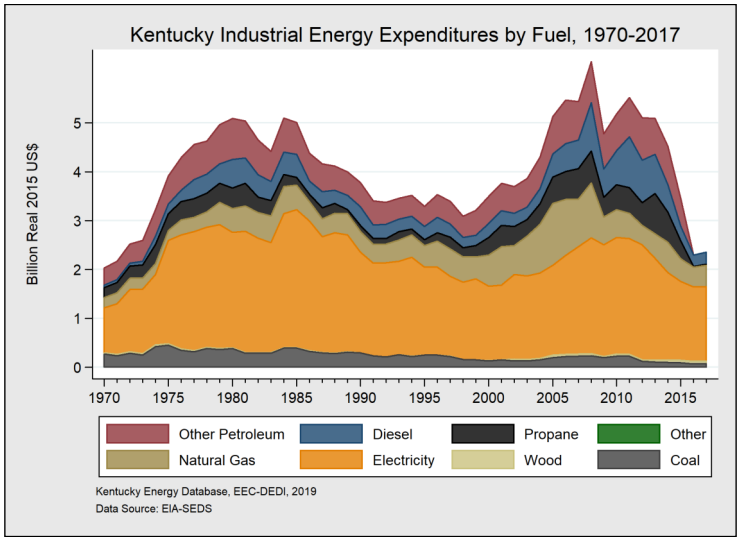




Fuel Type	Billion Btu	1 Year Change
Total Net	382,287	-3.2%
Petroleum	116,357	-11.9%
Electricity	97,103	+0.8%
Natural Gas	124,603	+0.2%
Coal	22,110	+8.1%
Wood	22,114	+1.7%

Fuel Type	Million Dollars	1 Year Change
Total	2,386	+4.7%
Electricity	1,571	+1.6%
Diesel	257	+8.4%
Propane	23	+30.5%
Natural Gas	461	+13.4%
Coal	74	+4.8%

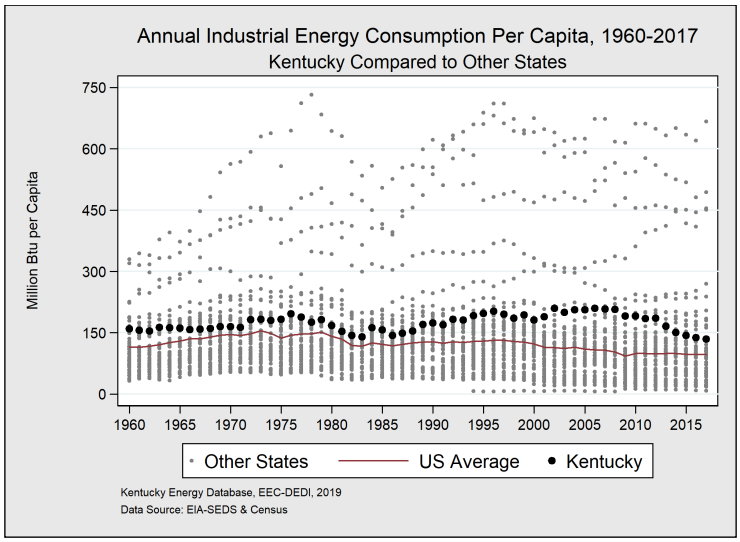




Kentucky-based manufacturing operations and farms consumed 382 trillion Btu of energy in 2017, a decrease of 3.2% from 2016. Natural gas was the largest component of industrial energy use in 2017, or 32% of total industrial energy consumption. Electricity and petroleum accounted for 25% and 30% of industrial energy consumption, respectively.

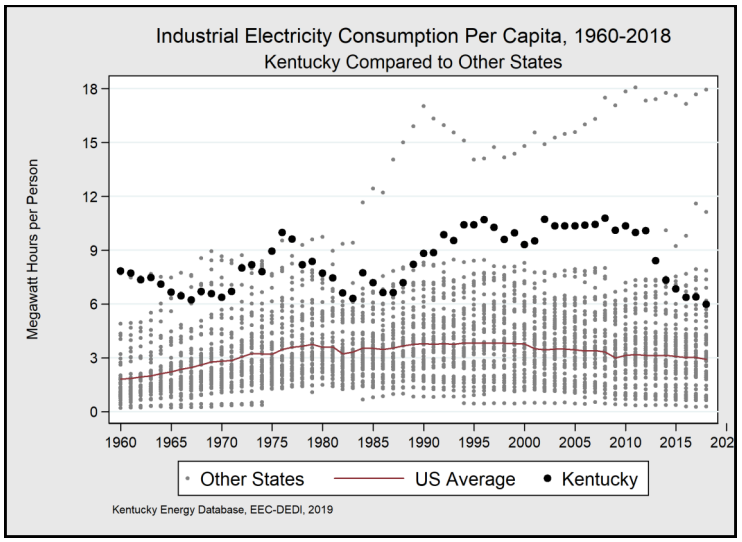
Kentucky spent more than $2.3 billion to fuel factories and farms within the Commonwealth, which was a 4.7% increase in industrial energy spending compared with 2016. Electricity was the largest expenditure—65% of industrial energy spending. Diesel and natural gas accounted for 11% and 19% of industrial expenditures, respectively. Natural gas, coal, wood, and ethanol accounted for the remainder of industrial energy expenditures in 2017.

Industrial Energy Intensity



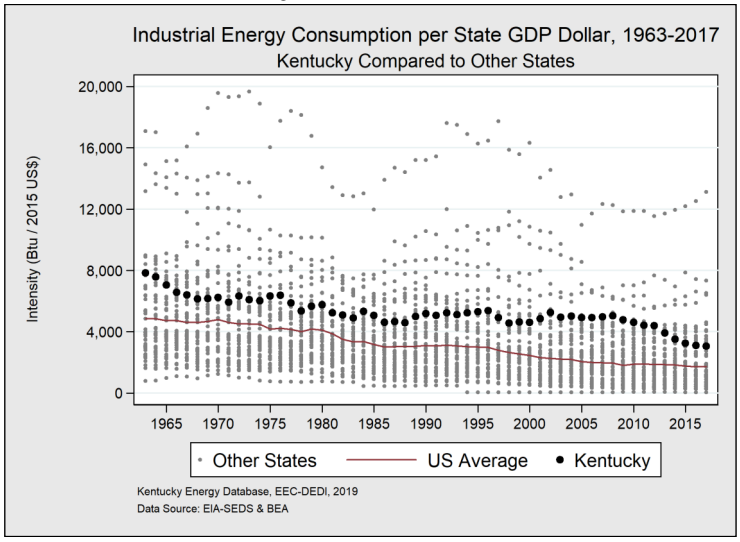
State	MMBtu per Capita	Rank
Louisiana	666.7	1st
Kentucky	134.4	14th
U.S. Average	97.9	-
Maryland	17.9	51st

Kentucky industrial energy consumption per capita decreased by 2.8% in 2017, but remains above average due to energy -intensive manufacturing.



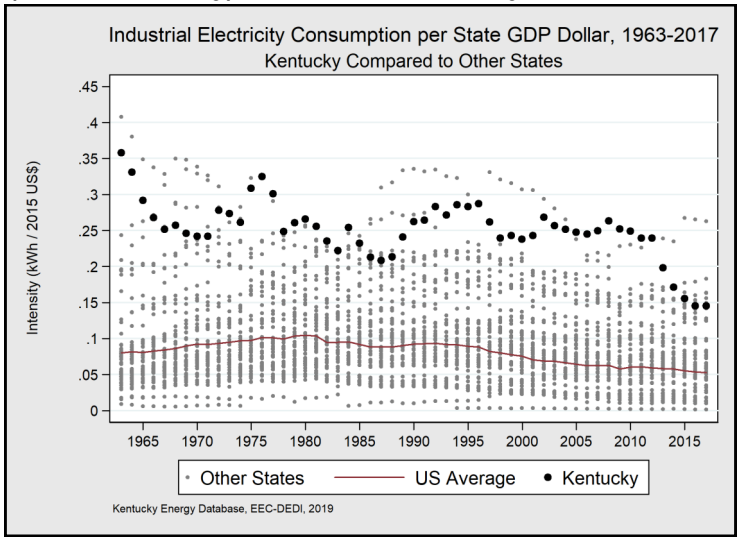
State	MWh per Capita	Rank
Wyoming	17.7	1st
Kentucky	6.4	8th
U.S. Average	3.0	-
Maryland	0.6	51st

Industrial electricity consumption per capita decreased by 6.3% in 2018, but remains above average due to the presence of energy-intensive manufacturing.



State	Btu/$U.S. GDP	Rank
Louisiana	13,115	1st
Kentucky	3,056	15th
U.S. Average	1,711	-
New York	259	51st

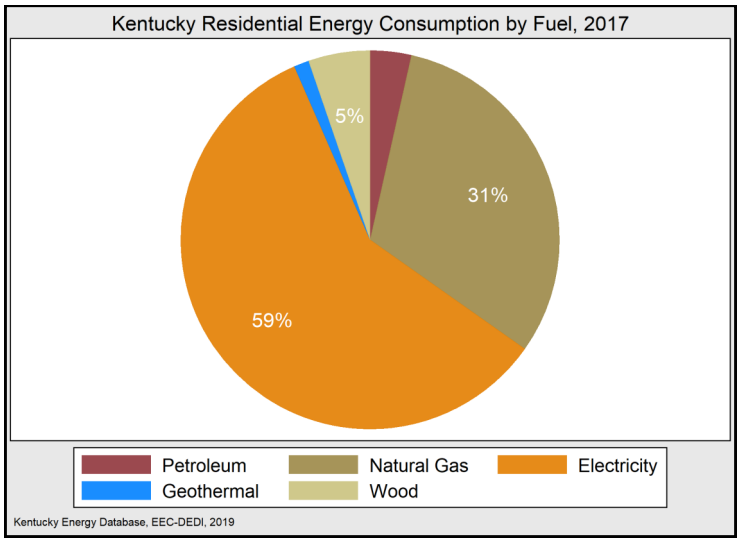
Kentucky industrial energy intensity decreased by 33% compared with 2010, and is decreasing significantly faster than the national average.

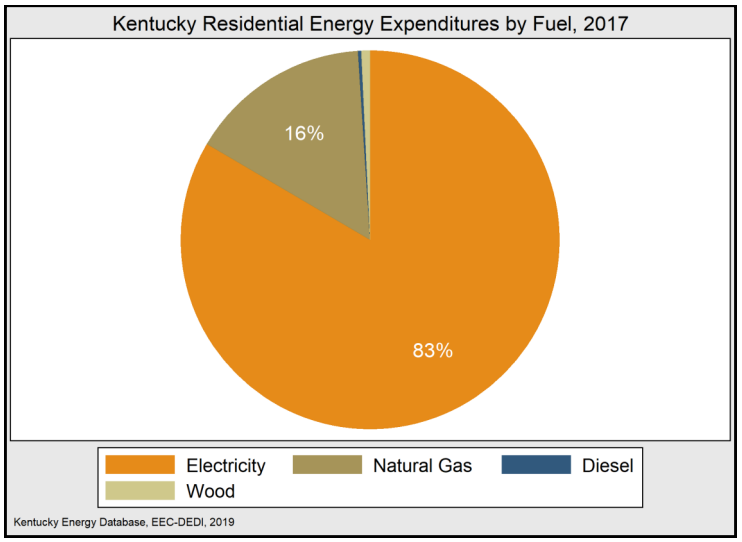


State	kWh/$U.S. GDP	Rank
Wyoming	0.26	1st
Kentucky	0.14	7th
U.S. Average	0.05	-
Maryland	0.009	50th

In 2017, Kentucky was 7th in terms of industrial electricity use per dollar of GDP, but changed by a negligible amount from 2016.

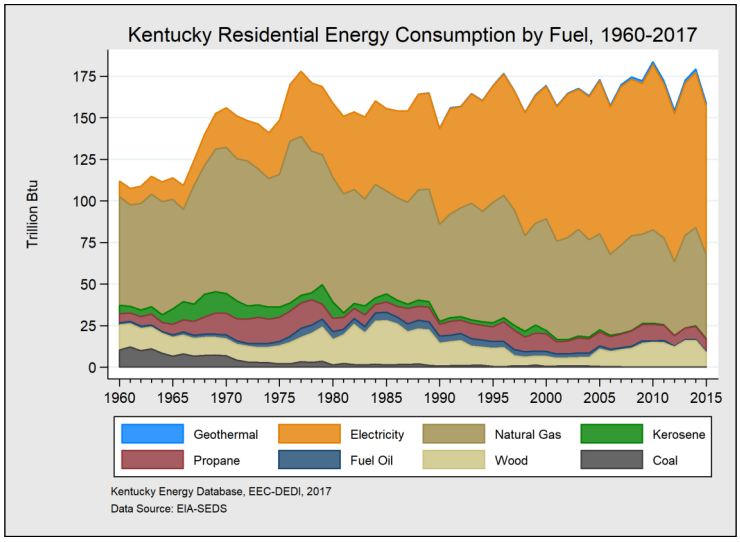
Residential Energy Consumption

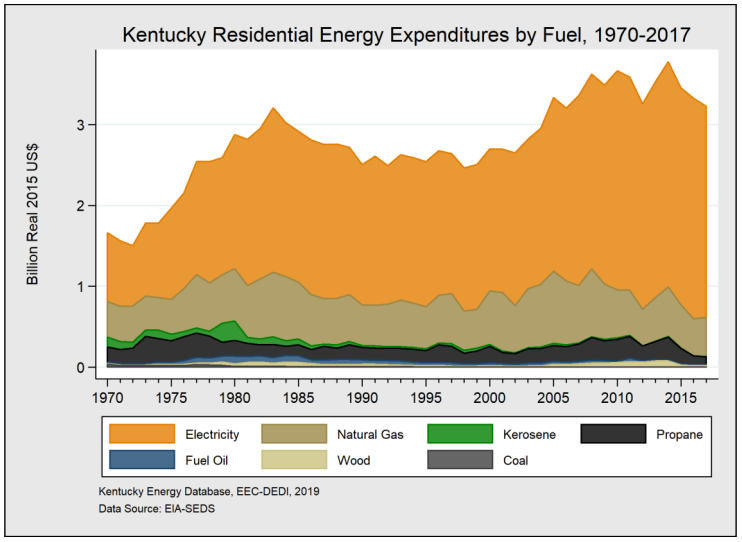




Fuel Type	Billion Btu	1 Year Change
Total Net	144,696	-5.2%
Electricity	84,899	-5.5%
Natural Gas	45,244	-3.4%
Wood	7,608	+0.7%
Petroleum	5,085	-22.1%
Geothermal	1,860	+0.0%

Fuel Type	Million Dollars	1 Year Change
Total	3,328	-1.0%
Electricity	2,700	-2.3%
Natural Gas	503	+8.9%
Liquid Propane Gas	100	-11.4%
Wood	24	+12.8%
Kerosene	1.5	-34.8%

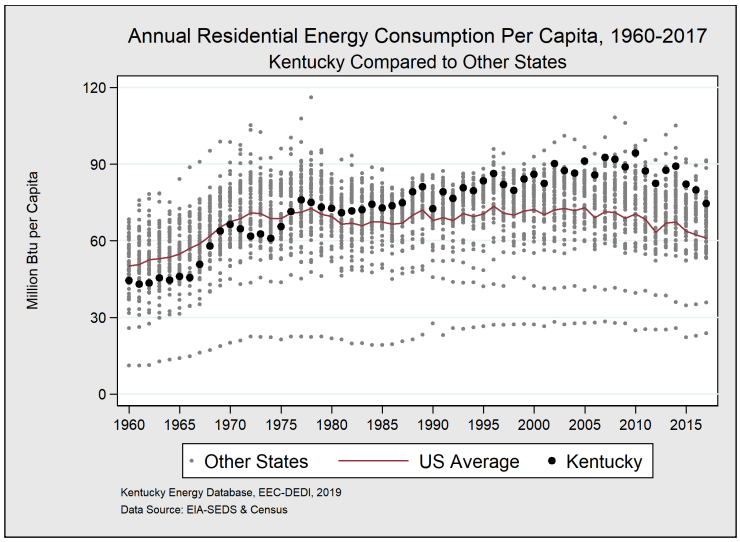


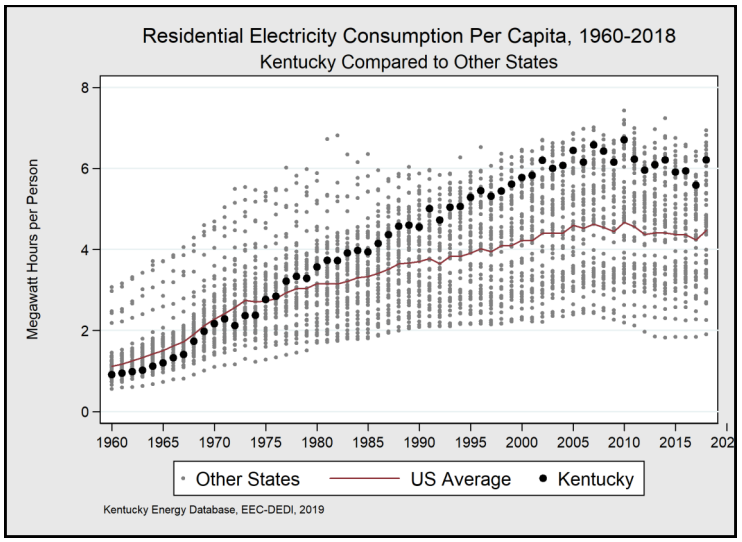


Households in Kentucky consumed 144 trillion Btu of energy in 2017, a 5.2% decrease in net residential energy consumption compared with 2016. The largest portion of energy used in the residential sector—59%—was through electricity and the second largest was natural gas. Over time, electricity has increased its share of domestic energy consumption while natural gas, primarily used for home heating, has decreased.

Kentucky households spent nearly $3.3 billion on energy commodities and energy consumption in 2017, a 1% decrease in residential energy expenditures compared with 2016. Electricity expenditures comprised 83% of spending, which totaled $2.7 billion during the year.

Residential Energy Intensity



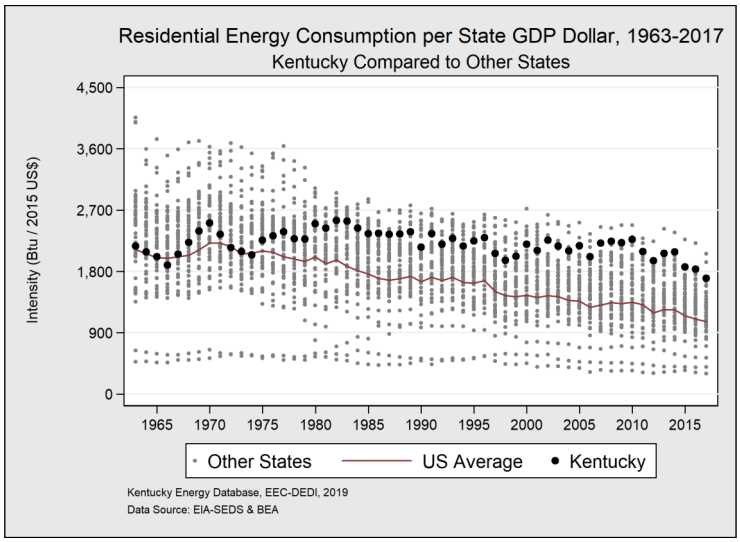


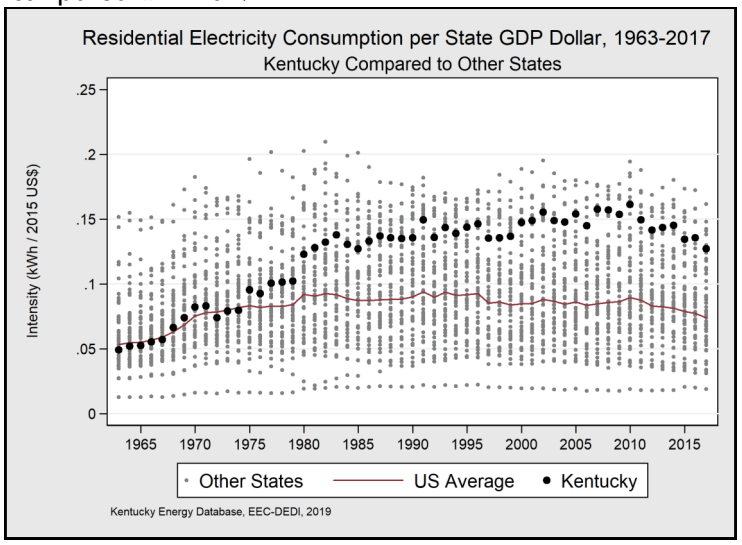
State	MMBtu per Capita	Rank
North Dakota	91.5	1st
Kentucky	74.5	10th
U.S. Average	61.0	-
Hawaii	23.8	52nd

Kentucky residential energy consumption per capita decreased in 2017 by 6.6%, and is 10th highest of all states.

State	MWh per Capita	Rank
North Dakota	6.4	1st
Kentucky	5.6	10th
U.S. Average	4.2	-
Hawaii	1.8	52nd

In 2018, Kentucky ranked 10th nationally in terms of residential electricity use per capita, an increase of 11.1% compared with 2017.





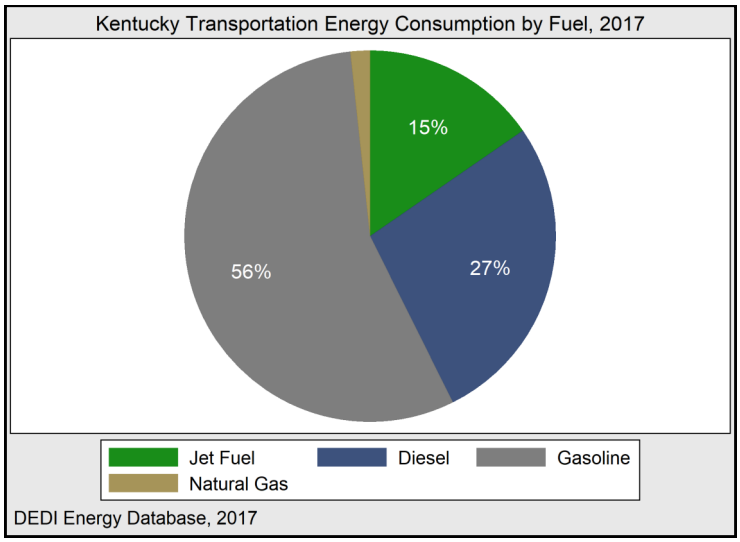
State	Btu/$U.S. GDP	Rank
Montana	2,056	1st
Kentucky	1,696	4th
U.S. Average	1,066	-
Hawaii	399	51st

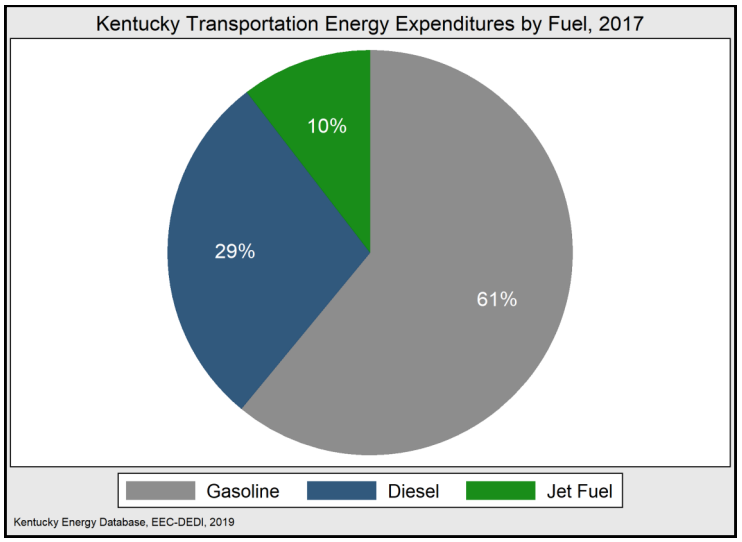
Kentucky ranked 4th in terms of residential energy consumption relative to one dollar of state GDP. Residential energy intensity decreased by 7.6% compared with 2016.

State	kWh/$U.S. GDP	Rank
Mississippi	0.16.	1st
Kentucky	0.13	7th
U.S. Average	0.07	-
Hawaii	0.03	51st

In 2017, Kentucky ranked 7th in terms of residential electricity use relative to one dollar of state GDP, a decrease of 5.9%.

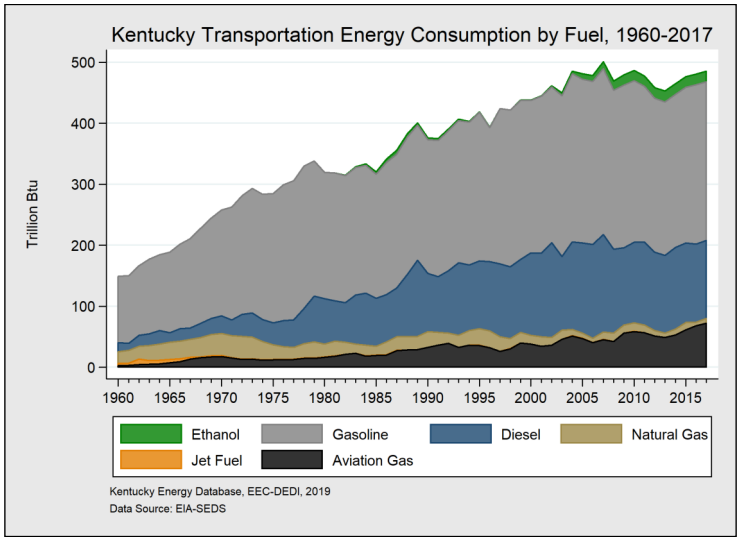
Transportation Energy Consumption

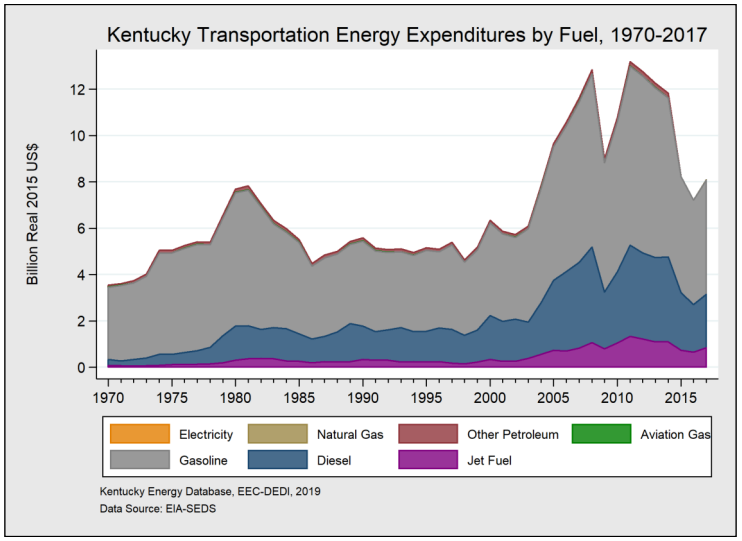




Fuel Type	Billion Btu	1 Year Change
Total	470,715	+1.0%
Gasoline	260,507	-0.4%
Diesel	127,680	-0.1%
Jet Fuel	71,976	+5.8%
Natural Gas	7,876	+36.4%
Propane	37	-52.6%

Fuel Type	Million Dollars	1 Year Change
Total	8,536	+14.0%
Gasoline	5,099	+11.8%
Diesel	2,392	+14.8%
Jet Fuel	871	+31.8%
Other Petroleum	0.70	-41.7%

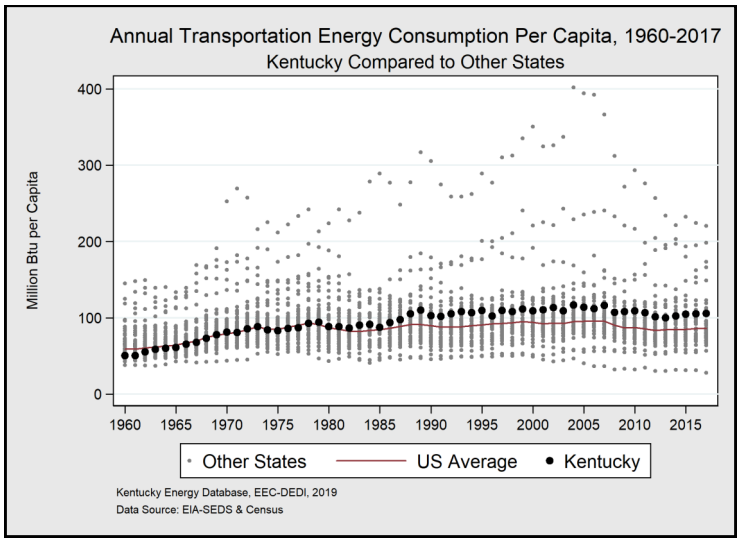


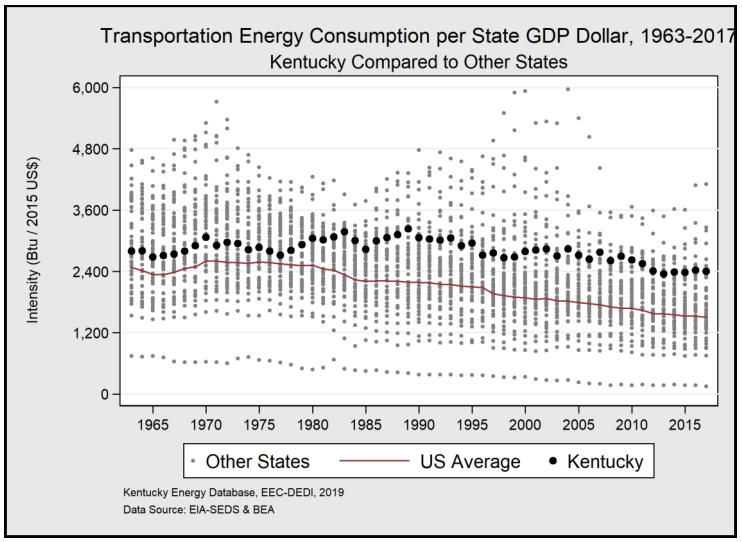


Transportation sector energy consumption in Kentucky was 470 trillion Btu in 2017, a 1% increase compared with 2016. Gasoline was 56% of transportation energy consumption in 2017, followed by diesel at 27%. The other 16% of transportation energy consumption came from jet fuel, natural gas and propane.

Transportation energy expenditures were approximately $8.5 billion in Kentucky in 2017. Compared with 2016, transportation energy expenditures increased by 14%. Gasoline was the largest component of transportation energy expenditures with 61% of spending in 2017. Diesel expenditures were 29% of transportation energy costs in Kentucky in 2017. (Consumption of natural gas by way of transmission pipelines is not tabulated in terms of transportation sector energy expenditures).

Transportation Energy Intensity





State	MMBtu per Capita	Rank
Alaska	220.37	1st
Kentucky	105.68	10th
U.S. Average	86.02	-
Rhode Island	56.36	52nd

In 2017, Kentucky transportation energy consumption per capita increased by 0.6% compared with 2016, which is 10th highest of all states.

State	Btu/$U.S. GDP	Rank
Mississippi	4,106	1st
Kentucky	2,404	9th
U.S. Average	1,504	-
New York	751	52nd

In 2015, Kentucky ranked 9th in terms of transportation energy consumption per dollar of state GDP. Transportation energy intensity decreased by 0.15% compared with 2014.

Kentucky Coal Production

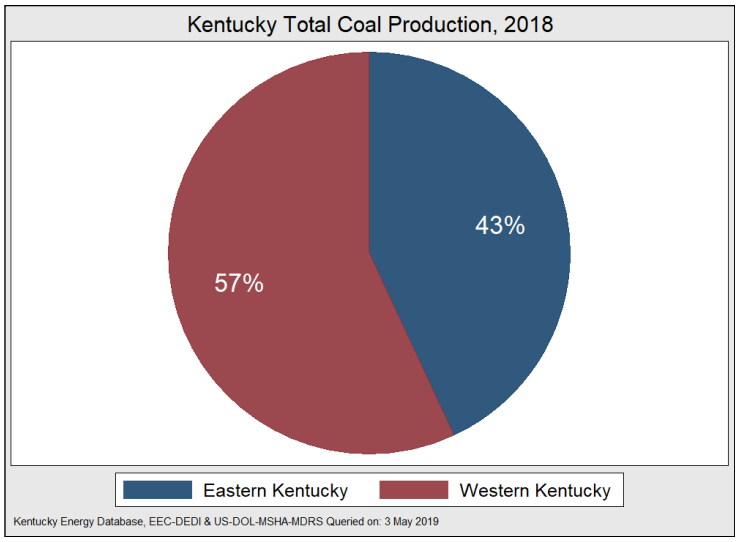
County	Tons	1 Year Change	Percentage
Total	39,798,896	-4.9%	100%
Union	9,753,472	+8.8%	24.5%
Pike	4,328,175	-5.4%	10.9%
Perry	3,638,302	-3.6%	9.1%
Hopkins	3,528,289	-1.3%	8.9%
Harlan	3,097,648	-11.5%	7.8%
Ohio	2,738,362	-33.6%	6.9%
Muhlenberg	2,628,986	-5.3%	6.6%
Webster	2,475,504	-5.8%	6.2%
Mclean	1,270,993	-3.2%	3.2%
Leslie	1,264,272	+20.7%	3.2%
Floyd	918,122	-32.7%	2.3%
Bell	795,063	-27.5%	2.0%
Knott	621,055	+10.8%	1.6%

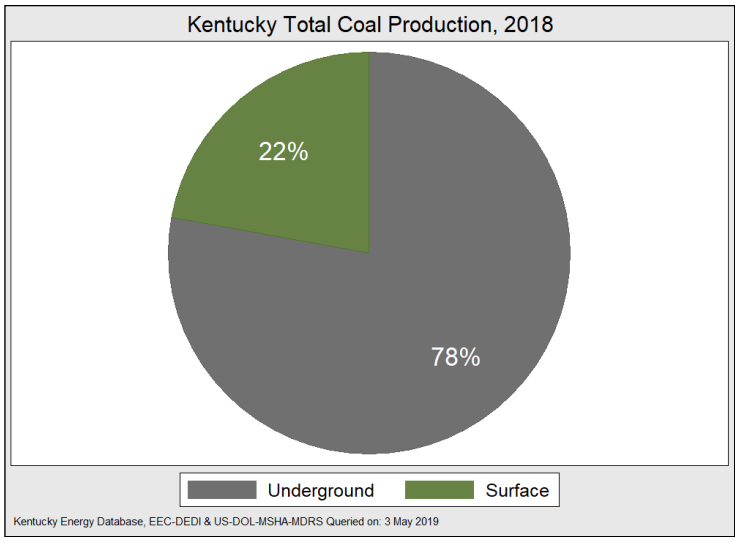
County	Tons	1 Year Change	Percentage
Letcher	587,638	+57.8%	1.5%
Magoffin	503,227	+331.7%	1.3%
Whitley	453,720	-10.8%	1.1%
Johnson	359,287	-49.8%	0.9%
Daviess	263,518	+18.1%	0.7%
Knox	183,857	+54.1%	0.5%
Martin	151,837	-54.5%	0.4%
Morgan	107,649	+128.0%	0.3%
Lawrence	89,884	+50.5%	0.2%
Breathitt	39,236	+49.6%	0.1%
Laurel	800	-58.5%	<0.1%

During 2018, coal production in the Commonwealth decreased to 39.7 million tons. In 2018, Union County remained the top producer of coal in Kentucky throughout the entire year. Pike County, the largest producer from 1978 to 2011, mined the most in eastern Kentucky.

In Kentucky, coal mining is divided between two different geologic basins—the Central Appalachian Basin of eastern Kentucky and the Illinois Basin of western Kentucky. Kentucky is the only major coal exporting state to span two geologic basins, and the chemical composition and accessibility of the coal from each is distinct. Eastern Kentucky has recorded coal mining since as early as 1790 and western Kentucky is known to have had mining operations in 1820. The coalfield of eastern Kentucky has coal with a relatively higher heat content and lower sulfur content than western Kentucky. Eastern Kentucky coal is also more difficult to mine. As a result of differences regarding the extractability and quality of the coal, eastern Kentucky is overall more expensive than western Kentucky coal. The difference in the delivered price of coal between the two coalfields is a result of numerous factors that affect both the supply of and demand for coal, including transportation costs, the ease of accessing coal and the subsequent mining techniques employed, and the chemical properties and heat content of the coal.

Kentucky Coal Production



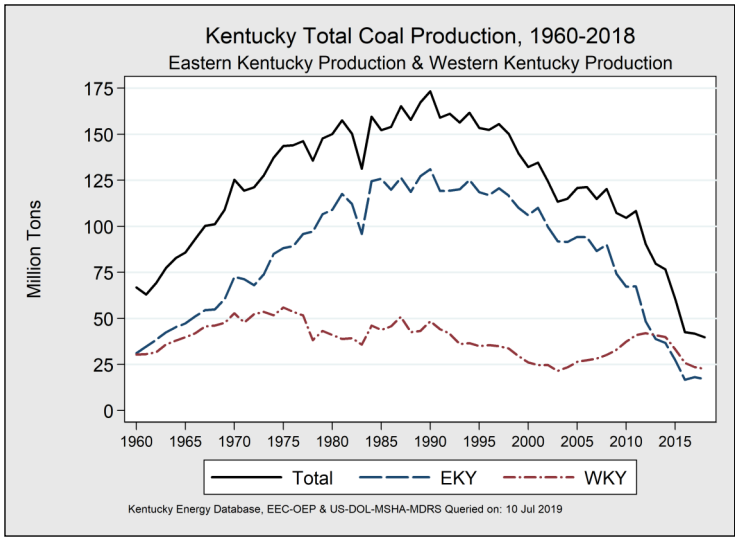


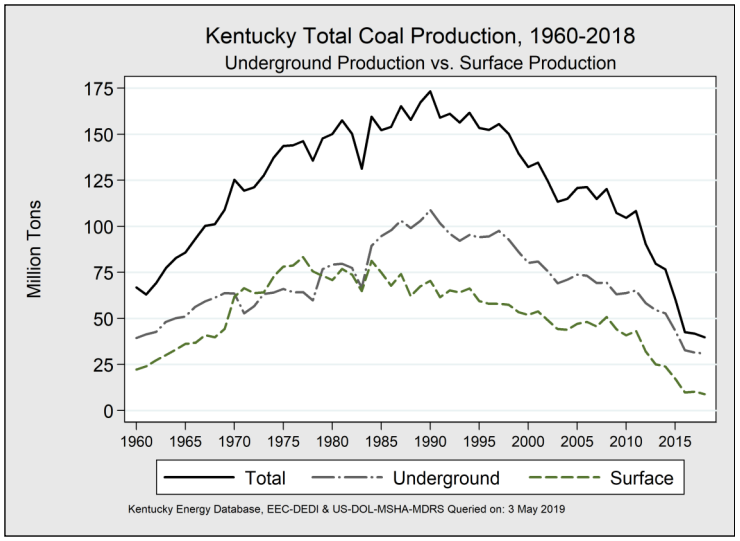
Region	2018 Tonnage	Annual Change
Total	39,798,896	-4.9%
Western Kentucky	22,659,124	-4.0%
Eastern Kentucky	17,139,772	-5.9%

Mine Type	2018 Tonnage	Annual Change
Total	39,798,896	-4.9%
Underground	30,963,537	-1.7%
Surface	8,835,359	-14.4%

Kentucky coal mines produced 39.7 million tons in 2018, a decrease of 4.9% from 2017. Production declined in both the eastern and western coalfields in 2018.

The majority of Kentucky coal production has been from underground operations since 1979, following the passage of the Surface Mine Control and Reclamation Act of 1977.

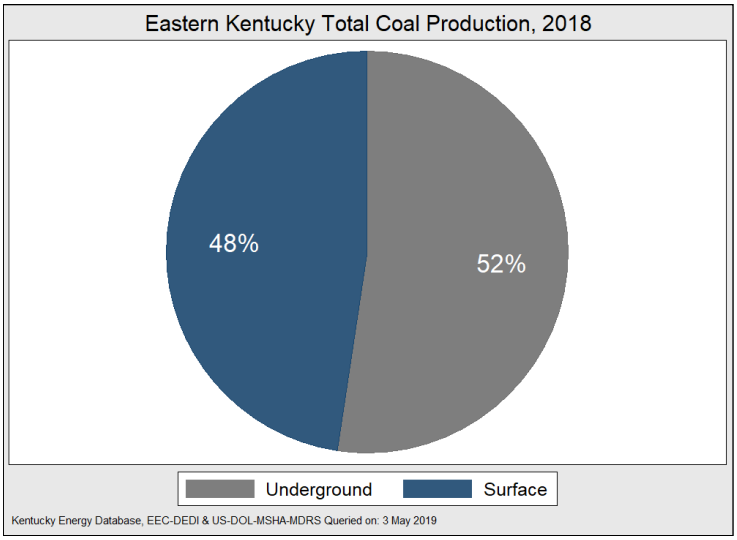


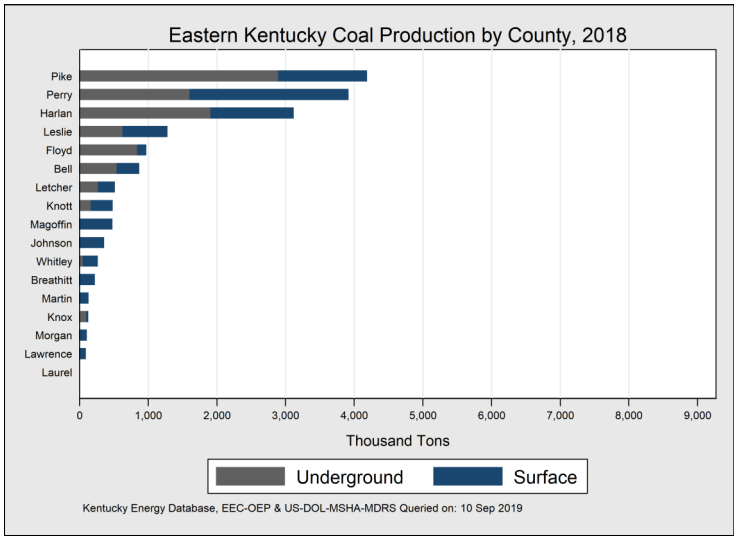


Eastern Kentucky has been the top-producing region in Kentucky since 1912, when eastern Kentucky overtook western Kentucky. Western Kentucky coal mines have produced the majority of coal in the Commonwealth since the third quarter of 2013 and were the main source of Kentucky coal from 1886 to 1911.

Underground coal mines produced 30.9 million tons of coal, or 78% of total Kentucky production in 2018, a decrease of 1.7% from 2017. Surface mining operations, which mined 8.8 million tons of coal, decreased production by 14.4% since 2017. Production declines in both surface and underground mining since 1990 have been concentrated in the eastern coalfield.

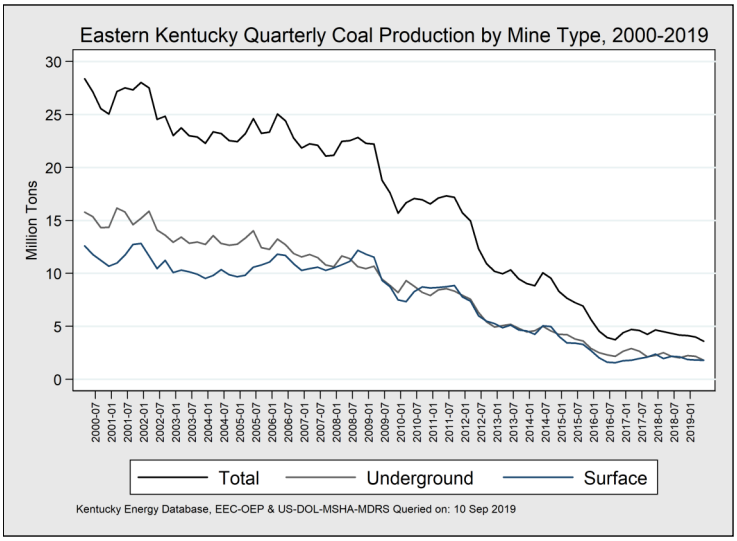
Eastern Kentucky Coal Production





Mine Type	2018 Tonnage	Annual Change
Total	17,139,772	-5.9%
Surface	8,163,843	-1.2%
Underground	8,975,929	-9.9%

Eastern Kentucky coal production decreased in 2018 by 5.9% to 17.1 million tons of coal, 52% from underground mines and 48% from surface mines.



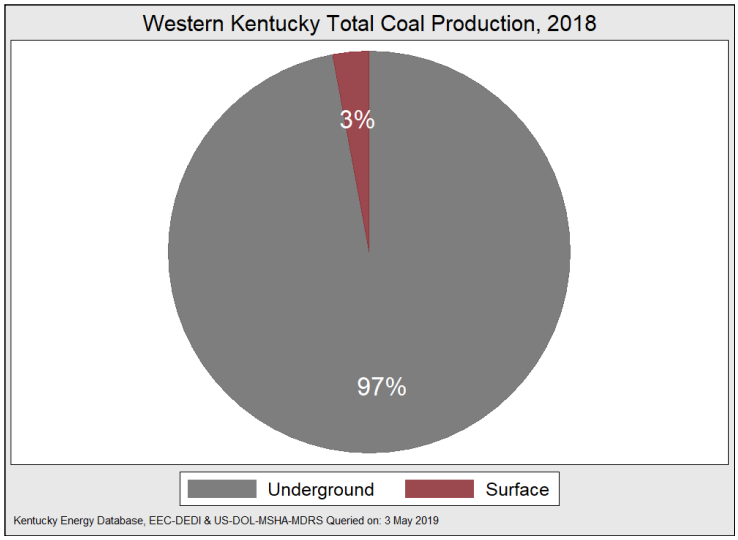
Eastern County	2018 Tonnage	Annual Change
Pike	4,328,175	-5.4%
Perry	3,638,302	-3.6%
Harlan	3,097,648	-11.5%
Leslie	1,264,272	+20.7%
Floyd	918,122	-32.7%
Bell	795,063	-27.5%
Knott	621,055	+10.8%
Letcher	587,638	+57.8%
Magoffin	503,227	+331.7%
Whitley	453,720	-10.8%
Johnson	359,287	-49.8%
Knox	183,857	+54.1%
Martin	151,837	-54.5%
Morgan	107,649	+128.0%
Lawrence	89,884	+50.5%
Breathitt	39,236	+49.6%
Laurel	800	-58.5%

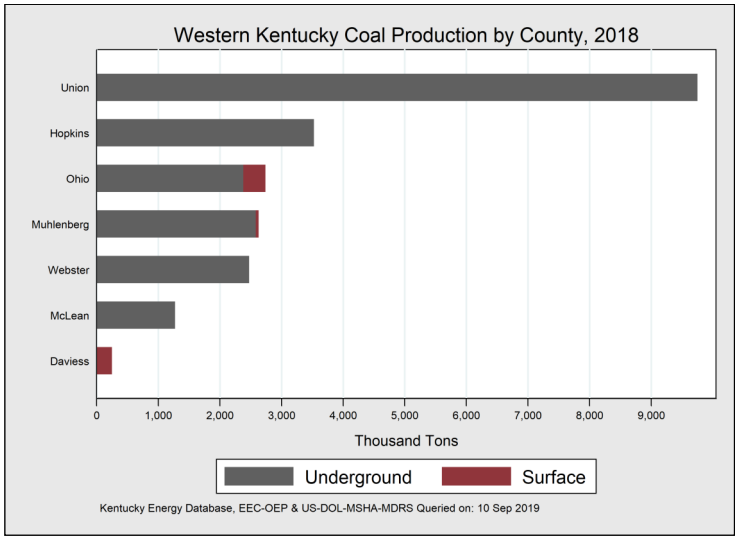
Annual production slowed at both underground and surface mining operations in eastern Kentucky in 2018, by 9.9% and 1.2% respectively.

Eastern Kentucky underground coal production during the fourth quarter of 2018 was 2.2 million tons, an increase of 9.7% from the third quarter. Eastern Kentucky surface mines produced 1.8 millions tons in the fourth quarter of 2018, a 11.4% from the previous quarter.

The largest producing counties experienced decreases in production during 2018. Pike County reduced coal production by 5.4% while Perry County experienced a 3.6% decrease. Pike county still remained the highest coal-producing county in eastern Kentucky and fourth-highest coal producing county in Kentucky.

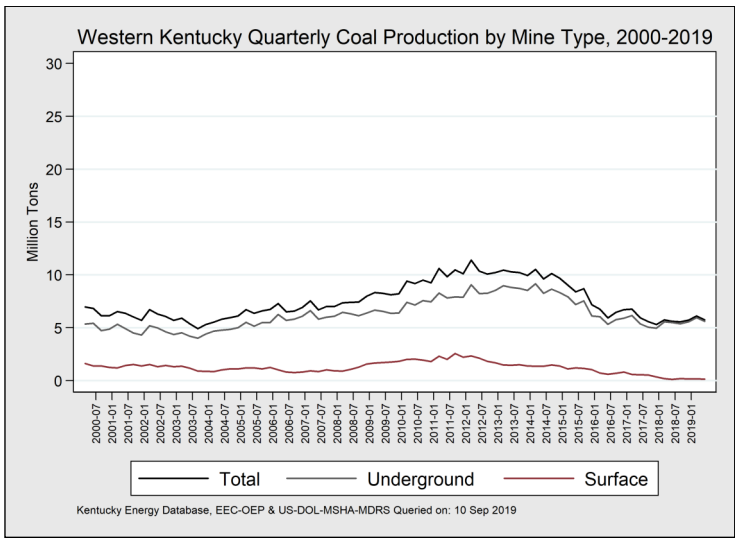
Western Kentucky Coal Production





Mine Type	2018 Tonnage	Annual Change
Total	22,659,124	-4.0%
Underground	21,987,608	+2.0%
Surface	671,516	-67.3%

Western Kentucky mined 22.6 million tons of coal in 2018, a decrease of 4% from 2017. Underground mines accounted for 97% of regional production in 2018.



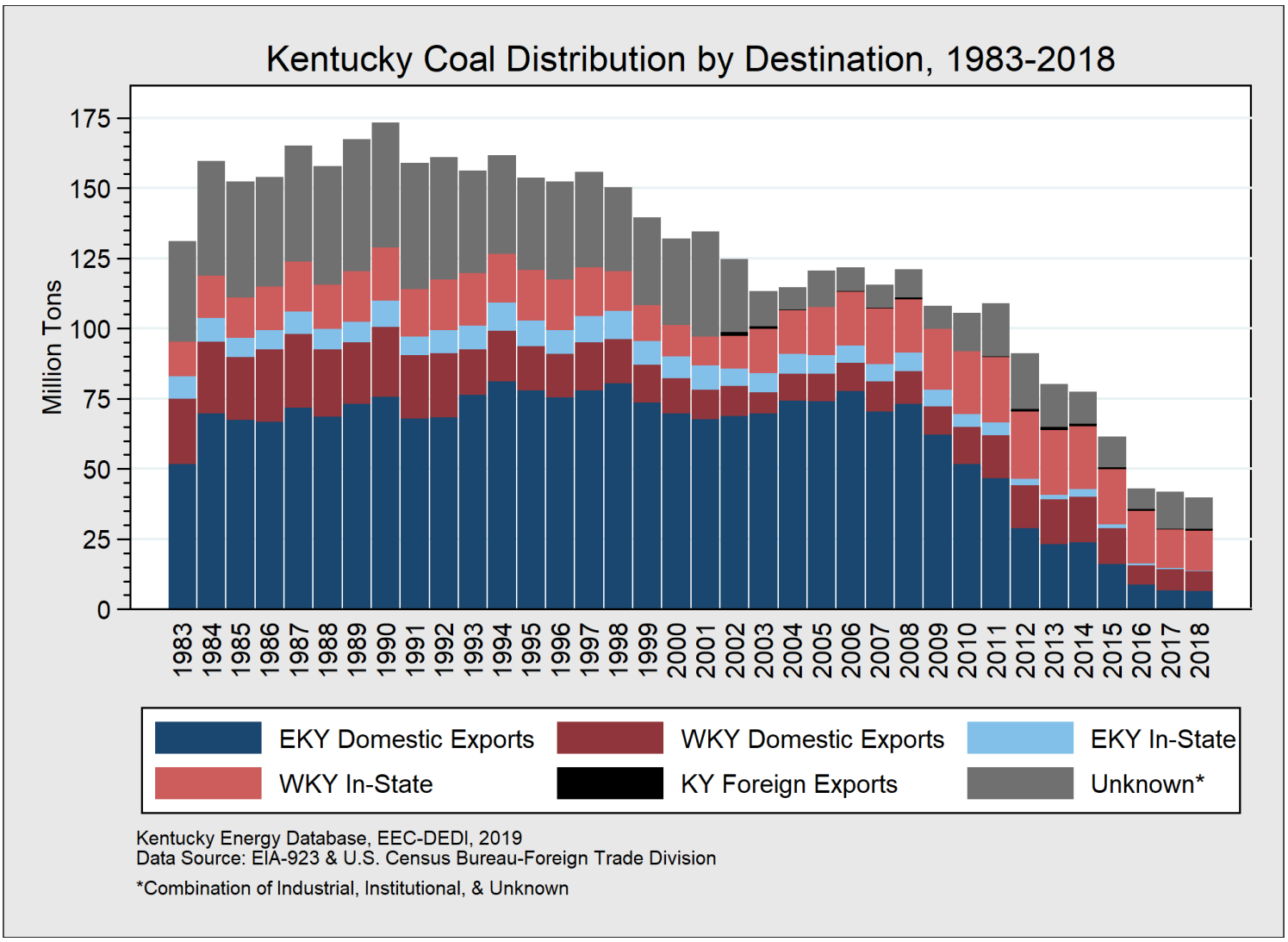
Surface mining made up 3% of coal production in western Kentucky. The majority of western Kentucky coal production was excavated by surface mining until 1985. In fact, Muhlenberg County was the Commonwealth's leading coal producer from 1961 to 1978, predominantly through the utilization of surface mining techniques.

Western County	2018 Tonnage	Annual Change
Union	9,753,472	+8.8%
Hopkins	3,528,289	-1.3%
Ohio	2,738,362	-33.6%
Muhlenberg	2,628,986	-5.3%
Webster	2,475,504	-5.8%
Mclean	1,270,993	-3.2%
Daviess	263,518	+18.1%

Union County remained Kentucky's leading coal producing county, mining 9.7 million tons during 2018. Production in the county increased by 8.8% from the year prior.

Most western Kentucky mining since 1985 has been underground. As a result of the topography and basinal structure of the Illinois Basin, surface coal production is relatively more accessible on the edges of the coalfield, further from the Ohio River, where much of the economically viable coal has been extracted in years past. The topography, in part, explains the relative increase in underground mining in the region since 1983 and the relative decrease in surface mining since peak regional surface production in 1972.

Kentucky Coal Distribution, 2018



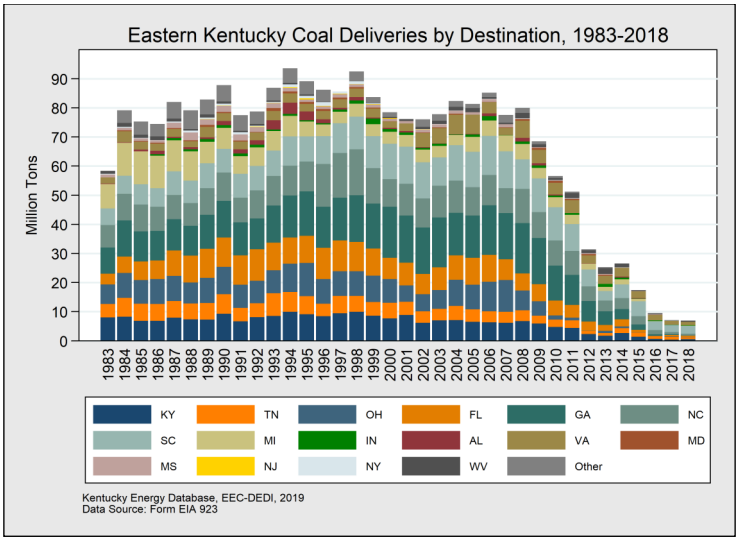
Coal Distribution by Destination, 2018		
Coal and Destination	Thousand Tons	Percentage
Total Production	39,799	100%
WKY In-State	14,166	35.6%
Industrial/Unknown	11,293	28.3%
WKY Out-of-State	6,998	17.6%
EKY Out-of-State	6,465	16.2%
Foreign Exports	487	1.2%
EKY In-State	389	1.0%

†Totals labeled "Out-of-State" represent shipments of coal to consumers within the United States, and may be considered domestic exports. A difference of approximately 11.2 million tons exists between total production and total distribution in the table above—a product of coal stockpiling, lags in data reporting, calendar year parameters, comparison of statistics across multiple data sources, and reporting errors.

The annual distribution of coal mined in Kentucky is a combination of in-state consumers, out-of-state power plants, factories, and foreign exports.

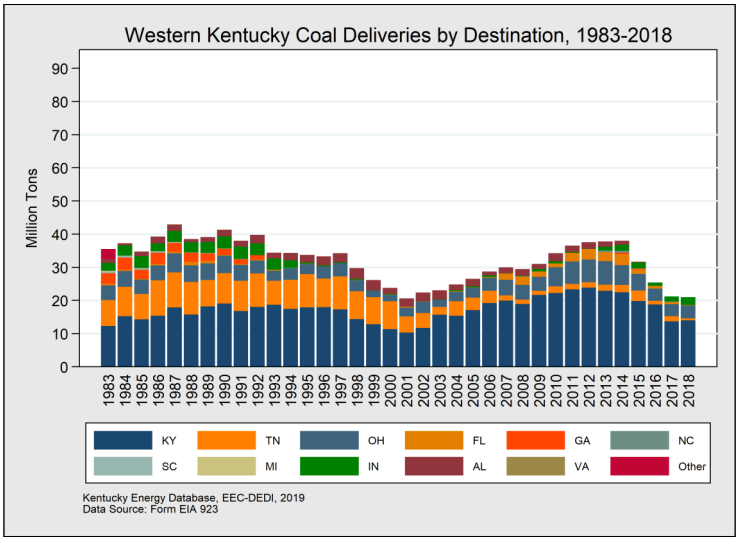
Eastern Kentucky coal has predominantly been sold to states in the southeastern United States. Conversely, western Kentucky coal has mostly been mined for in-state consumption. Kentucky remains the single-largest consumer of Kentucky coal, increasing its consumption as other states have decreased their consumption of coal from Kentucky. The Cooper, E.W. Brown, and H.L. Spurlock power plants consumed most of the eastern Kentucky coal in Kentucky. Known foreign exports in 2018 reached 487,000 tons, or 1.2% of known coal deliveries, and decreased by 18% from the year prior.

Kentucky Coal Deliveries



Eastern Kentucky Coal Deliveries, 2018		
Destination	Thousand Tons	Percentage
Total	6,869	100%
South Carolina	2,720	39.6%
Virginia	1,240	18.0%
North Carolina	674	9.8%
Tennessee	625	9.1%
Florida	412	6.0%
Kentucky	389	5.9%
West Virginia	359	5.7%
Indiana	169	2.5%
Ohio	94	1.9%
Georgia	75	1.1%
Pennsylvania	13	0.3%
Michigan	9	0.1%

Known shipments of steam coal from eastern Kentucky to power plants within the United States decreased by 3.2% in 2018 to 6.8 million tons. The largest markets for eastern Kentucky coal are traditionally located in the southeast, and were led by South Carolina, North Carolina, and Virginia during the year. Overall, coal mined in the region was shipped to 12 different states in 2018.



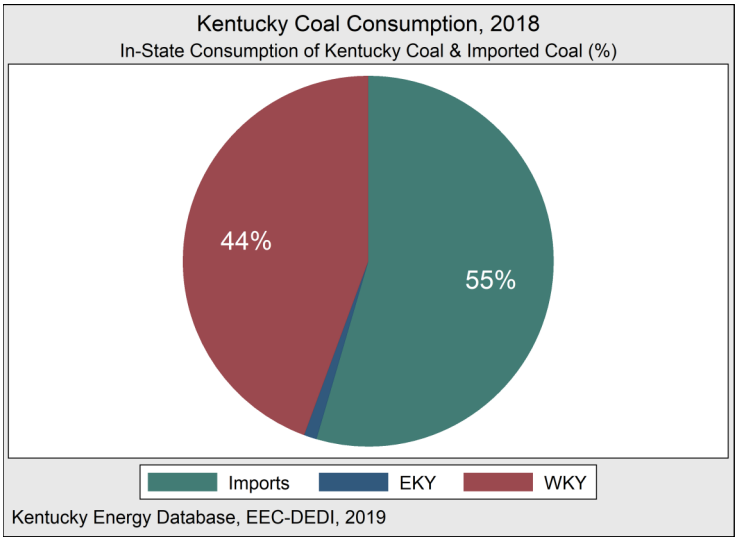
Western Kentucky Coal Deliveries, 2018		
Destination	Thousand Tons	Percentage
Total	21,164	100%
Kentucky	14,166	66.9%
Florida	3,947	18.6%
Indiana	2,350	11.1%
Tennessee	537	2.5%
Ohio	92	0.4%
Mississippi	67	0.3%
Pennsylvania	6	0.03%

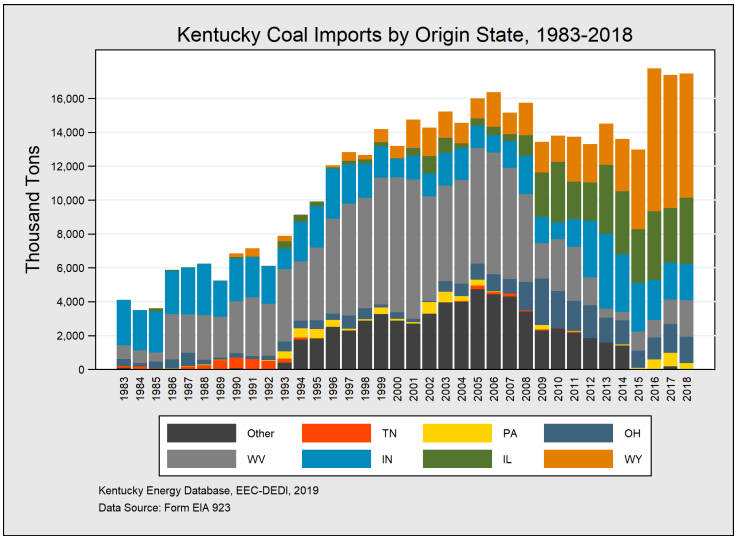
Known shipments of steam coal from western Kentucky to power plants within the United States decreased by 0.1 % in 2018 to 21.1 million tons. The largest market for western Kentucky coal is consistently Kentucky, which represented 66.9% of western Kentucky coal deliveries during the year. Overall, coal mined in western Kentucky was shipped to 8 different states in 2018.

Kentucky Coal Deliveries, 2018		
Origin	Thousand Tons	1 Year Change
Total	28,033	-0.9%
WKY	21,164	+0.3%
EKY	6,869	-4.5%

Total Kentucky coal deliveries have decreased by 82.3 million tons, or by 74.6% since 2008, primarily because of reduced shipments from eastern Kentucky.

Kentucky In-State Coal Consumption

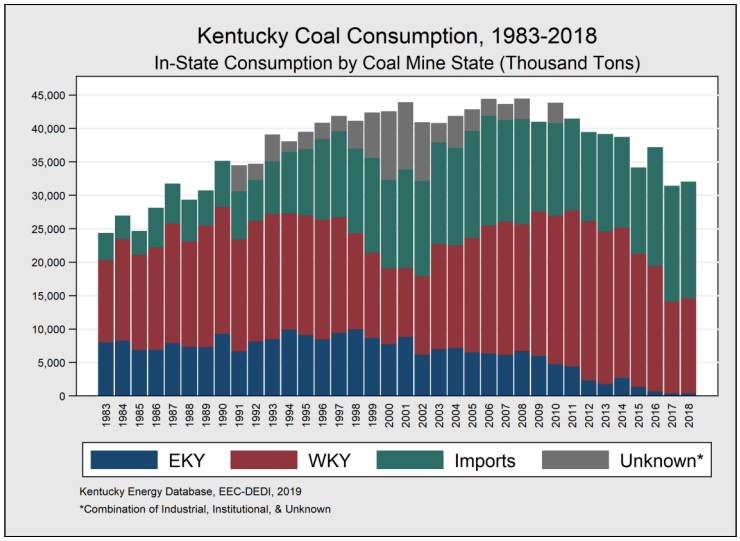




Origin of Coal	Thousand Tons	1 Year Change
Total	32,037,588	+1.9%
Western Kentucky	14,166,247	+0.4%
Imports	17,467,006	+12.6%
Eastern Kentucky	404,335	+3.4%

All values have been rounded to the nearest thousand tons.

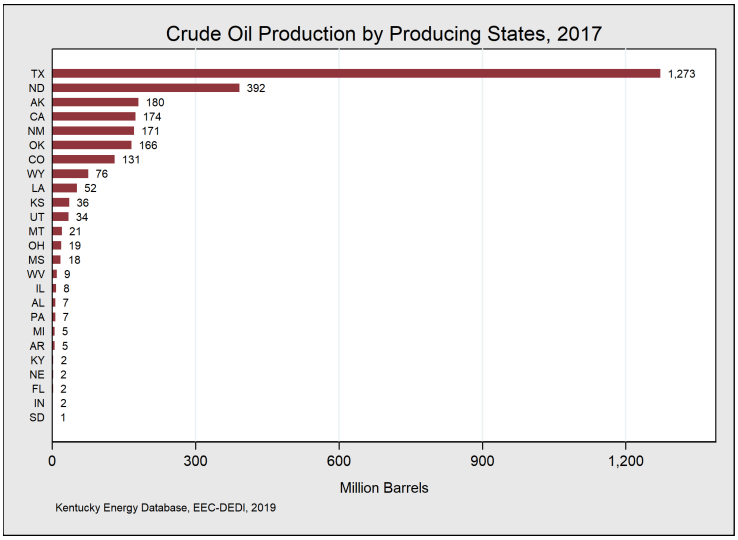
Imported Coal	Thousand Tons	1 Year Change
Total Imports	17,467	+1.5%
Wyoming	7,333	-6.7%
Illinois	3,920	+21.5%
Indiana	2,179	+51.5%
Ohio	2,119	-2.5%
West Virginia	1,546	-9.4%
Pennsylvania	369	-53.5%

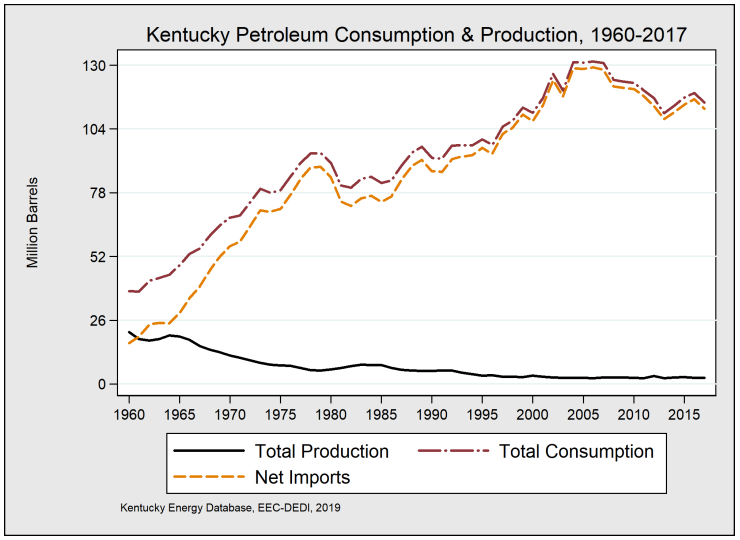


Coal consumption in Kentucky increased by 1.9% in 2018 to 32 million tons. Coal imports were the largest source of coal used within the Commonwealth, representing 55% of coal consumption. Conversely, coal from eastern Kentucky accounted for 1% of the coal consumed in Kentucky in 2018.

Several factors affect the use of imported coal in Kentucky including the price, delivery cost, heat content, and the sulfur content of a particular coal. For electrical power generation, utilities must balance the economic and environmental costs of these factors when purchasing coal. As a result, electric utilities, municipalities, and power producers often blend coal from a variety of sources to maintain a diversified cost-effective fuel resource while complying with environmental regulations. Since 1990, electric utilities in Kentucky have increasingly used coal containing relatively higher sulfur content, a trend accelerated through the installation of sulfur dioxide scrubbers on many coal-fired generators throughout the state. Nationally, many other electric utilities have elected to install similar environmental control systems, thereby altering traditional coal sourcing requirements. The net result of these recent decisions in Kentucky has meant an increasing reliance on western Kentucky coal supplies, and a diminishing demand for eastern Kentucky coal. The relatively low price of coal from several western states has also increased imports for electric power generation.

Kentucky Crude Oil Production





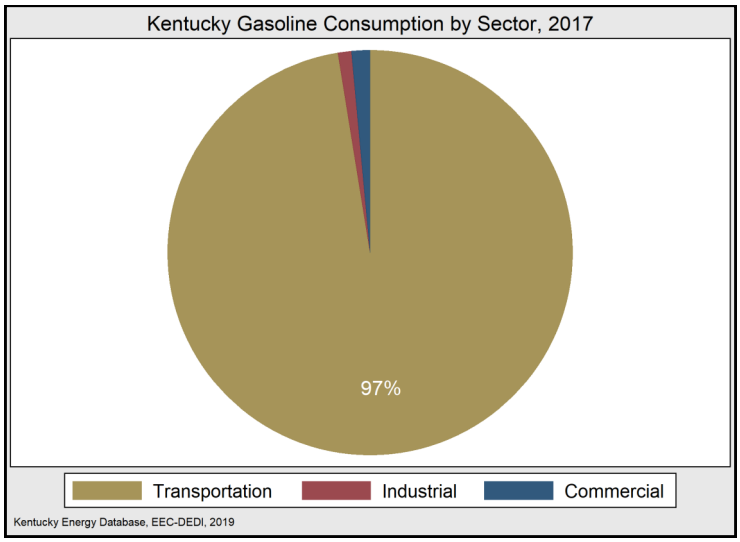
Production	2017 Million Barrels	Rank
Texas	1,273	1st
Kentucky	2	21st

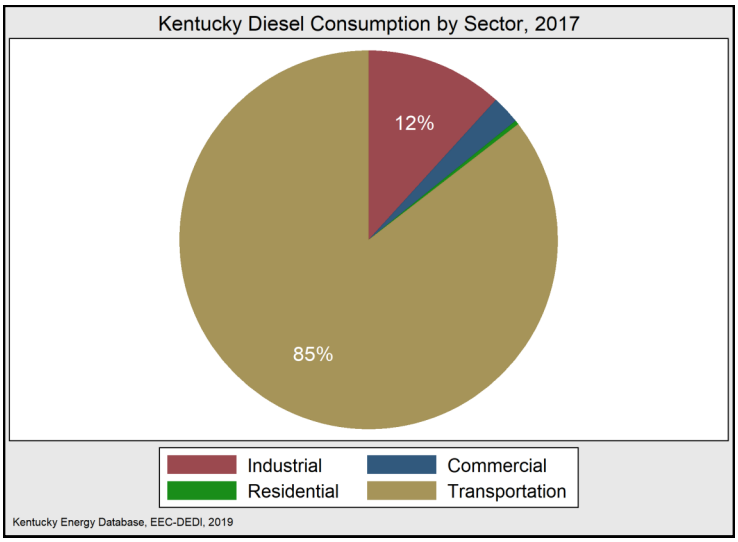
Crude oil production in Kentucky decreased by 4.5% in 2017 to produce 2.4 million barrels. Annual crude oil production in Kentucky had remained between 2.4 and 2.9 million barrels since the year 2000, but has recently increased with more widespread application of horizontal wells and nitrogen foam and hydraulic fracture stimulations. Despite this increase, in-state crude oil production contributes to less than 1% of total U.S. production.

Though Kentucky is a producer of petroleum, on average it has imported 88% of petroleum supplies since 1960. As statewide consumption has increasingly outstripped production, petroleum imports have increased from 44 to 98% between 1960 and 2017.

Additional information on the location of oil fields and wells is available from the Kentucky Geological Survey Geologic Map Information Service at:
http://kgs.uky.edu/kgsmap/kgsgeoserver/viewer.asp

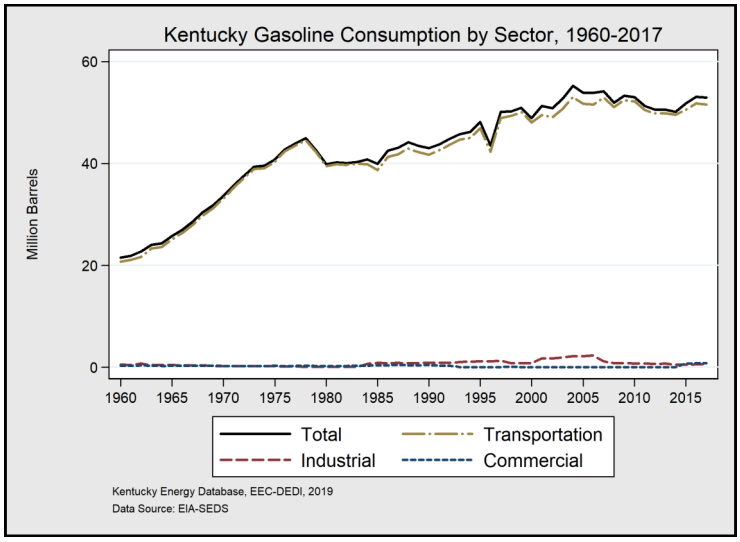
Kentucky Liquid Fuel Consumption

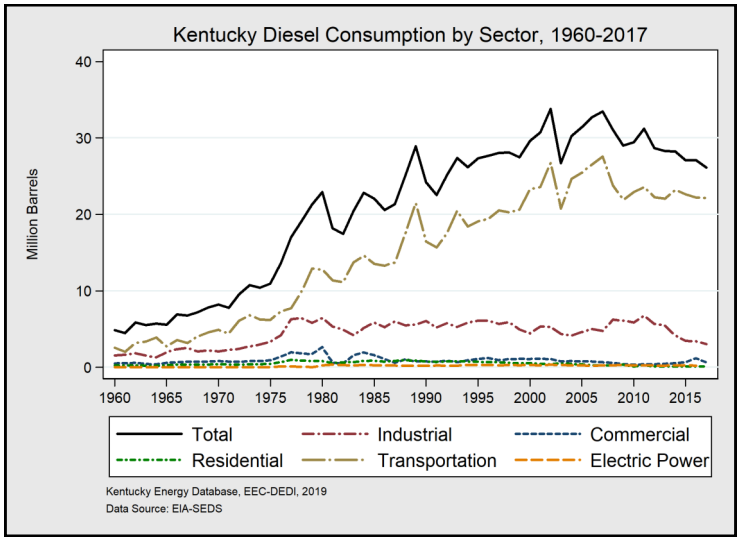




Sector	Thousand Barrels	Percentage
Total	52,908	-0.4%
Transportation	51,555	-0.4%
Industrial	568	+0.9%
Commercial	785	+1.3%

Sector	Thousand Barrels	Percentage
Total	26,136	-3.5%
Transportation	22,178	-0.1%
Industrial	3,052	-10.4%
Commercial	624	-47.0%
Electric Power	191	-9.9%
Residential	91	-2.2%

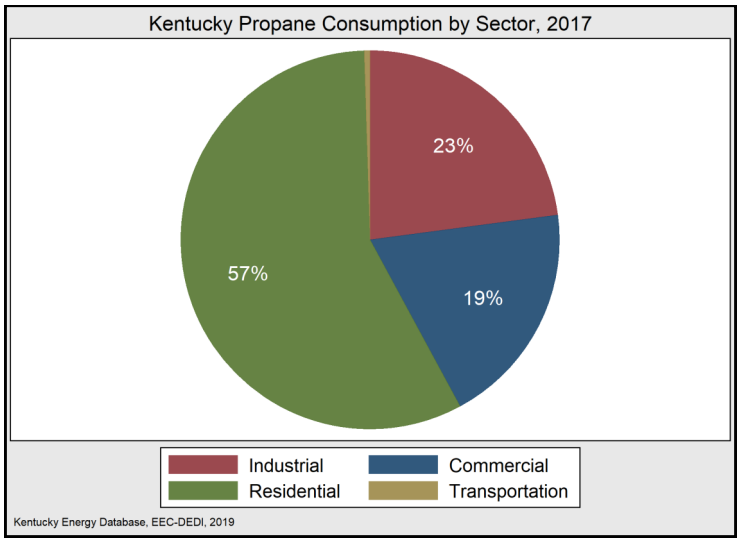


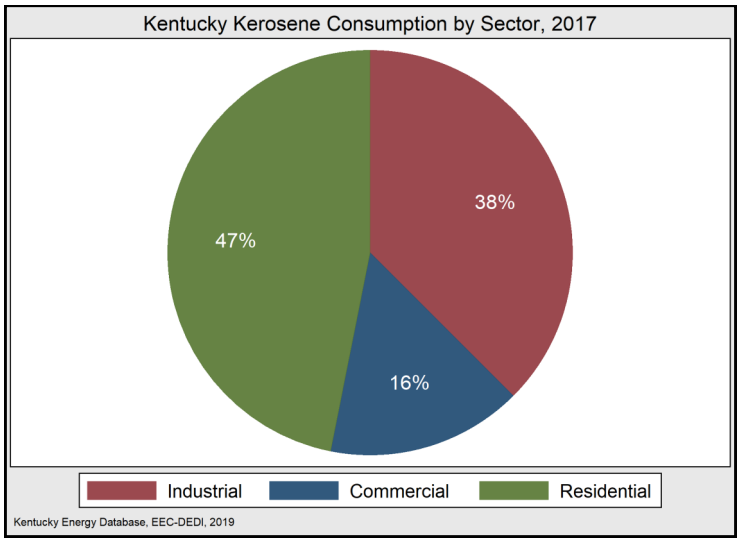


In 2017, Kentucky consumed 52.9 million barrels of gasoline, with 97% used for transportation. Compared with 2016, total gasoline consumption in Kentucky decreased by 0.4%.

In 2017, Kentucky consumed 26.1 million barrels of diesel fuel, a 3.5% decrease in overall consumption from 2016. The vast majority of diesel consumption—85%—was consumed by the transport sector, mostly for trucking on highways, marine vessels, and railroad consumers. Industrial users, predominately manufacturing facilities and farms, consumed 12%. The commercial, residential, and electric power sectors made up the remaining 3% in 2017.

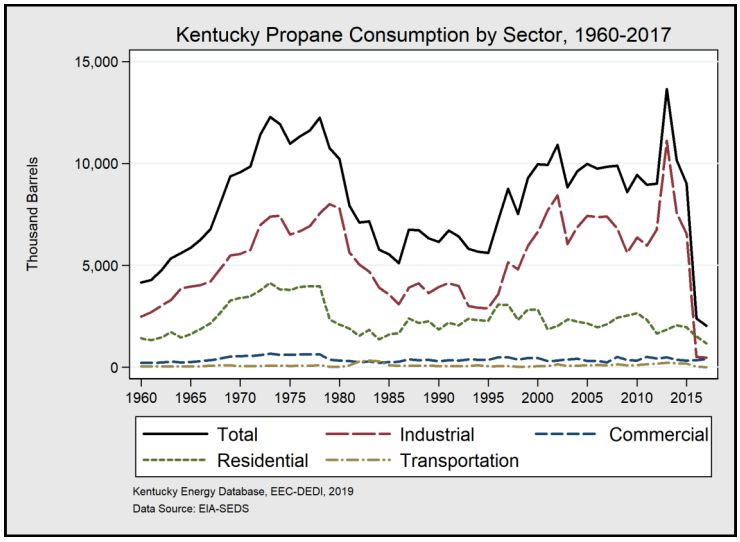
Kentucky Liquid Fuel Consumption

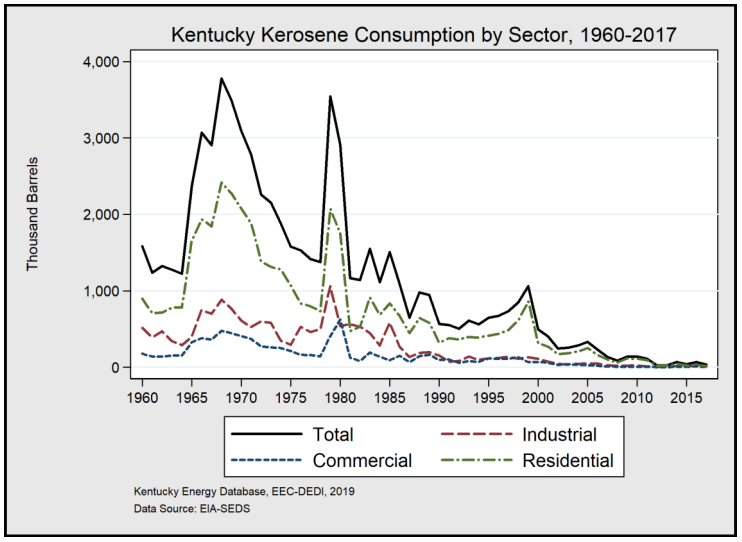




Sector	Thousand Barrels	Percentage
Total	2,030	-15.0%
Industrial	465	-7.4%
Residential	1,165	-23.1%
Commercial	390	11.1%
Transportation	10	-50.0%

Sector	Thousand Barrels	Percentage
Total	33	-50.7%
Residential	15	-50.0%
Industrial	12	-57.1%
Commercial	5	-44.4%



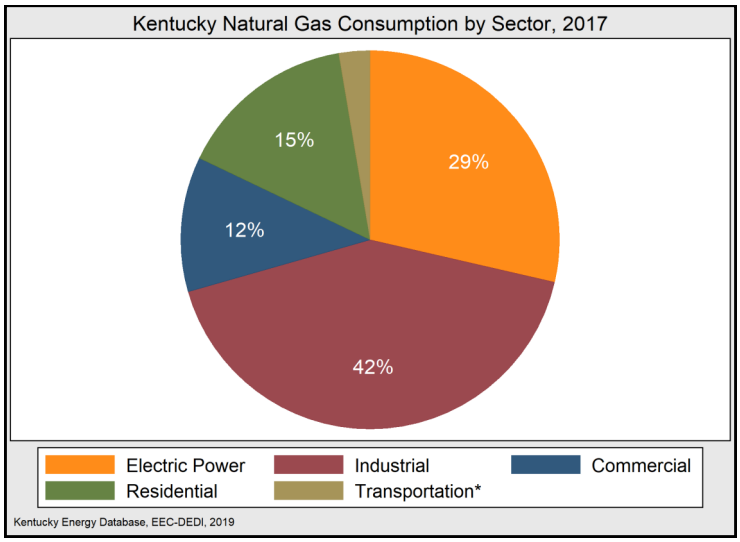


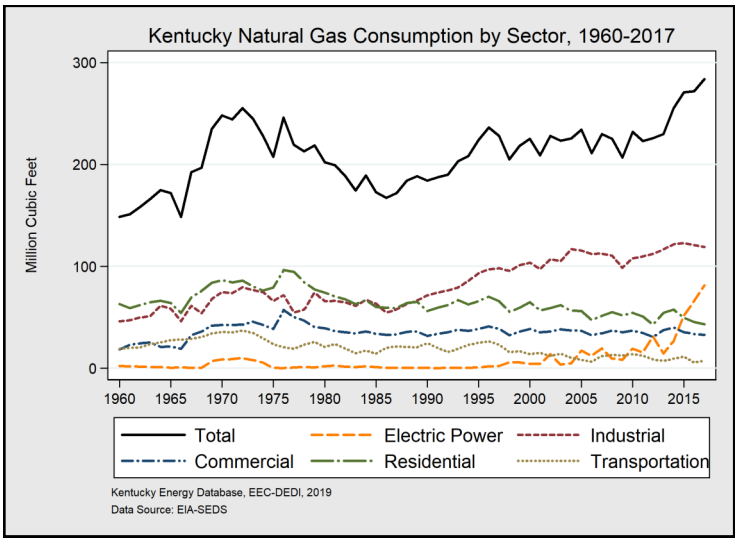
In 2017, more than 2 million barrels of liquid petroleum gas (LPG), which is mostly propane, but also includes ethane and butane, was consumed in Kentucky. Since 2016, consumption decreased by 15%. With 57% of total consumption, the residential sector was the largest end-user of LPG, followed by the industrial sector with 22%. The commercial and transportation sectors comprised the remaining 19% of LPG consumption in 2017.

In 2017, Kentucky consumed 33,000 barrels of kerosene. The residential sector was by far the largest consumer of kerosene, consuming 47% of the total for home heating. The industrial sector was the next largest consumer with 38% of consumption. Compared with 2016, Kentucky kerosene consumption decreased by 50.7%.

*These quantities exclude kerosene-type jet fuel, which is itemized in transportation energy consumption.

Kentucky Natural Gas Consumption





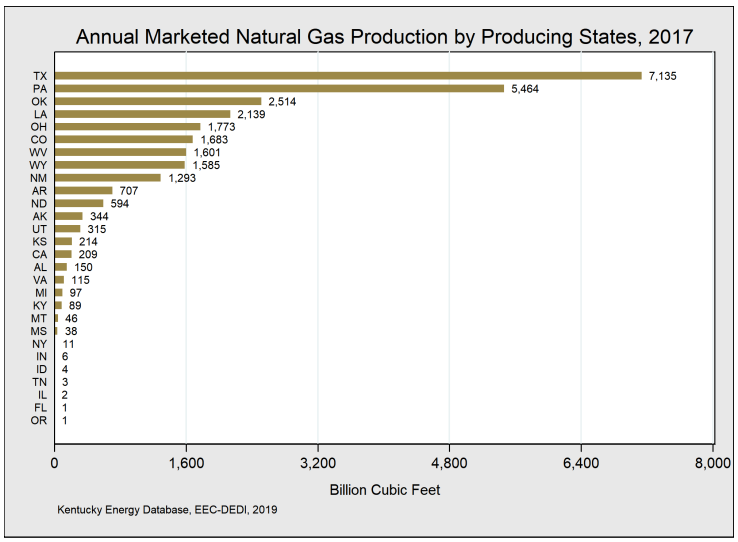
Sector	Million Cubic Feet	1 Year Change
Total	283,905	+4.4%
Industrial	119,119	-1.4%
Residential	43,253	-4.9%
Commercial	32,796	-2.2%
Electric Power	81,208	+22.4%
Transportation*	7,529	+34.2%

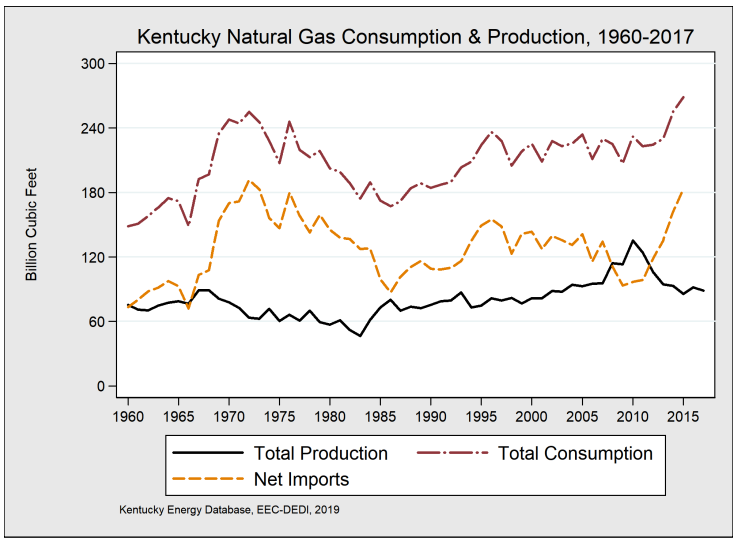
*Natural gas consumption by the transportation sector is the summation of vehicle fuel usage and natural gas used in the movement of natural gas resources through transmission and distribution pipelines. In Kentucky in 2017, direct vehicle fuel usage of natural gas was approximately 44 million cubic feet. The remainder (7,383 MMcf) was consumed as natural gas pipeline fuel.

Kentucky's consumption of natural gas grew by 4.4% in 2017 to consume a total of 283,905 million cubic feet, approximately 1% of United States total consumption. The industrial sector was by far the largest consumer of natural gas, using 45% of the state total. The residential sector was the next largest consumer of natural gas with 18% of consumption. The electric power sector—with 29% of total natural gas consumption in 2017—is at record levels. Consumption of natural gas for electricity will likely increase in the future. Natural gas combined cycle (NGCC) plants have replaced coal-fired boilers at the Cane Run, Big Sandy, and Paradise power plants. The commercial and transportation sectors consumed 12% and 3% of statewide consumption respectively.

The commercial and residential sectors consume natural gas to generate heat while industrial consumers, which include agriculture, primarily use natural gas as a process feedstock in manufacturing operations. As a result, residential and commercial consumption follows a seasonal pattern, with notable fluctuation due to weather while industrial consumption is more consistent throughout the year. The sizeable consumption by the industrial sector is reflective of the large presence of industrial firms within Kentucky.

Kentucky Natural Gas Production





State	2017 BCF	Rank
Texas	7,135	1st
Kentucky	89	19th

Kentucky produced 89 billion cubic feet (Bcf) of natural gas in 2017, an 8% decrease in natural gas production from 2014. As shown in the map above, the majority of economically extractable natural gas is located in eastern Kentucky. Given a favorable price of natural gas, statewide production has the capacity to increase substantially, but production is expected to remain less than other states.

Though Kentucky is a natural gas producer, Kentucky is a net importer of natural gas. Kentucky imported 69% of annual natural gas consumption in 2017.

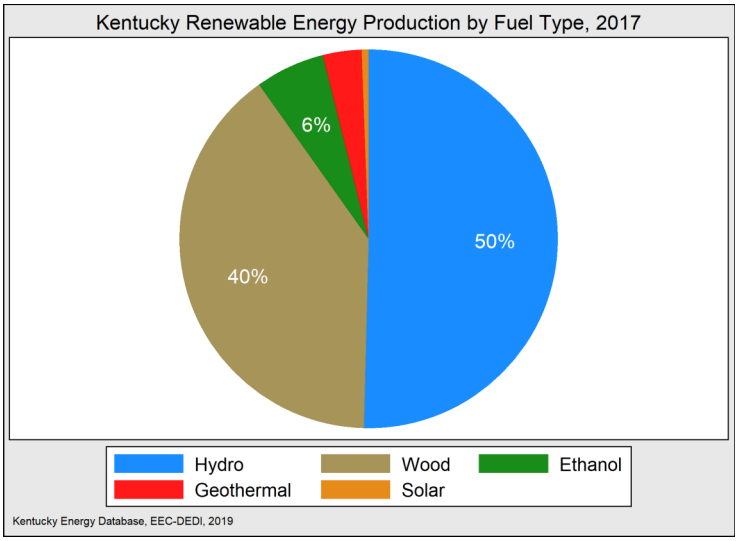
Additional information on the location of natural gas fields and wells is available from the Kentucky Geological Survey Geologic Map Information Service at:

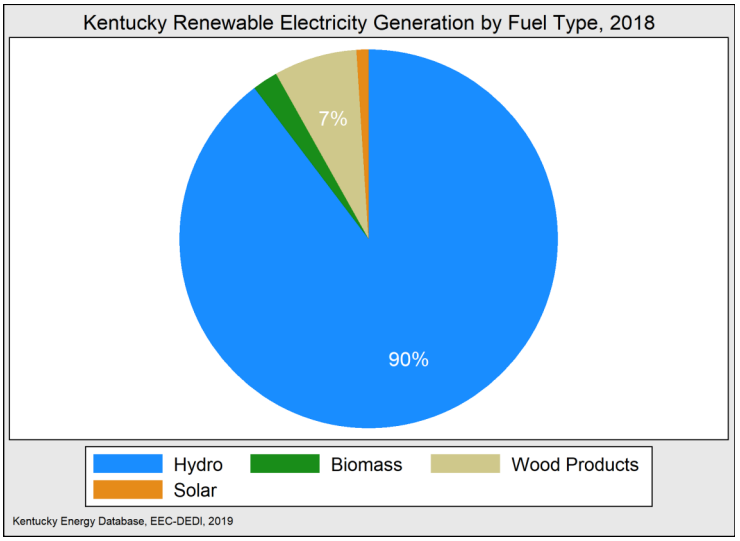
http://kgs.uky.edu/kgsmap/kgsgeoserver/viewer.asp

Kentucky Renewable Energy

Aerial view of E.W. Brown Solar Facility. Photo courtesy of LG&E-KU.

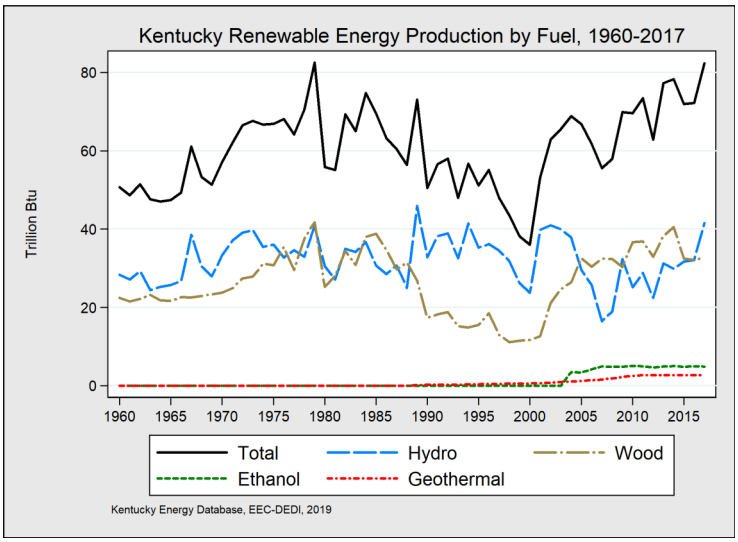
Kentucky Renewable Energy

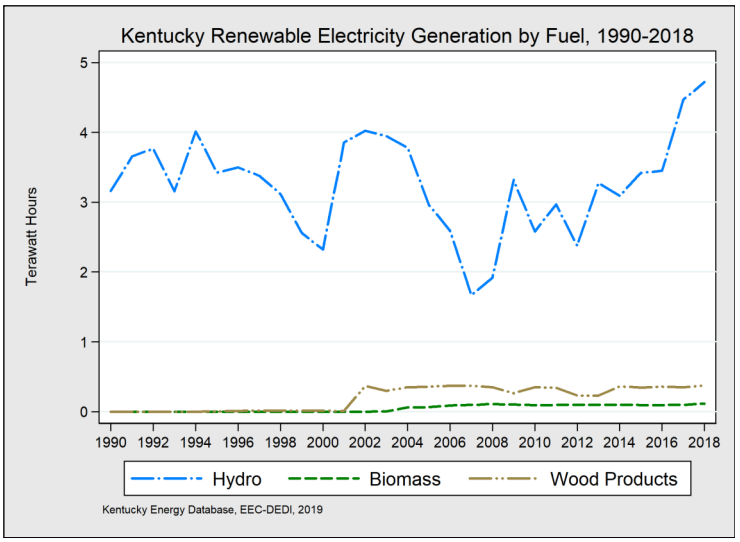




Fuel Type	Billion Btu	1 Year Change
Total	82,345	+13.9%
Wood & Biomass	32,734	+1.8%
Hydroelectric*	41,514	+29.3%
Ethanol†	4,904	-0.7%
Geothermal	2,712	+0.0%
Solar	481	+31.8%

Fuel Type	Gigawatt Hours	1 Year Change
Total	4,928,341	+25.9%
Hydroelectric*	4,464,904	+29.4%
Woody Biomass	347,480	-2.8%
Biomass	95,667	+1.5%
Solar	20,290	+72.9%





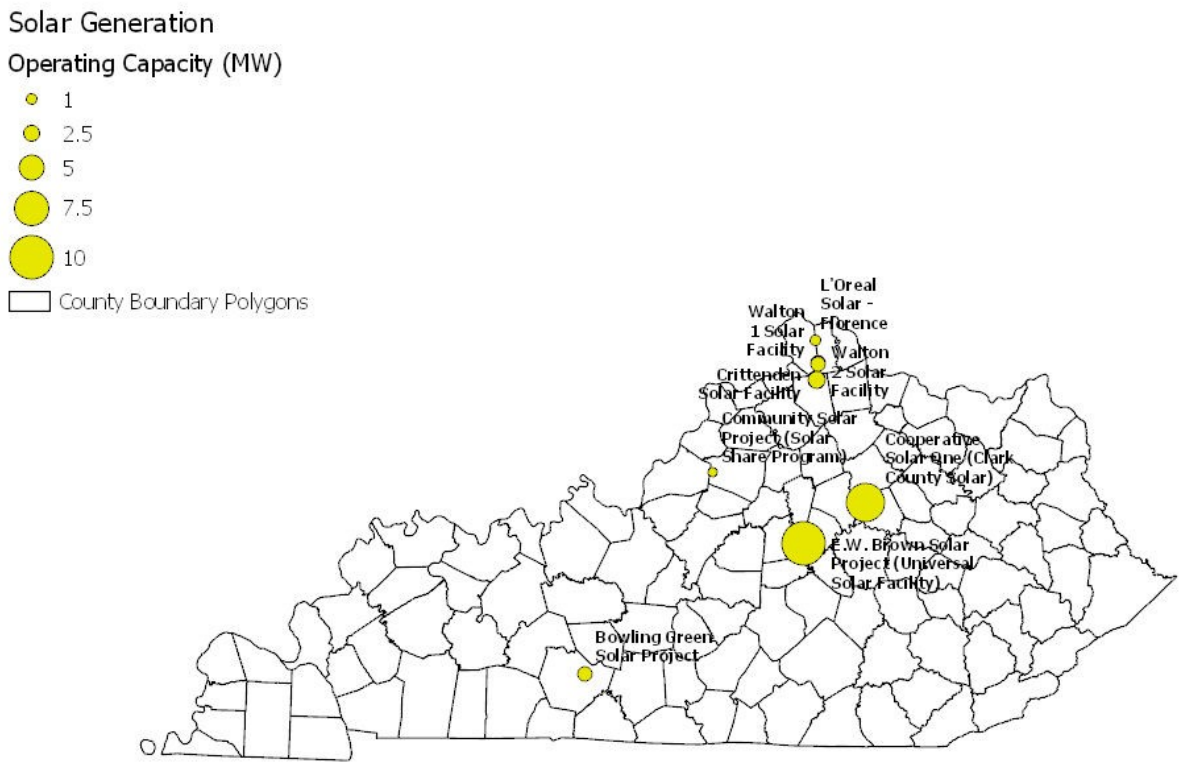
In 2017, Kentucky produced 82.3 trillion Btu of energy from renewable resources, a 13.9% increase compared with 2016. Year-to-year fluctuations are mostly due to variations in hydroelectric power, which itself is a reflection of rainfall. Hydroelectric, Wood and biomass waste was 96% of all renewable energy produced in Kentucky in 2017 with hydroelectric producing 50%, and the rest 46%.

†Ethanol includes the biomass inputs used in the production of ethanol. These data exclude the energy losses associated with making ethanol and the co-products gleaned during production and thereafter sold.

Hydroelectric power generated 90% of renewable electricity in Kentucky in 2018, or 4,928 gigawatt-hours of electricity. Total renewable electricity generation increased by 25.9% compared with 2017 as solar, hydroelectric and biomass increased from the year prior.

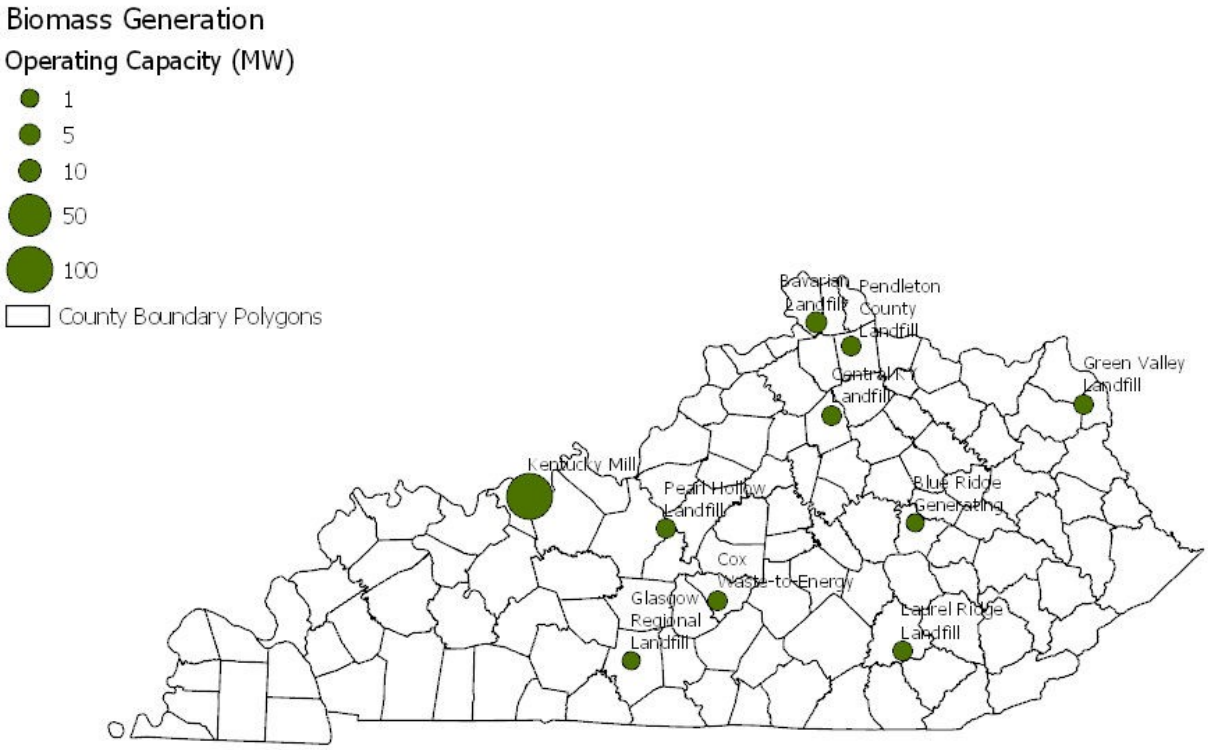
*Hydroelectric generation is directly accounted through gigawatt-hour consumption, whereas hydroelectric production (billion Btu) is a calculated fossil fuel displacement conversion, or the amount of fossil fuel energy required to generate an equal amount of electricity.

Kentucky Solar Generation



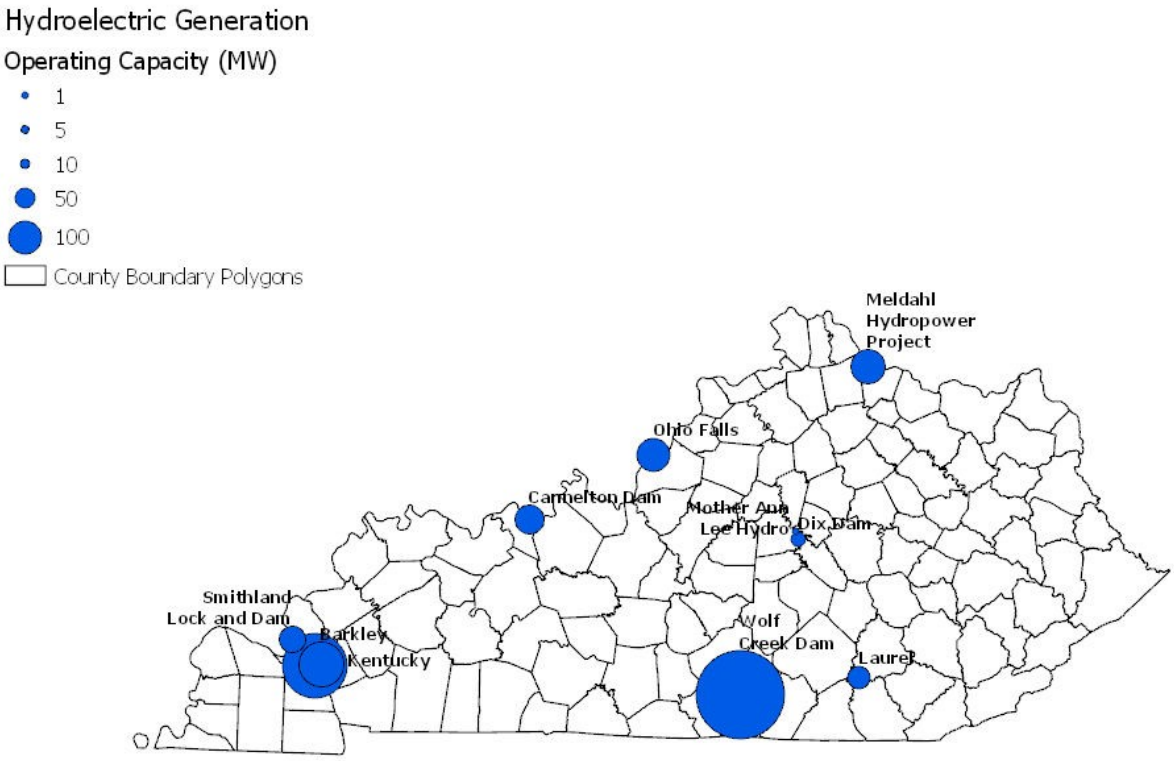
Name	Capacity (MW)
Bowling Green Solar Project	2.1
Community Solar Project (Solar Share Program)	0.5
Cooperative Solar One (Clark County Solar)	8.5
Crittenden Solar Facility	2.7
E.W. Brown Solar Project (Universal Solar Facility)	10
L'Oreal Solar - Florence	1.1
Walton 1 Solar Facility	2
Walton 2 Solar Facility	2

Kentucky Biomass Generation



Name	Capacity (MW)
Bavarian Landfill	4.7
Blue Ridge Generating	1.2
Central KY Landfill	2
Cox Waste-to-Energy	3.9
Glasgow Regional Landfill	1
Green Valley Landfill	2.4
Kentucky Mill	60
Laurel Ridge Landfill	4
Pearl Hollow Landfill	2.4
Pendleton County Landfill	3.2

Hydroelectricity Generation



Name	Capacity (MW)
Barkley	148
Cannelton Dam	87.9
Dix Dam	31.5
Kentucky	222.5
Laurel	61
Meldahl Hydropower Project	105
Mother Ann Lee Hydro	2.3
Ohio Falls	100.8
Smithland Lock and Dam	75.9
Wolf Creek Dam	312

Distributed Renewable Generation

Distributed Renewable Generation (DG) refers to those distributed renewable energy systems that generate or store electricity for delivery to the electrical grid and includes the eligible electric generating facilities under KRS 278.465 and those connected under utility tariffs filed under the regulation for Small Power Production and Cogeneration.

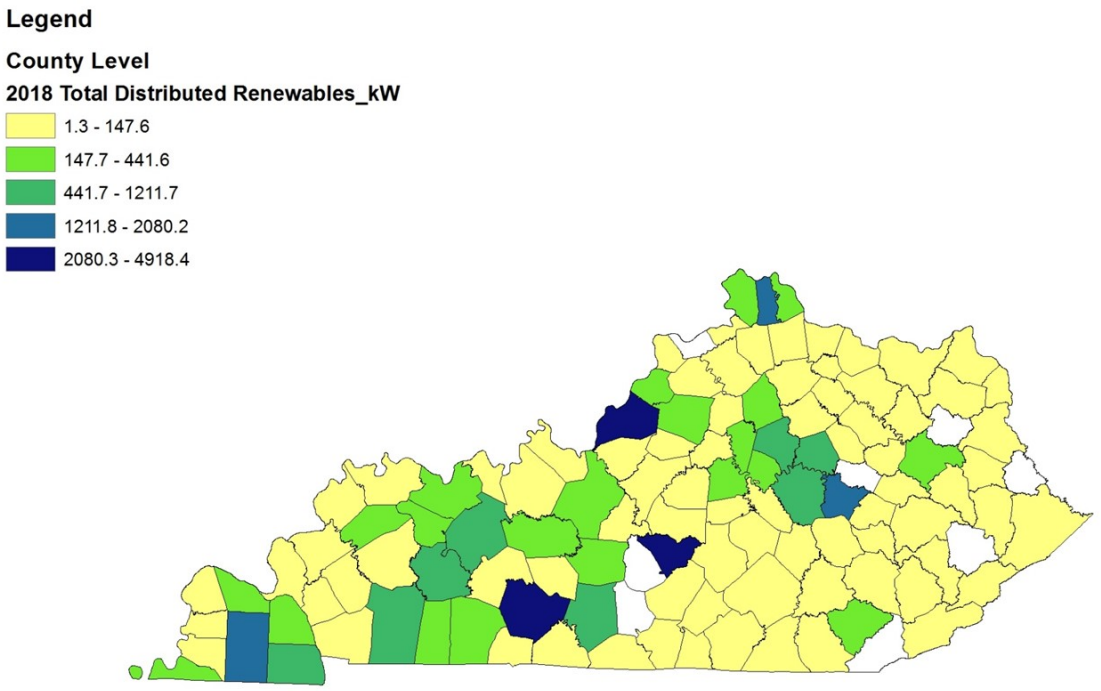
Net Energy Metering or Net Metering refers to a compensation mechanism established in KRS 278.465-468 which allows small renewable generation systems to interconnect to the electric distribution grid.

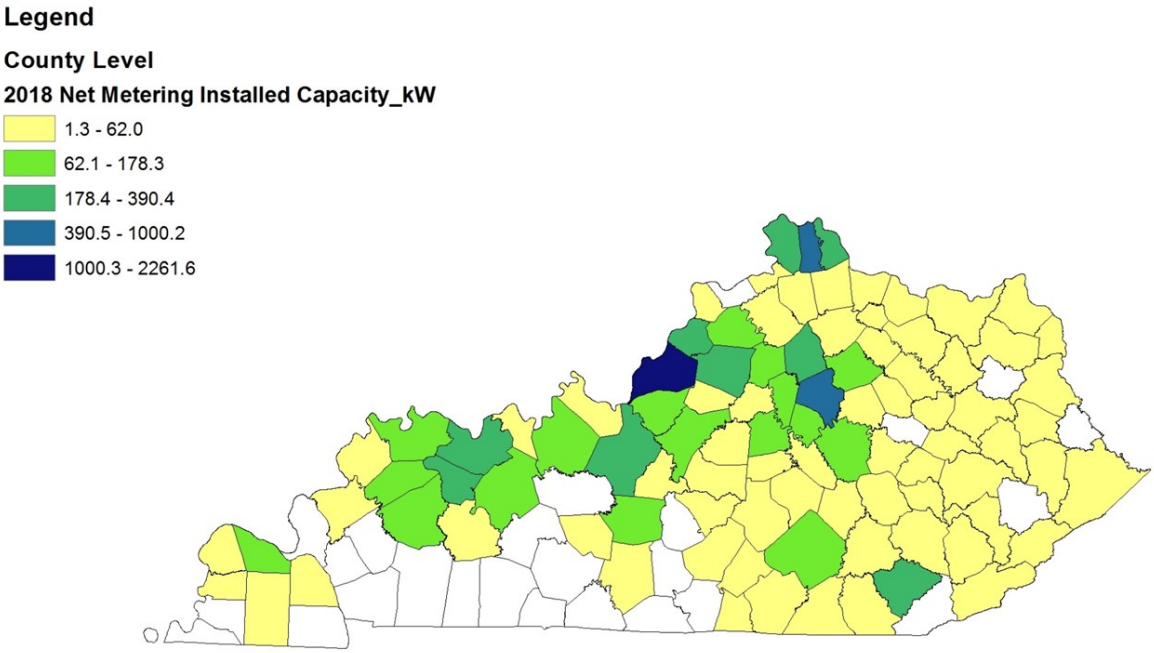
Distributed renewable generation systems located in areas of Kentucky served by TVA local power companies do not interconnect via net metering.

In addition to Net Metering, larger power generation systems interconnect to the electric grid via tariffs established by utilities under the Public Utility Regulatory Policies Act.

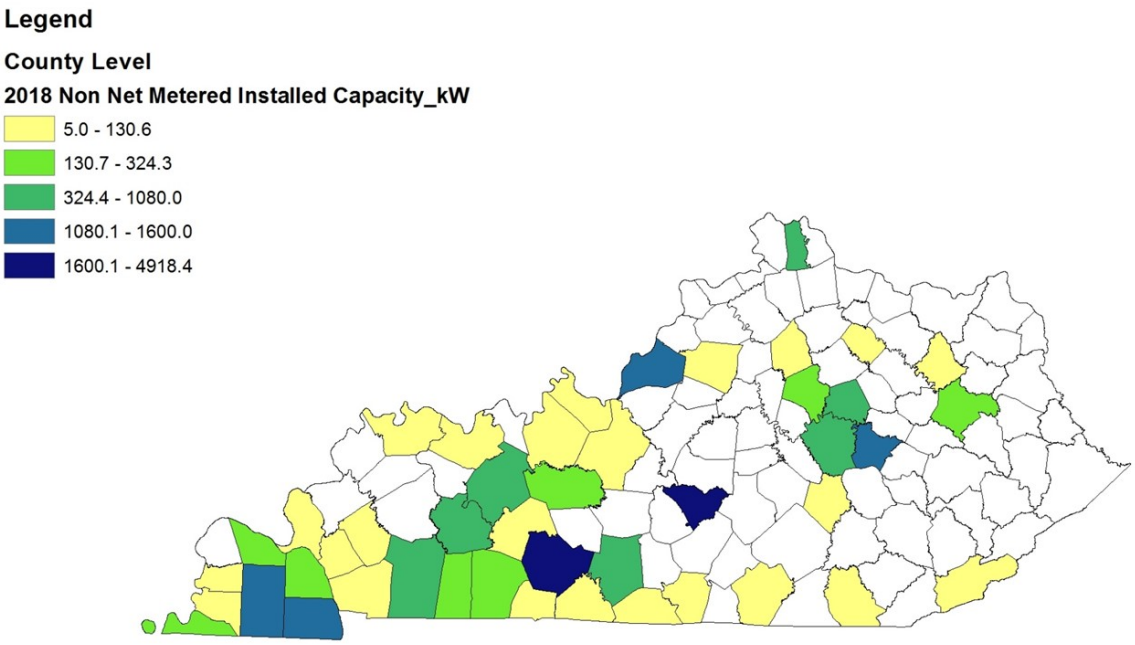
For more information on accessing alternative energy in Kentucky, visit the Consumer Energy Management and Access Guide located at eec.ky.gov/energy.

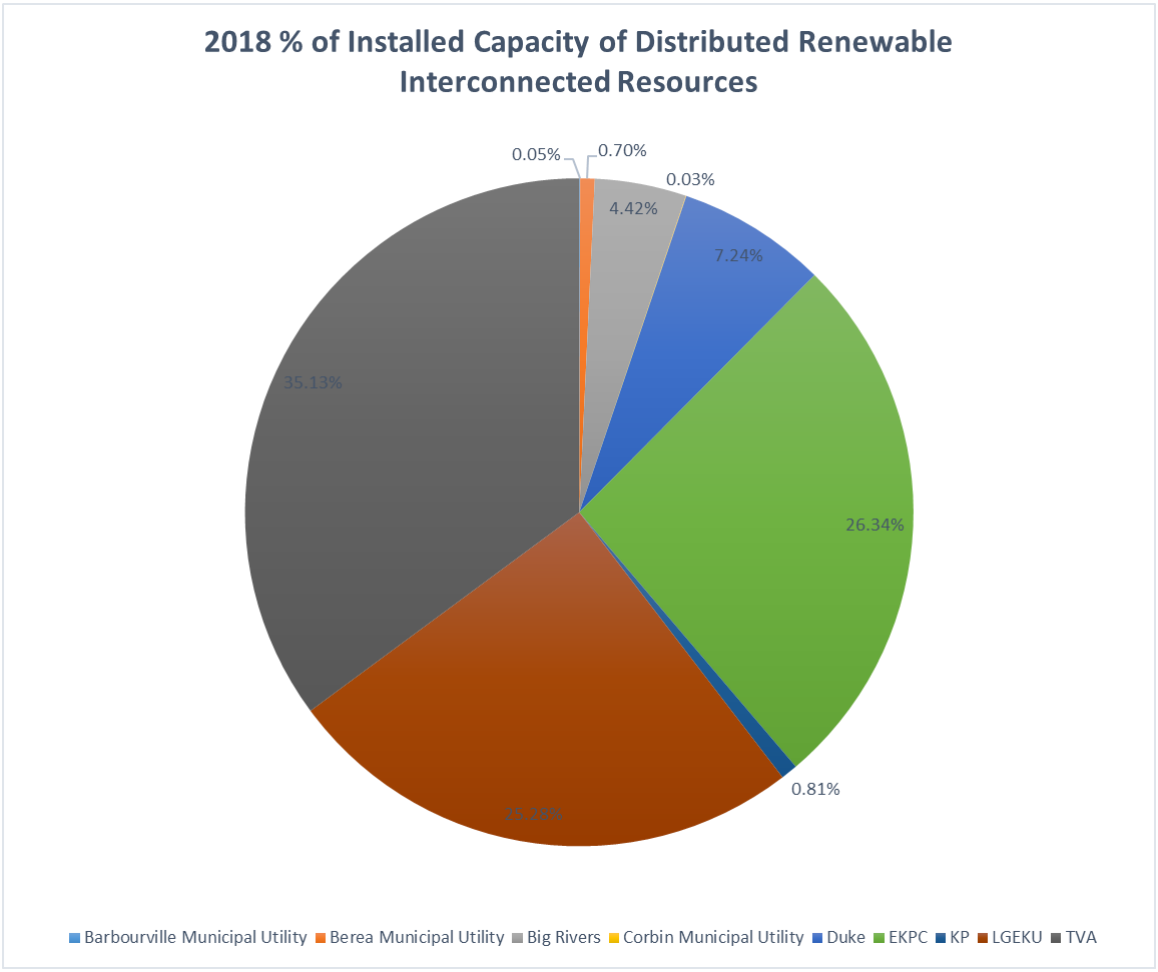
Distributed Renewable Generation





Distributed Renewable Generation





Coal-Fired Power Plant Profiles

Trimble County Power Plant, Kentucky's youngest coal-fired power plant. Owned jointly by Louisville Gas & Electric, Illinois Municipal Electric Agency, and Indiana Municipal Power Agency.

Coal-Fired Power Plant Profiles

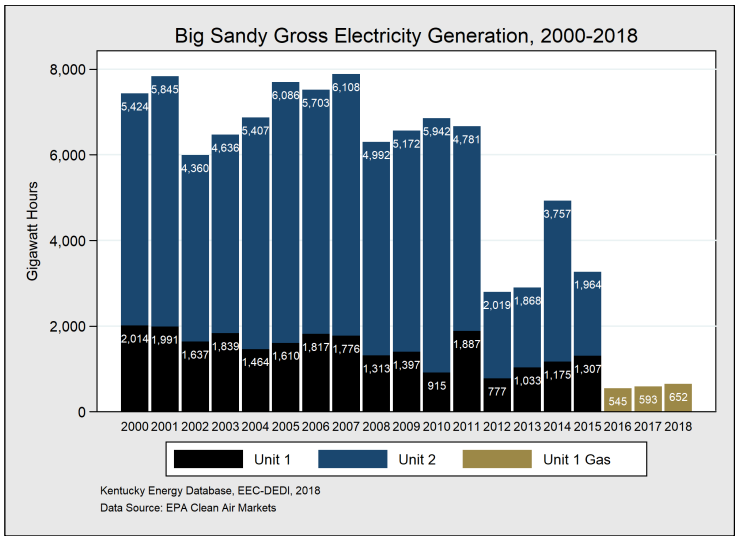
The following pages detail generation and emission statistics for Kentucky's coal fired generating plants. The plants that are profiled represent those that are currently coal fired or were once coal fired and have been converted to another source.

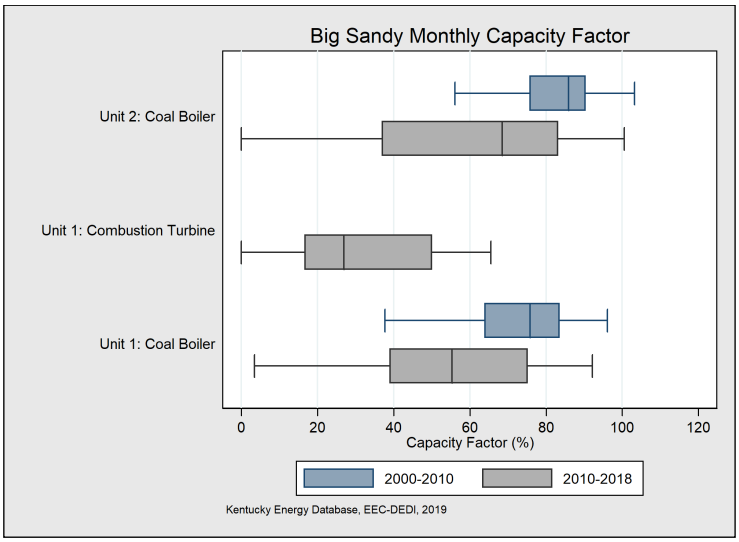
Edits from the previous edition:

Tyrone Power Plant and William C. Dale Power Plant have been removed from the 2019 edition due to retirements and their inability to resume operations due to demolition activities.

The reader will note that some power plants are not operational or have significantly reduced generation. Those power plants remain in this edition until they are no longer able to resume operations.

Big Sandy Power Plant





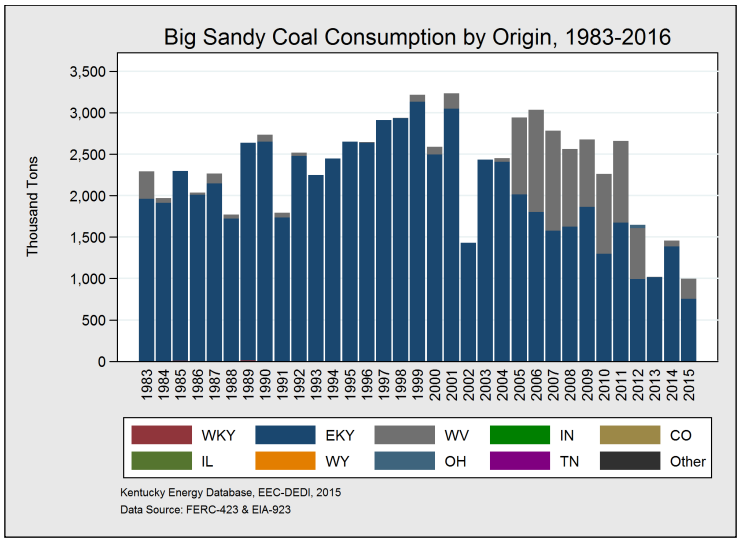
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1963**		**Natural Gas**	**268**	**27%**	**652**	**625**	**1,168**	**0.05**	**1.6**
1	1963		Natural Gas	268	27%	652	625	1,168	0.05	1.6
2	1969	2016	Coal	816		0	0			

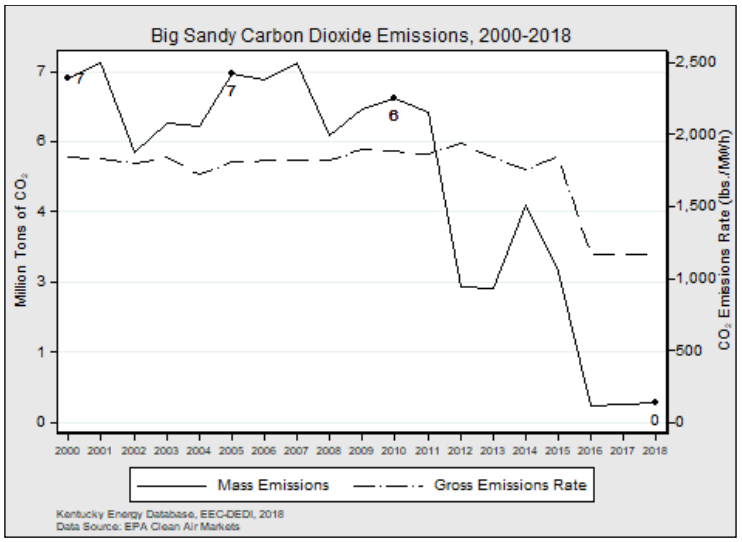
The Big Sandy Power Plant, near Louisa in Lawrence County, is 55 years old and consisted of two coal-fired electricity generating units, which came online in 1963 and 1969, respectively. The plant has a total nameplate capacity of 1,096 MW and is owned by Kentucky Power, a subsidiary of American Electric Power. In 2018, the plant generated 652 MWh of electricity, down from 3.3 GWh in 2015. Big Sandy's two coal-fired units were retired in 2016 and Unit 1 has been converted to a 268 MW natural gas combined cycle unit. Big Sandy's plant-wide capacity factor was 22% in 2016. The plant primarily burned coal trucked from eastern Kentucky in 2015, from Pike, Magoffin, Floyd, and Johnson counties.

*2018

†Converting to Natural Gas Combined Cycle

Big Sandy Power Plant

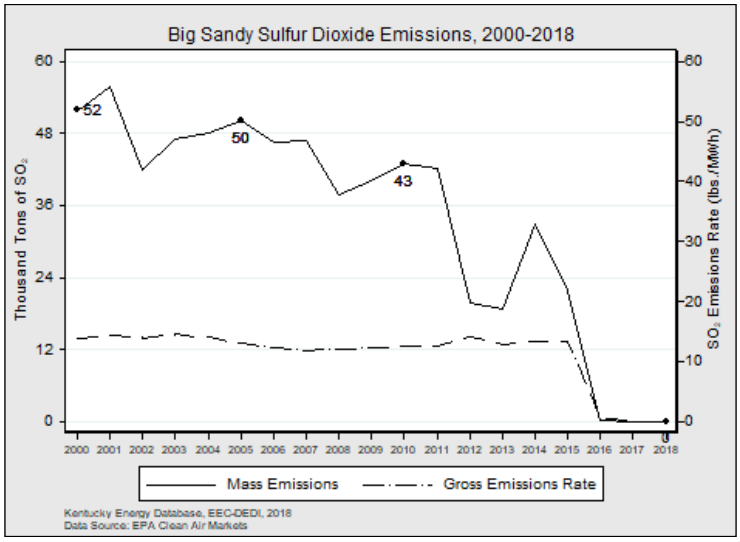


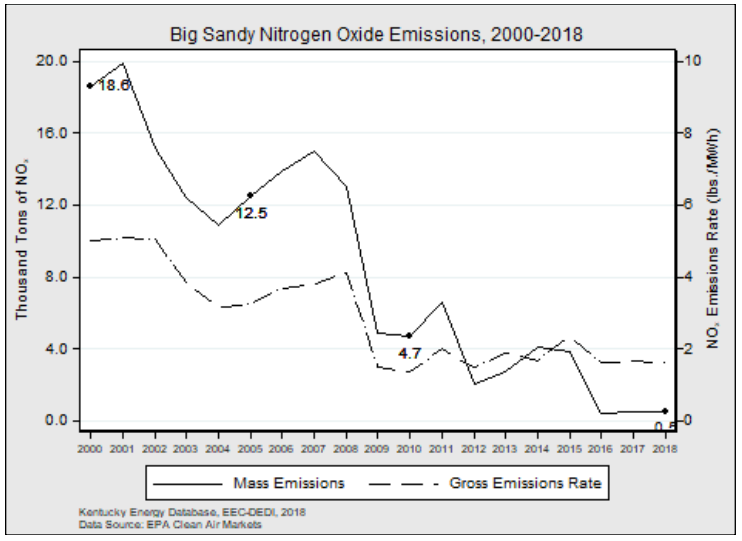


State	2015 Tons	Percentage
Total	1,457,580	100%
Eastern Kentucky	1,387,116	95%
West Virginia	70,464	5%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	380,765	-94%
Rate (lbs./MWh)	1,168	-38%

The Big Sandy Power Plant emitted 380 thousand tons of CO_2 in 2018, a decrease of 94% since 2010. The rate of CO_2 emissions is relatively unchanged and the decrease in emissions results from the generation lost after the plant's coal units were retired in 2016.





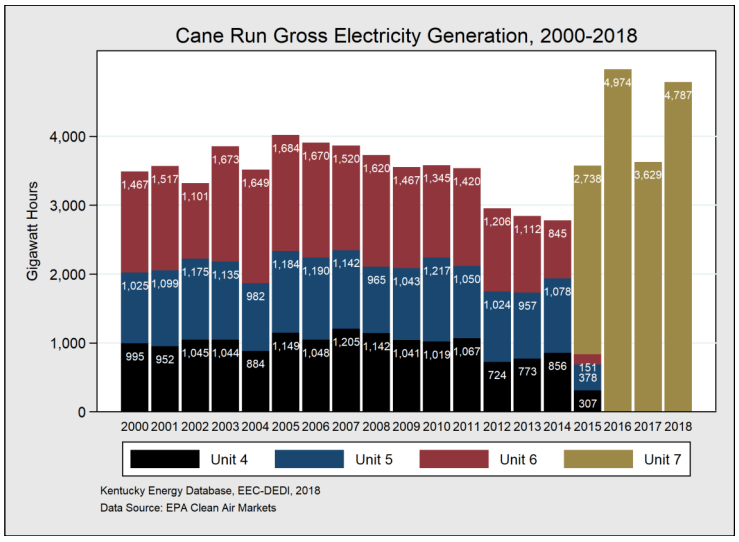
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	16.5	-99.99%
Rate (lbs./MWh)	0.05	-99.99%

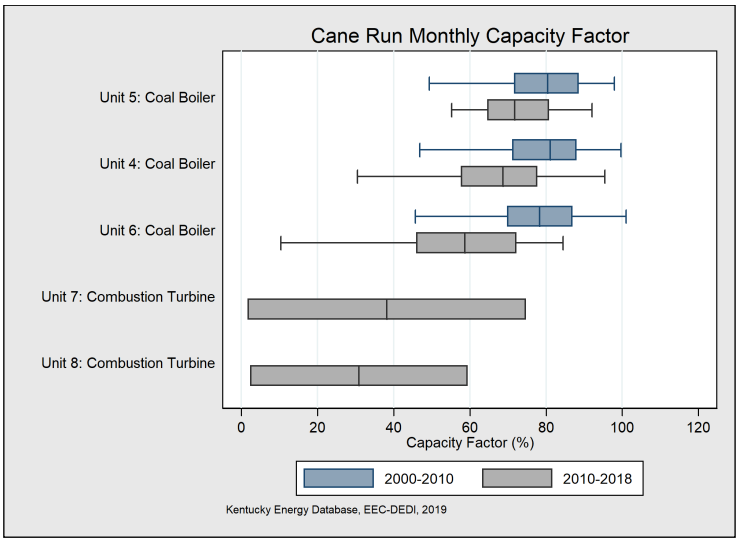
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	522	-89%
Rate (lbs./MWh)	1.6	-18%

The Big Sandy Power Plant emitted 16.5 tons of SO_2 in 2018. The SO_2 emissions rate has decreased at the plant by almost 100% after the closure of the plant's coal units in 2016.

The Big Sandy Power Plant emitted 522 tons of NO_x in 2018, a reduction of 89% since 2010. The rate of NO_x emissions decreased by 18% during that period.

Cane Run Station





Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1954**		**Coal**	**807**	**78%**	**4,786**	**4,711**	**809**	**0.0004**	**0.17**
4	1962	2015	Coal	155	0%	-	-	-	-	-
5	1966	2015	Coal	168	0%	-	-	-	-	-
6	1969	2015	Coal	240	0%	-	-	-	-	-
7A	2015		Natural Gas	260	75%	2,436	1,476	811	0.004	0.18
7B	2015		Natural Gas	260	77%	2,350	1,536	808	0.004	0.18
7S	2015		Natural Gas	287	82%		1,694			

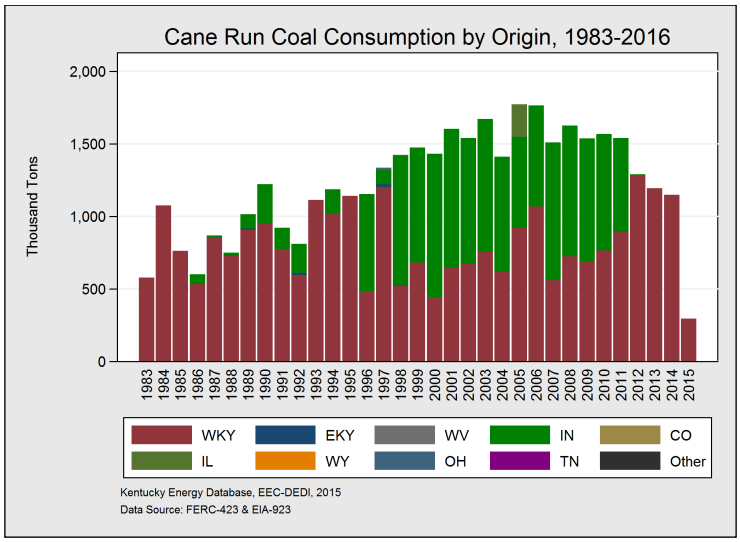
Cane Run Station, located southwest of Louisville in Jefferson County, began operation in 1954. The plant had six units at one time, but the three oldest coal units were retired by 1987. Units 4, 5, and 6 came online in 1962, 1966, and 1969, respectively. Units 4, 5, and 6 were retired in 2015 and replaced by 640 MW of natural gas combined cycle generation. In 2016, the plant generated 4.9 GWh of electricity, up from 3.5 GWh in 2015.

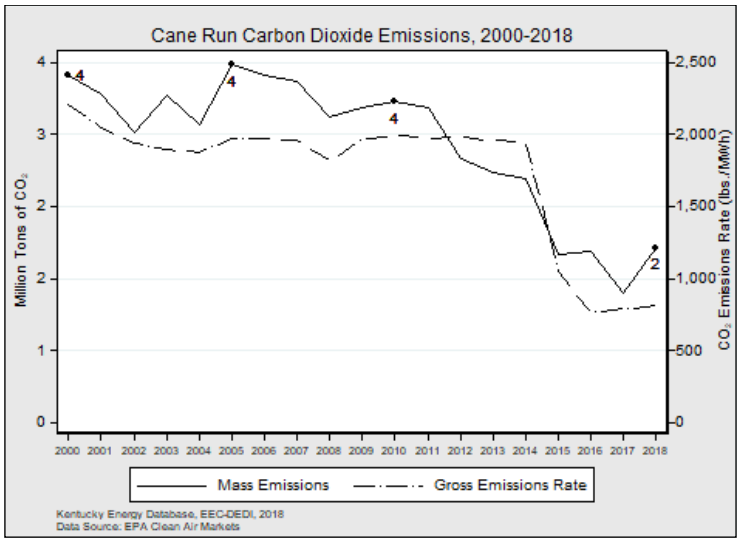
In their last full year of operation, Cane Run's coal units generated 2.7 GWh of electricity with an average capacity factor of 56%. Units 4, 5, and 6 generated 71.1 GWh for the Commonwealth over their lifetime with an average capacity factor of 59%. The coal units were demolished in June 2019.

*2018

Source: EPA Clean Air Markets and Louisville Gas & Electric website

Cane Run Station

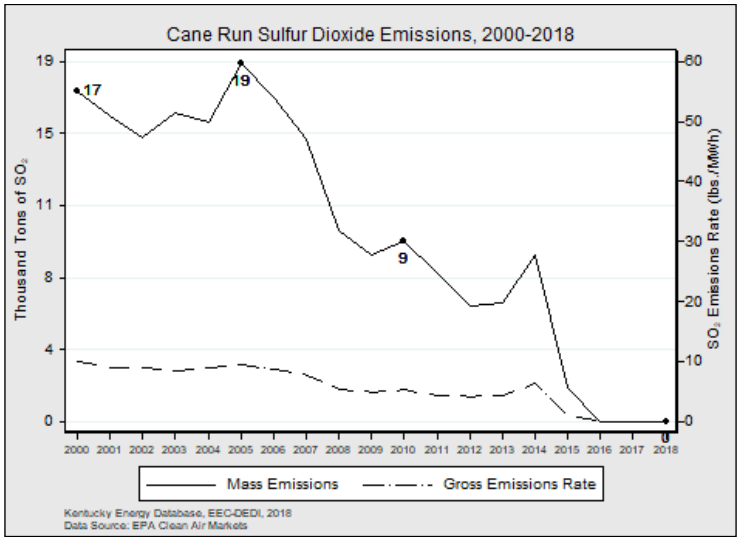


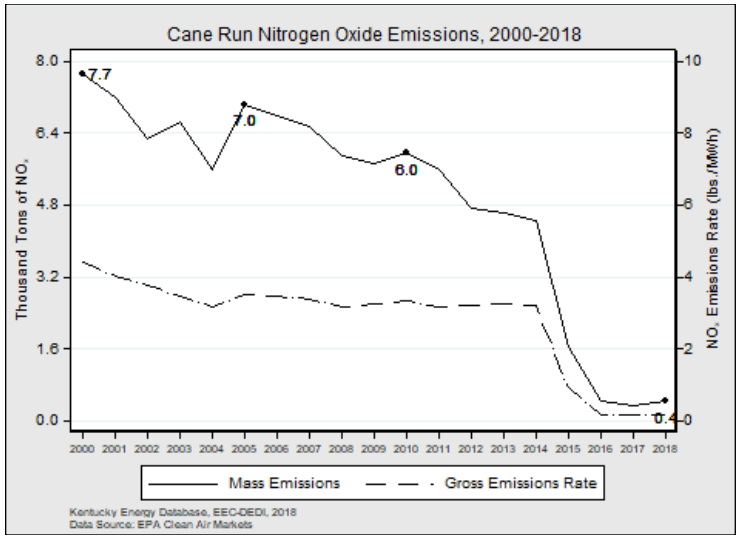


State	2016 Tons	Percentage
Total	1,147,537	100%
Western Kentucky	1,147,537	100%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,937,073	-45%
Rate (lbs./MWh)	809	-59%

Cane Rune Station emitted 1.9 million tons of CO_2 in 2018, a decrease of 45% from 2010 levels. The rate of CO_2 emissions decreased by 59% over the same period.





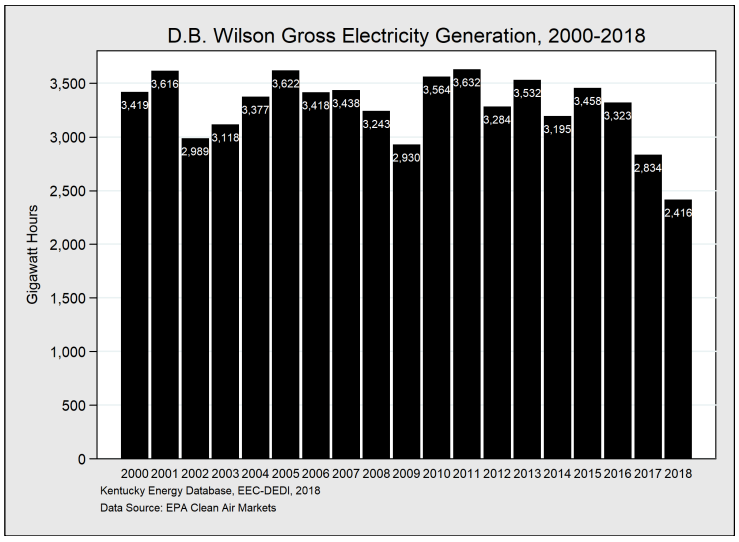
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	9.78	-99%
Rate (lbs./MWh)	0.004	-99%

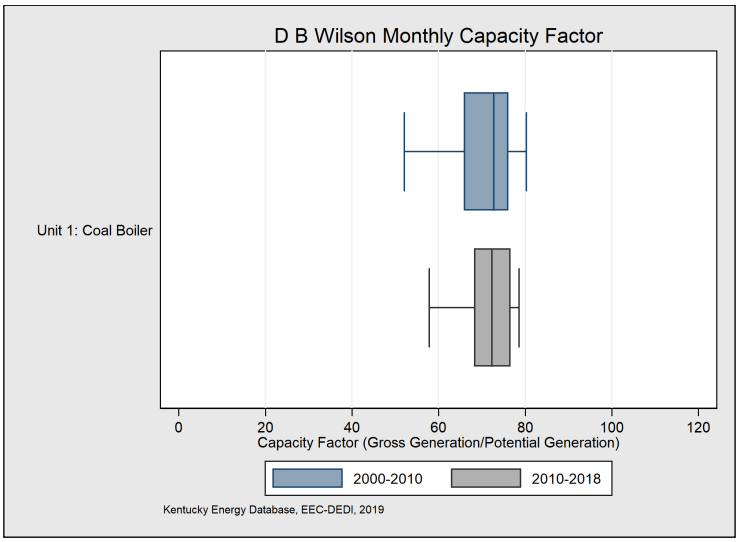
Nitrogen Dioxide	2015 Value	Since 2010
Emissions (Tonnage)	429	-93%
Rate (lbs./MWh)	0.17	-95%

Cane Rune Station emitted 9.78 tons of SO_2 in 2018, a decrease of 99.99%% since 2010. The rate of SO_2 emissions decreased by the same amount during that period.

Cane Rune Station emitted 4,29 tons of NO_x in 2018, a reduction of 92.8% since 1000. The rate of NO_x emissions decreased by nearly 95% during that period.

D. B. Wilson Station



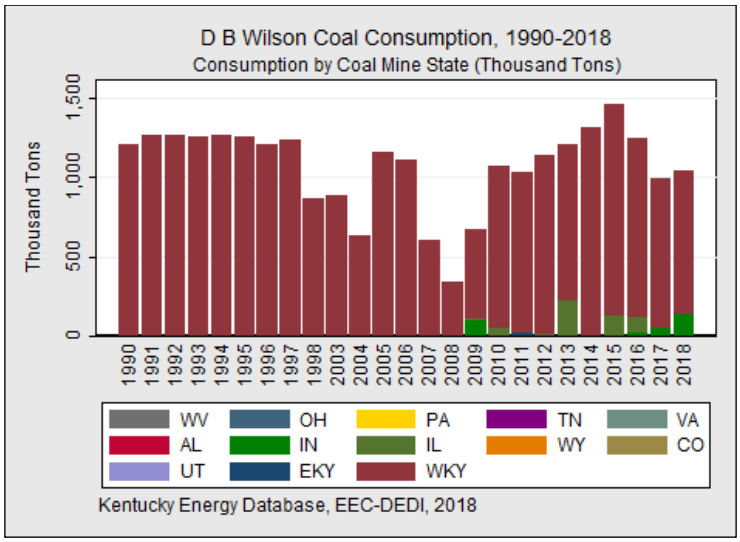


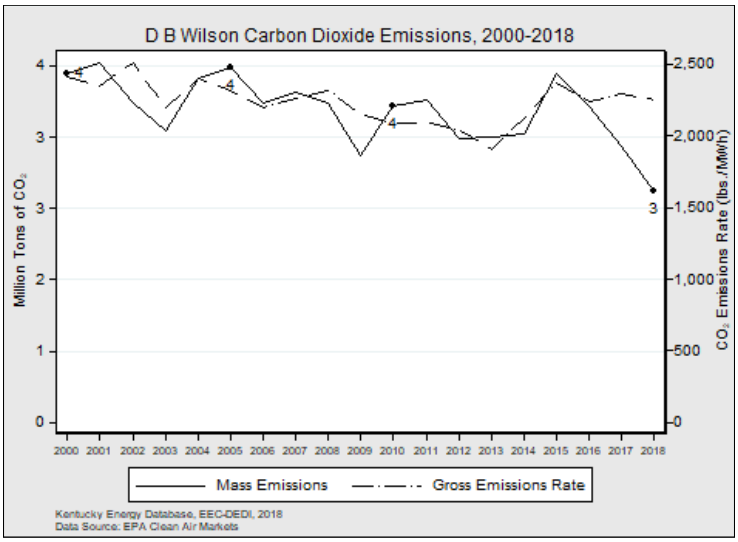
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1984**		**Coal**	**566**	**62%**	**2,416**	**2,256**	**2,252**	**4.2**	**0.96**
1	1984		Coal	566	62%	2,416	2,256	2,252	4.2	0.96

D. B. Wilson Station, located in Ohio County, is 34 years old and consists of one coal-fired electricity generating unit. The unit came online in 1984 and has a nameplate capacity of 566 MW. In 2018, the plant generated 2.4 GWh of electricity and had a plant-wide capacity factor of 62%. Wilson burned predominantly western Kentucky coal in 2018. Wilson Station is owned by Big Rivers Electric Corporation.

*2018

D. B. Wilson Station

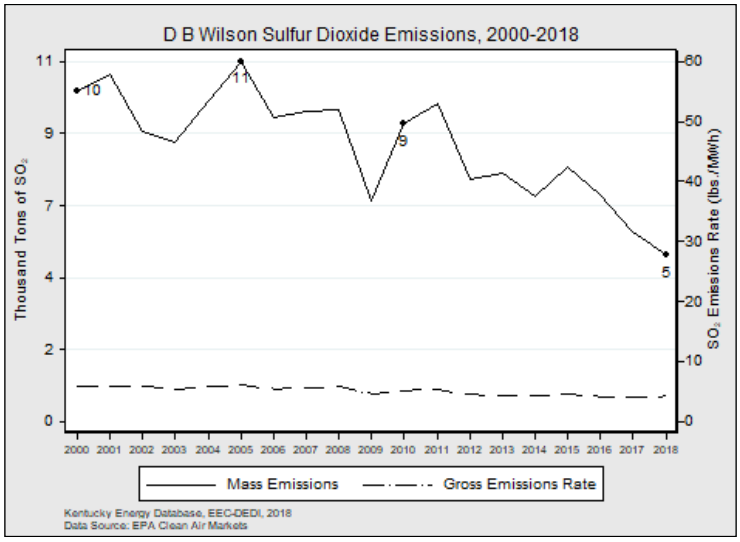


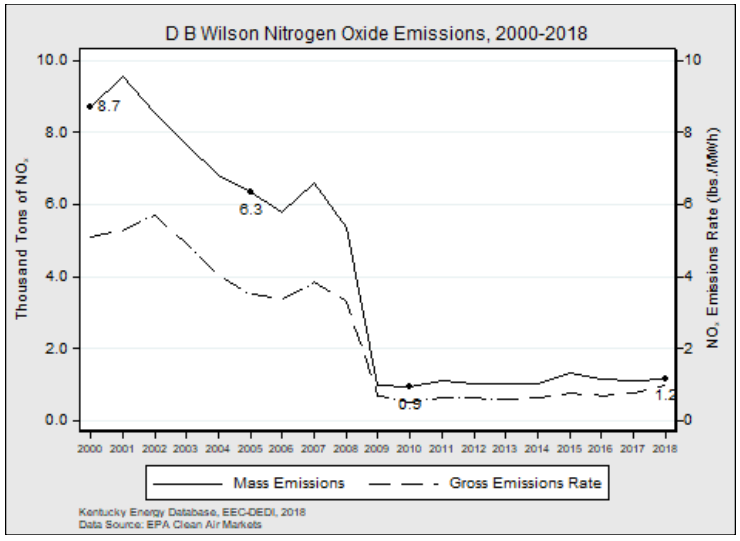


State	2018 Tons	Percentage
Total	1,307,770	100%
Western Kentucky	1,307,770	100%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,719,598	-27%
Rate (lbs./MWh)	2,251	-8%

The D. B. Wilson Station emitted 2.7 million tons of CO_2 in 2018, a decrease of 27% from 2010 levels. The rate of CO_2 emissions decreased by 8% during that period.





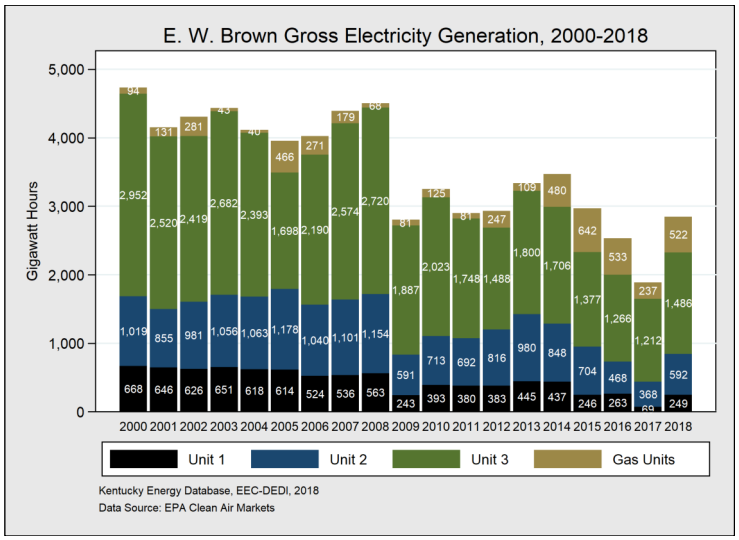
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	5,081	-44%
Rate (lbs./MWh)	4.21	-18%

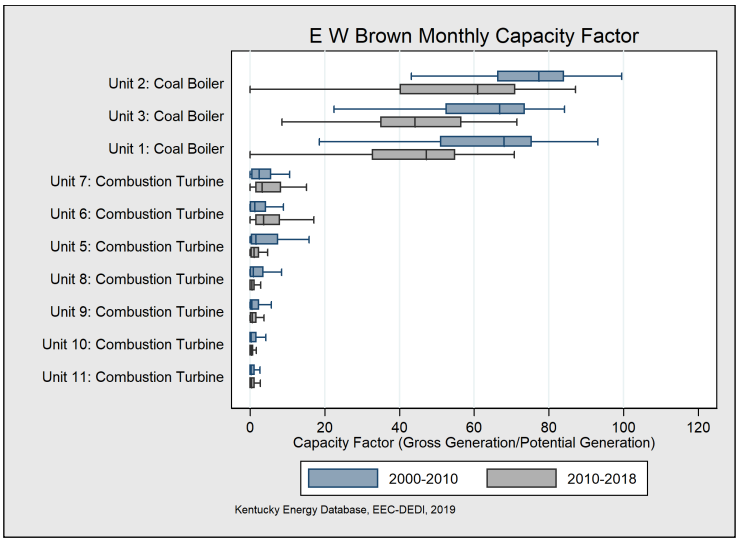
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,156	+24%
Rate (lbs./MWh)	0.96	+83%

The D. B. Wilson Station emitted 5,081tons of SO_2 in 2018, a decrease of 44% since 2010. The rate of SO_2 emissions reduced by 18% during that period.

The D. B. Wilson Station emitted 1,156 tons of NO_x in 2018, an increase of 24% since 2010. The rate of NO_x emissions increased by 83% during that period.

E. W. Brown Generating Station



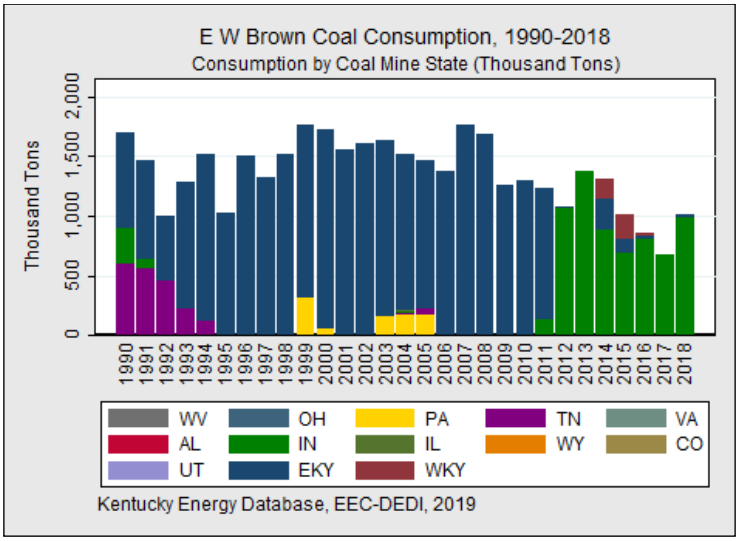


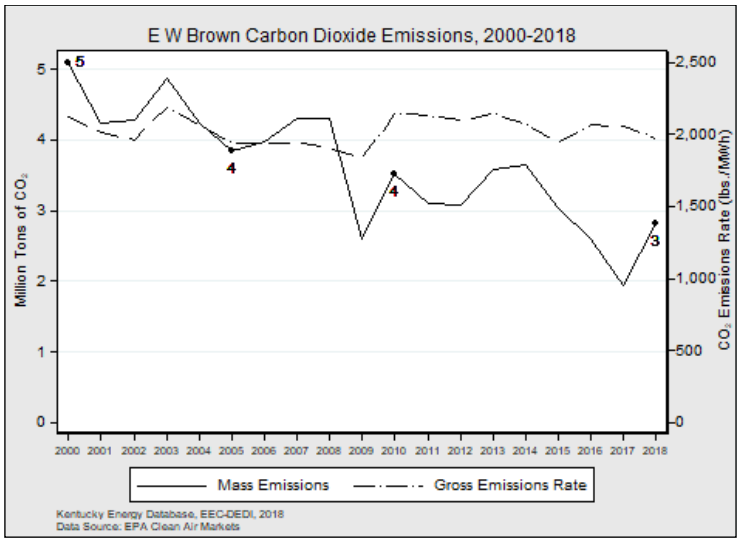
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1955**		**Coal**	**684**	**32%**	**2,849**	**2,035**	**1,970**	**1.47**	**0.7**
1	1957	2019	Coal	106	22%	249	210	2,076	0.89	1.99
2	1963	2019	Coal	166	35%	592	519	2,116	0.83	1.96
3	1971		Coal	412	36%	1,486	1,307	2,090	0.88	1.38
5	2001		Natural Gas	112	11%	120		1,522	0.007	0.9
6	1999		Natural Gas	146	9%	142		1,295	0.006	0.5
7	1999		Natural Gas	146	8%	126		1,292	0.006	0.79
8	1995		Natural Gas	102	4%	44		1,529	0.01	1.41
9	1994		Natural Gas	102	3%	36		1,580	0.14	1.67
10	1995		Natural Gas	102	3%	34		1,556	0.02	1.66
11	1996		Natural Gas	102	2%	21		1,553	0.04	1.52

The E. W. Brown Generating Station, located in Mercer County, consists of three coal-fired electricity generating units as well as seven natural gas combustion turbines used to meet peak demand. The plant is 60 years old, and the coal units came online in 1957, 1963, and 1971, respectively. E. W. Brown's coal units have a total nameplate capacity of 684 MW and is owned and operated by Kentucky Utilities. In 2018, the plant generated 2.8 GWh of electricity and its coal-units had an average capacity factor of 32%. The plant installed scrubbers on its three coal fired units in 2010 to reduce sulfur dioxide emissions. E. W. Brown mostly burned Indiana-based coal in 2018, marking a dramatic shift from the previous decade, during which it relied heavily on coal from eastern Kentucky, primarily from Perry County, but also from Knott, Leslie, Floyd, and Magoffin counties. The plant typically pays a premium for the coal it consumes because of high transportation costs to central Kentucky relative to other plants located on the Ohio and Green Rivers. Units 1 and 2 were retired in 2019.

*2018

E. W. Brown Generating Station

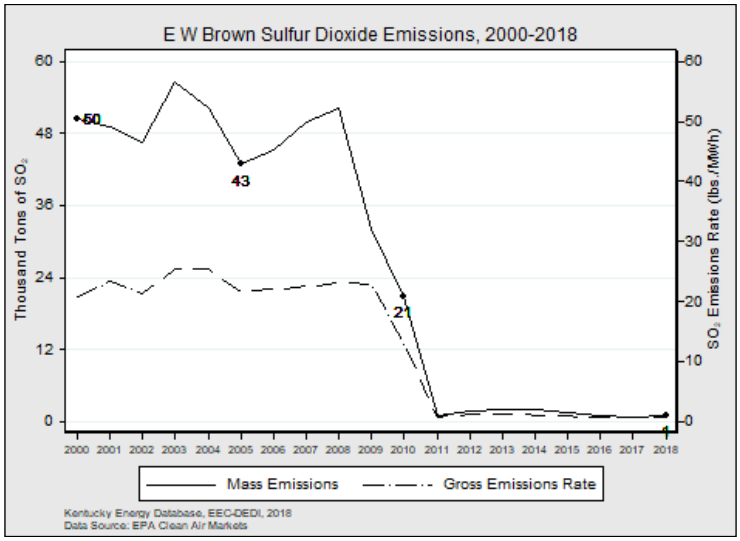


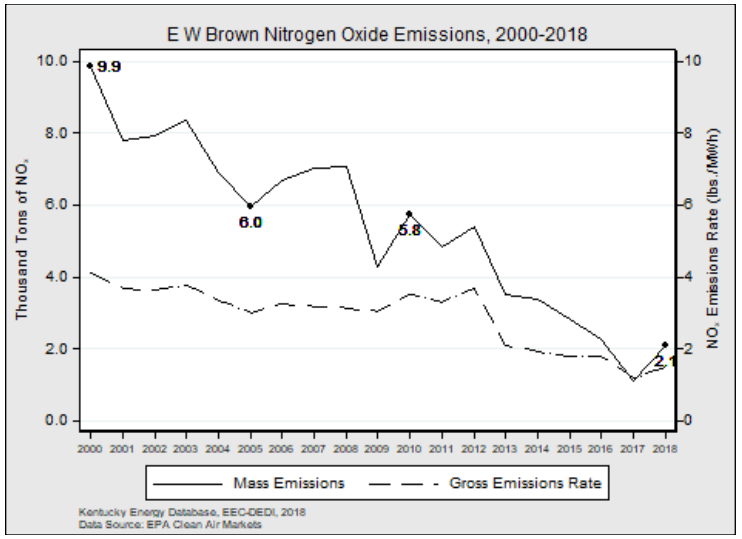


State	2018 Tons	Percentage
Total	1,307,307	100%
Indiana	889,927	68%
Eastern Kentucky	215,969	17%
Western Kentucky	201,411	15%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,806,292	-20%
Rate (lbs./MWh)	1,970	-8%

The E. W. Brown Generating Station emitted 2.8 million tons of CO_2 in 2018, a decrease of 20% since 2010. The rate of CO_2 emissions has remained relatively unchanged during that period and is the second highest of Kentucky coal plants.





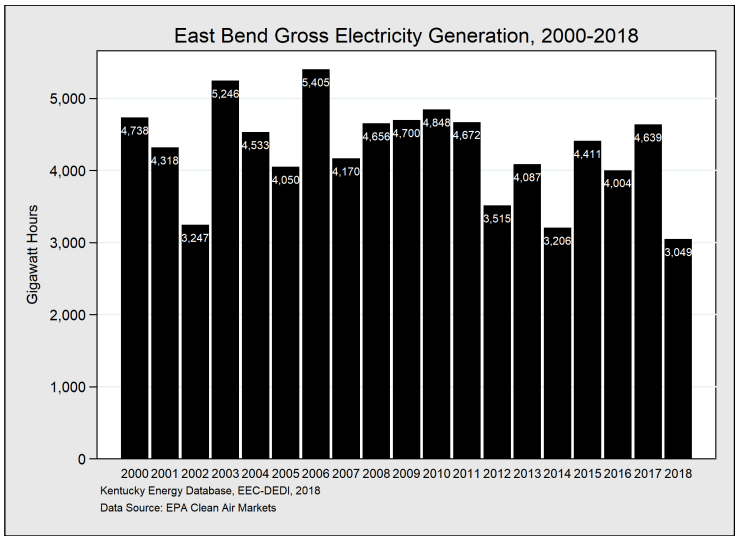
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,015	-95%
Rate (lbs./MWh)	0.71	-94%

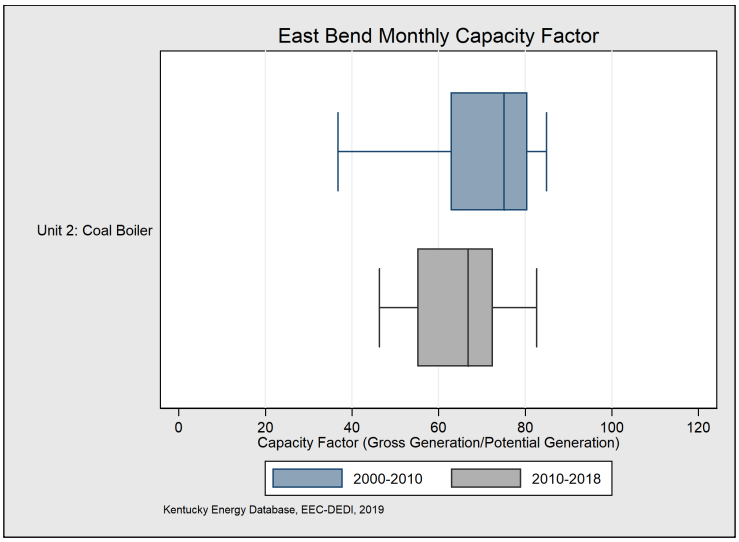
The E. W. Brown Generating Station emitted 1,015 tons of SO_2 in 2018, a decrease of 95% since 2010. The rate of SO_2 emissions decreased by 94% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,100	-63%
Rate (lbs./MWh)	1.47	-58%

The E. W. Brown Generating Station emitted 2,100 tons of NO_x in 2018, a reduction of 63% since 2010. The rate of NO_x emissions decreased by 58% during that period.

East Bend Generating Station



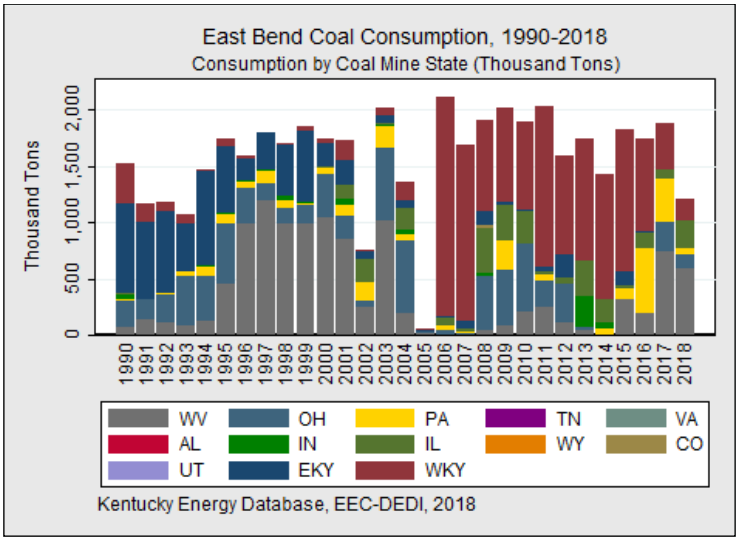


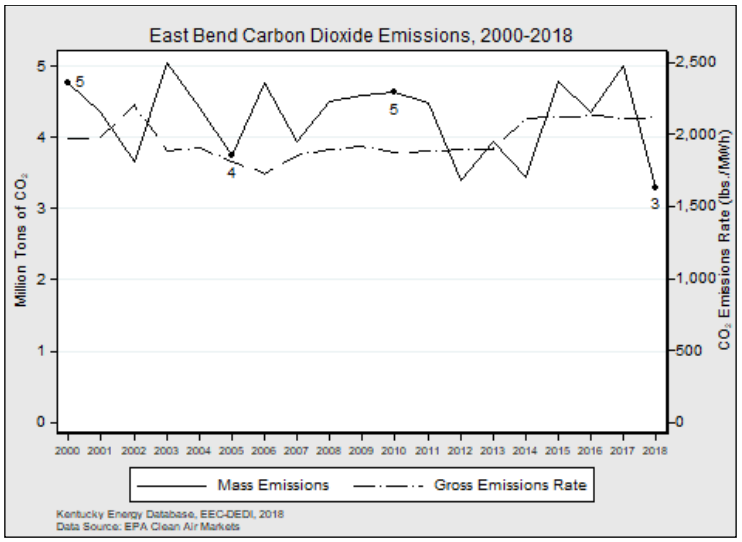
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1981**		**Coal**	**600**	**53%**	**3,049**	**2,793**	**2,118**	**1.32**	**1.26**
2	1981		Coal	600	53%	3,049	2,793	2,118	1.32	1.26

The East Bend Generating Station, located in Boone County, is 36 years old and consists of one coal-fired electricity generating unit. The unit came online in 1981 and has a nameplate capacity of 600 MW. The coal plant is owned by Duke Energy, but was originally constructed and owned jointly by Cincinnati Gas & Electric and Dayton Power & Light. In 2018, the plant generated 3 TWh of electricity and had a capacity factor of 53%. After the installation of sulfur dioxide scrubbers in 2005, East Bend began shifting its consumption of low-sulfur coal from West Virginia to that of western Kentucky, which has relatively higher sulfur content but a lower cost. In 2018, East Bend used a mix of coal from western Kentucky, Indiana, and Illinois. .

*2018

East Bend Generating Station

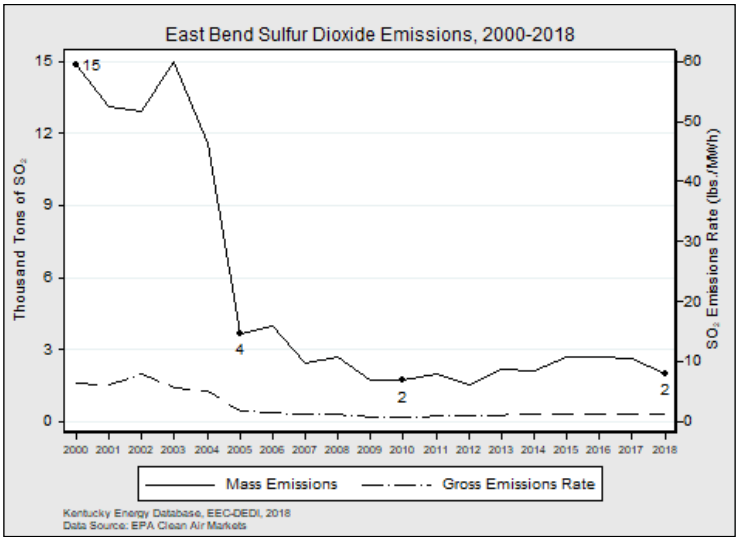


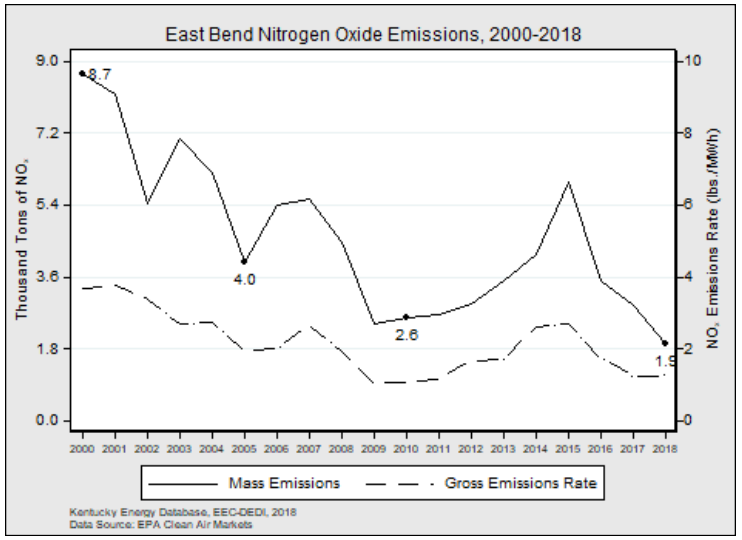


State	2018 Tons	Percentage
Total	1,426,557	100%
Western Kentucky	1,110,137	78%
Illinois	206,939	15%
Indiana	53,316	4%
Pennsylvania	51,477	4%
West Virginia	4,688	0%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,228,075	-29%
Rate (lbs./MWh)	2,118	+13%

The East Bend Generating Station emitted 3.2 million tons of CO_2 in 2018, a decrease of 29% from 2010 levels. The rate of CO_2 emissions increased by 13% during that period.





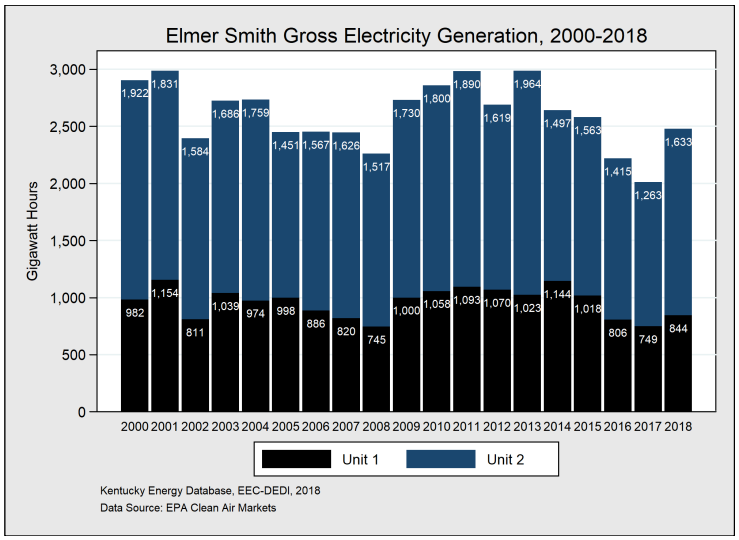
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,012	+18%
Rate (lbs./MWh)	1.32	+87%

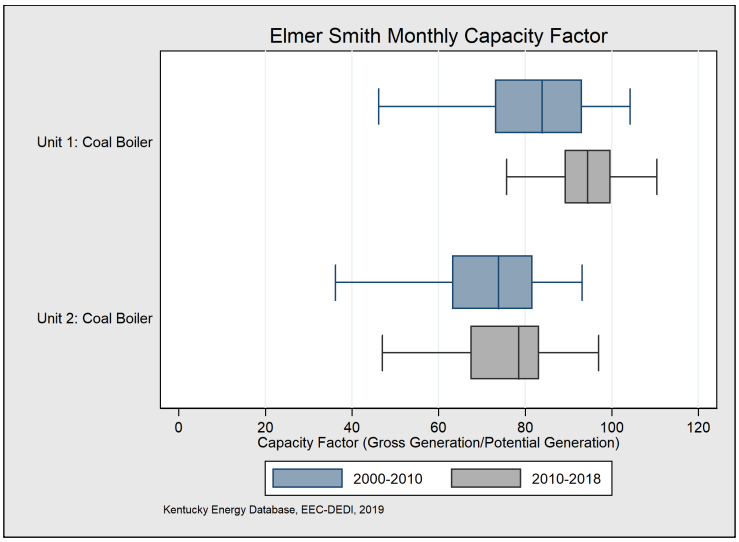
The East Bend Generating Station emitted 2,012 tons of SO_2 in 2018, an increase of 18% since 2010. The rate of SO_2 emissions increased by 87% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,919	-25%
Rate (lbs./MWh)	1.26	+19%

The East Bend Generating Station emitted 1,919 tons of NO_x in 2018, a reduction of 25% since 2010. The rate of NO_x emissions increased by 19% during that period.

Elmer Smith Station





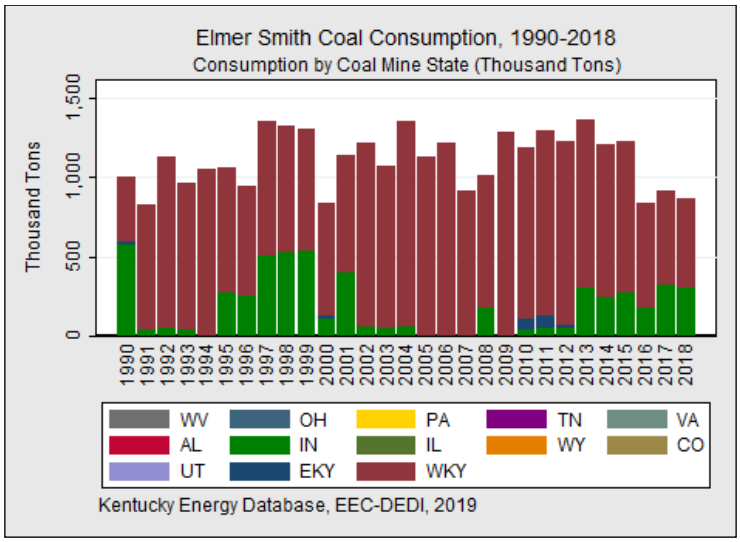
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1964**		**Coal**	**401**	**61%**	**2,478**	**2,210**	**2,040**	**1.69**	**2.21**
1	1964	2019	Coal	139	59%	844	729	2,060	1.62	1.64
2	1974	2020	Coal	263	64%	1,633	1,481	2,030	1.72	2.51

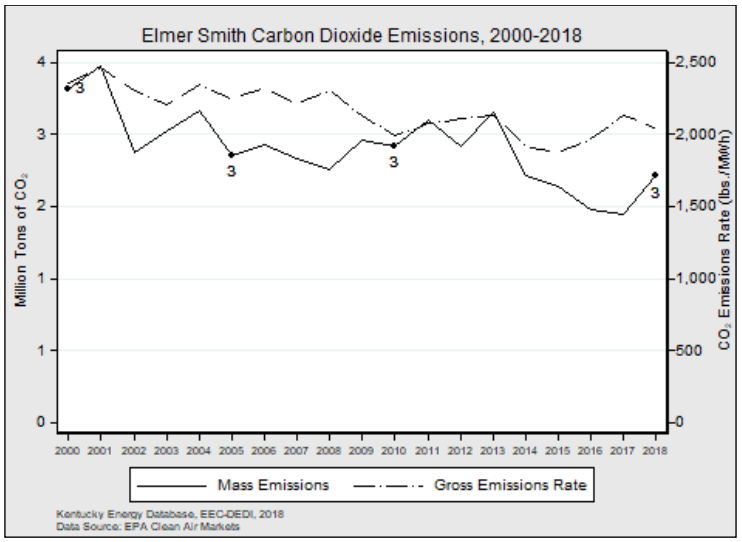
Elmer Smith Station, located in Henderson County, is 54 years old and consists of two coal-fired electricity generating units, which began operating in 1964 and 1974, respectively. The plant has a total nameplate capacity of 401 MW. In 2018, the plant generated 2.4 GWh of electricity and had a plant-wide capacity factor of 61%. The majority of the coal used at Elmer Smith in 2018 was trucked from western Kentucky. Both units are scheduled to retire by 2020, Unit 1 in 2019 and Unit 2 in 2020. Elmer Smith Station is owned and operated by Owensboro Municipal Utilities.

*2018

Photo by Kentucky EEC Staff

Elmer Smith Station

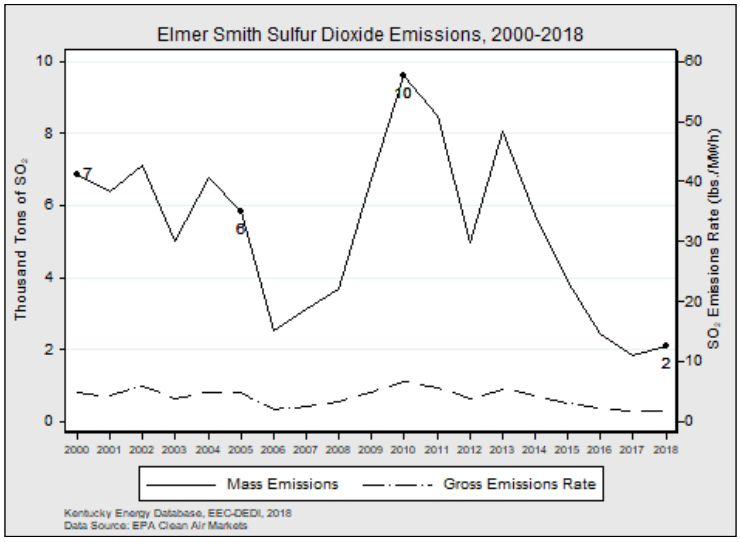


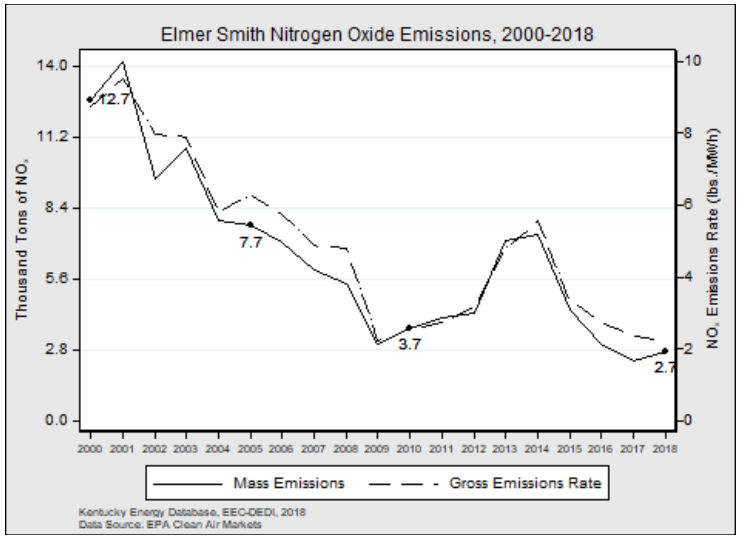


State	2018 Tons	Percentage
Total	1,205,618	100%
Western Kentucky	953,943	79%
Indiana	248,443	21%
Tennessee	3,232	<1%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,527,776	-11%
Rate (lbs./MWh)	2,040	+3%

Elmer Smith Station emitted 2.5 million tons of CO_2 in 2018, a decrease of 11% from 2010 levels. The rate of CO_2 emissions increased by 3% during that period.





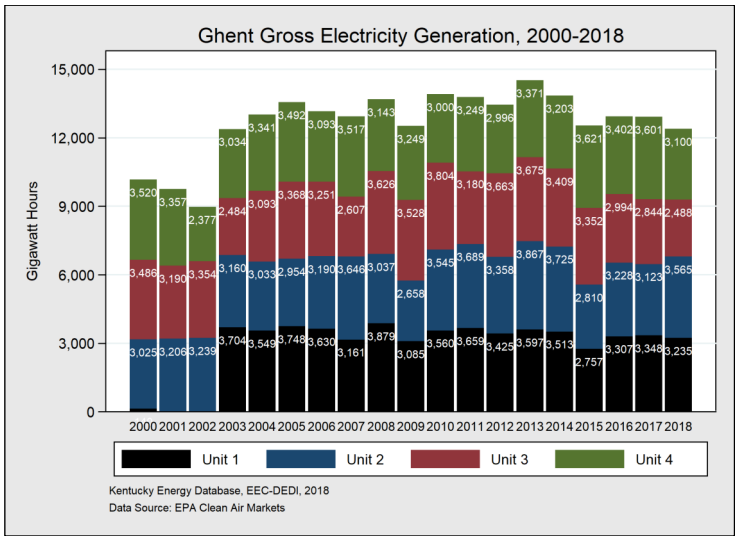
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,088	-78%
Rate (lbs./MWh)	1.69	-75%

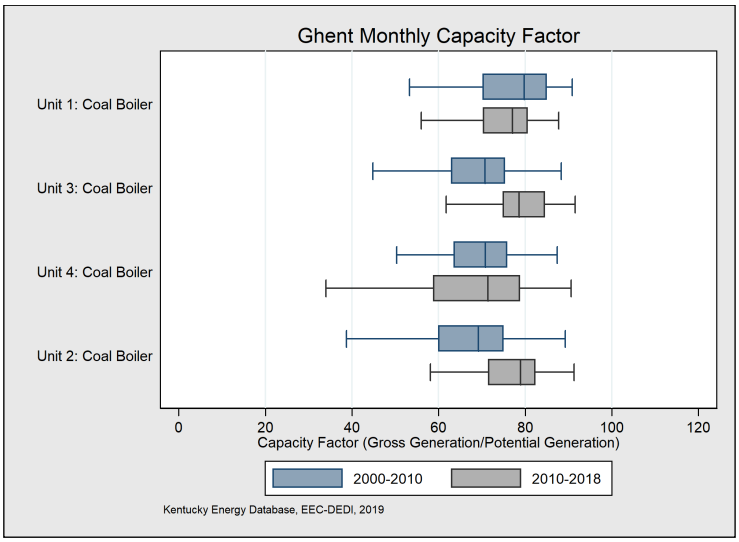
Elmer Smith Station emitted 2,088 tons of SO_2 in 2018, a decrease of 78% since 2010. The rate of SO_2 emissions reduced by 75% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,736	-25%
Rate (lbs./MWh)	2.21	-14%

Elmer Smith Station emitted 2,736 tons of NO_x in 2018, a reduction of 25% since 2010. The rate of NO_x emissions decreased by 14% during the same period.

Ghent Generating Station



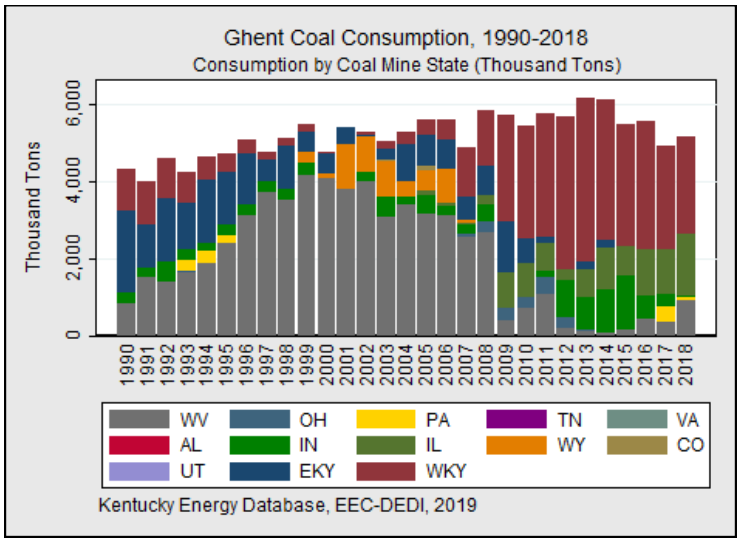


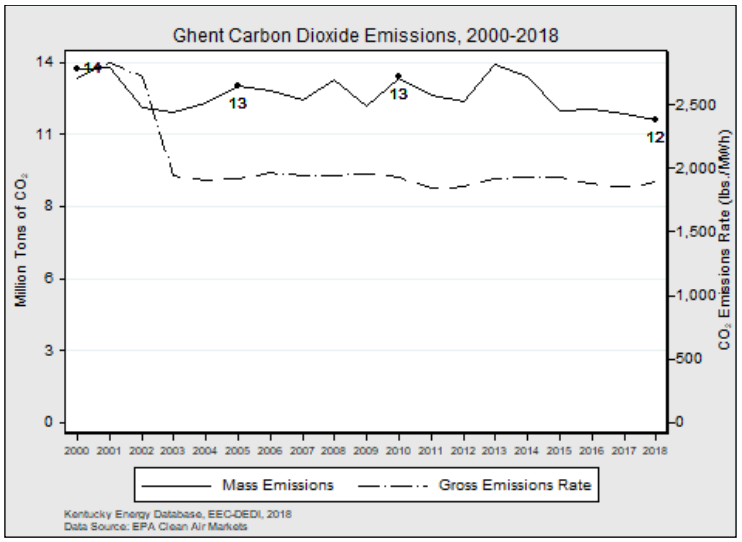
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1973**		**Coal**	**1,932**	**66%**	**12,389**	**11,265**	**1,893**	**1.72**	**1.10**
1	1974		Coal	479	71%	3,235	2,979	2,032	0.54	0.51
2	1977		Coal	495	76%	3,565	3,275	1,799	3.07	1.83
3	1981		Coal	489	52%	2,488	2,210	1,798	2.49	1.56
4	1984		Coal	469	66%	3,100	2,801	1,932	0.77	0.39

The Ghent Generating Station, located in Carroll County, began operation in 1973 and consists of four coal-fired electricity generating units. The units came online in 1974, 1977, 1981, and 1984, respectively. The plant is owned by Kentucky Utilities and has a total nameplate capacity of 1,932 MW, making it the largest of Kentucky Utilities' electricity plants. In 2018, the plant had a plant-wide capacity factor of 66% and generated 12.3 GWh of electricity. All four units at Ghent underwent retrofits to control for sulfur dioxide emissions from 2007 to 2009. The majority of coal consumed by Ghent in 2018 was transported by river barge from the western Kentucky counties: Union, Ohio, Magoffin, McLean, Webster, and Daviess. The plant burned smaller amounts of coal from Indiana, Illinois, West Virginia, and Perry County, in eastern Kentucky. This is a significant change from the 2000s, when it used mostly coal from West Virginia.

*2018

Ghent Generating Station

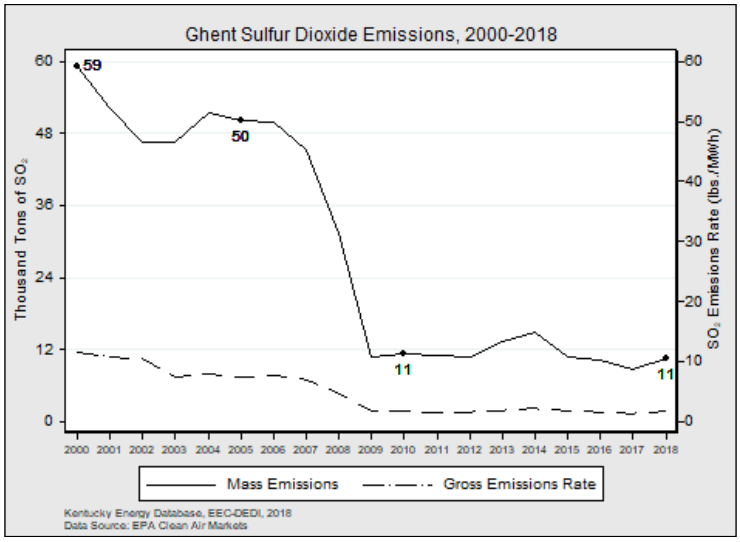


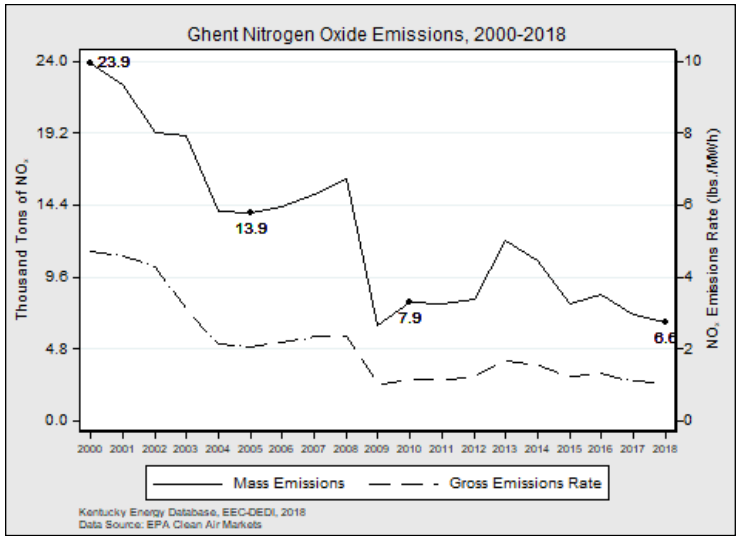


State	2018 Tons	Percentage
Total	6,113,933	100%
Western Kentucky	3,757,227	61%
Indiana	1,122,871	18%
Illinois	1,074,418	18%
Eastern Kentucky	81,467	1%
West Virginia	77,950	1%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	11,725,834	-13%
Rate (lbs./MWh)	1,893	-2%

The Ghent Generating Station emitted 11.7 million tons of CO_2 in 2018, a decrease of 13% from 2010 levels. The rate of CO_2 emissions decreased by 2% during that period.





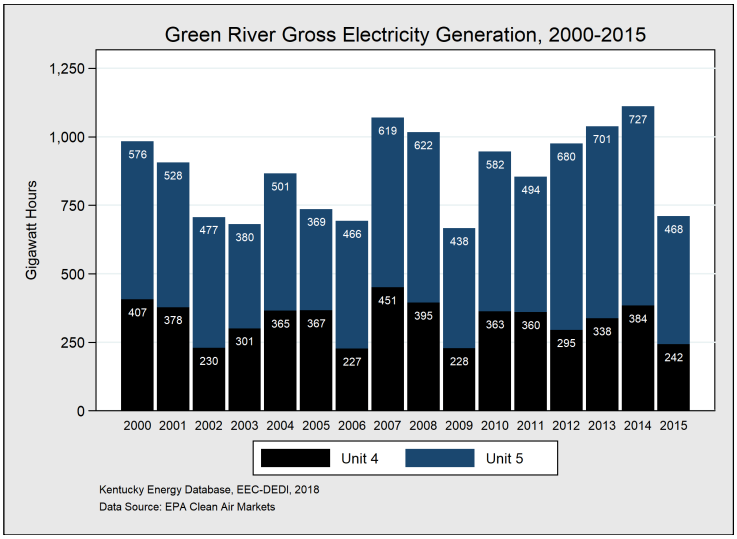
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	10,620	-7%
Rate (lbs./MWh)	1.715	+5%

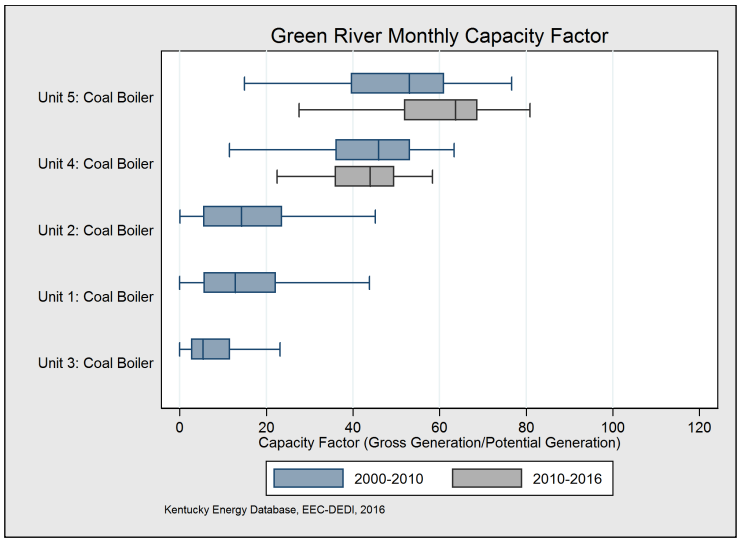
The Ghent Generating Station emitted 10,620 tons of SO_2 in 2018, a decrease of 7% since 2010. The rate of SO_2 emissions increased by 5% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	6,614	-16%
Rate (lbs./MWh)	1.1	-6%

The Ghent Generating Station emitted 6,614 tons of NO_x in 2018, a reduction of 16% since 2010. The rate of NO_x emissions decreased by 6% since 2010.

Green River Generating Station



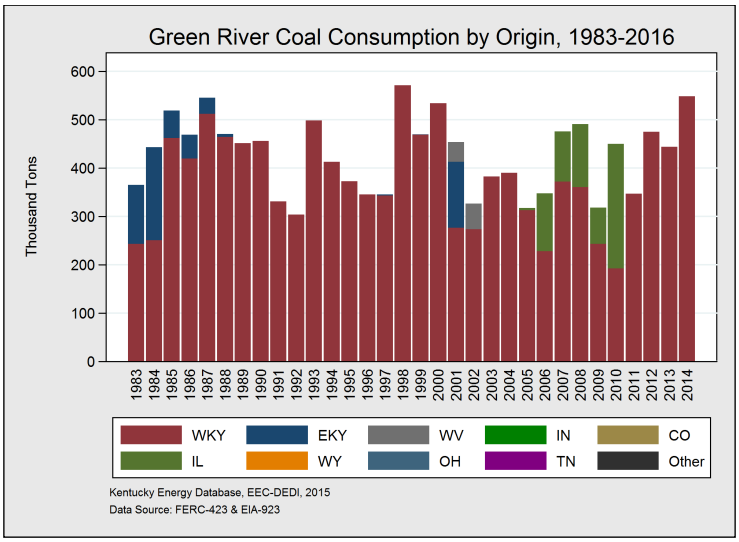


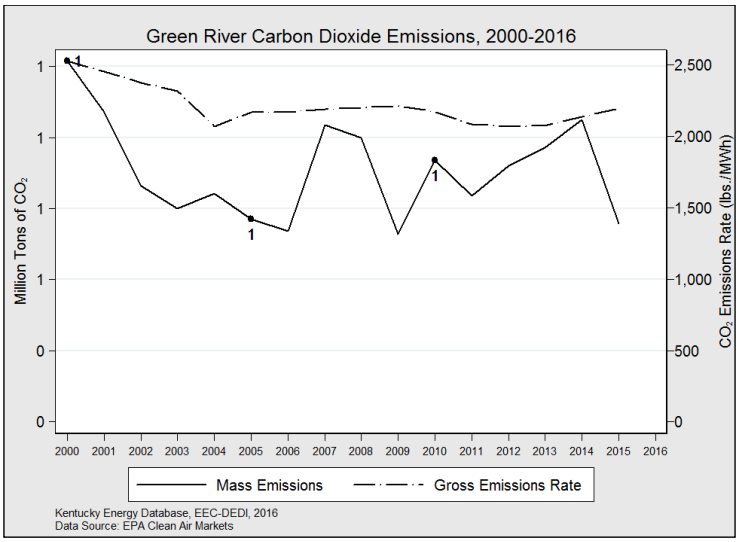
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1950**	**2015**	**Coal**	**215**	**38%**	**710**	**656**	**2,135**	**39.55**	**4.54**
4	1959	2015	Coal	95	29%	242	222	2,534	46.16	5.40
5	1954	2015	Coal	120	45%	468	434	1,924	36.06	4.08

The Green River Generating Station, located in Muhlenberg County, was 65 years old in 2015 and consisted of two coal-fired electricity generating units. The units have ceased operation and were retired at the end of September 2015. The units came online in 1950 and 1959, respectively. The plant had a total nameplate capacity of 215 MW. In 2016, the plant generated slightly more than 0.7 GWh of electricity and had a plant-wide capacity factor of 38%. Most of the coal burned at Green River has originated in western Kentucky since at least 1990, but the plant has not registered coal deliveries since 2009. Green River Generating Station is owned and operated by Kentucky Utilities.

*2014

Green River Generating Station

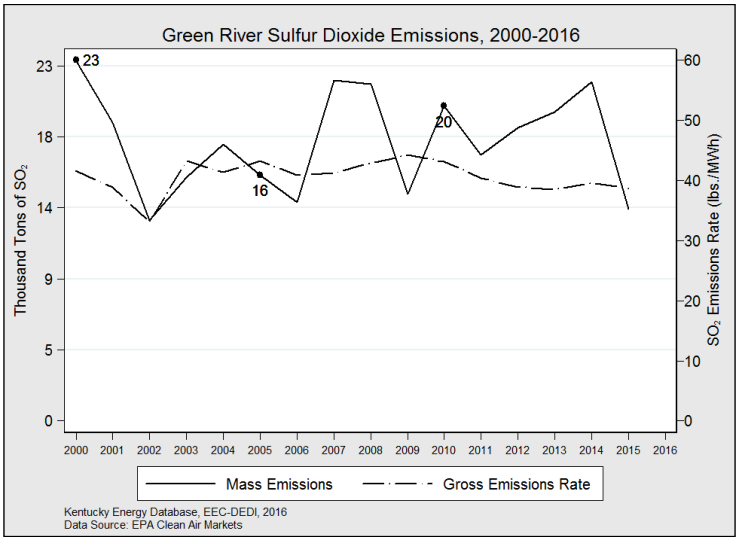


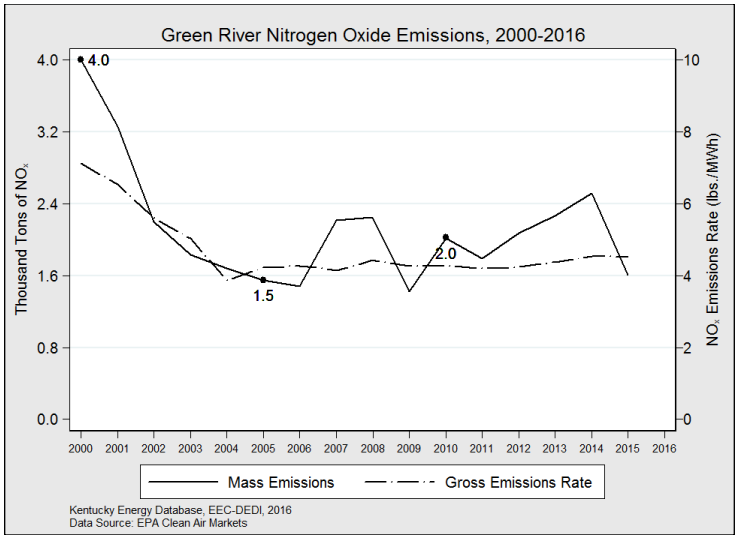


State	2009 Tons	Percentage
Total	318,193	100%
Western Kentucky	243,180	76%
Illinois	75,013	24%

Carbon Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	1,185,794	-16%
Rate (lbs./MWh)	2,135	-15%

The Green River Generating Station emitted 1.2 million tons of CO_2 in 2014, a decrease of 16% from 2000 levels. The rate of CO_2 emissions decreased by 15% during that period, but is the third highest of Kentucky power plants.





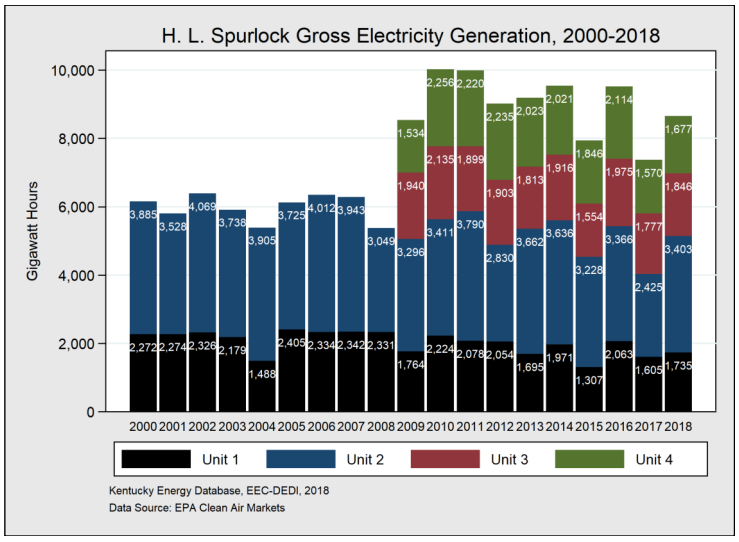
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	21,967	-6%
Rate (lbs./MWh)	39.55	-5%

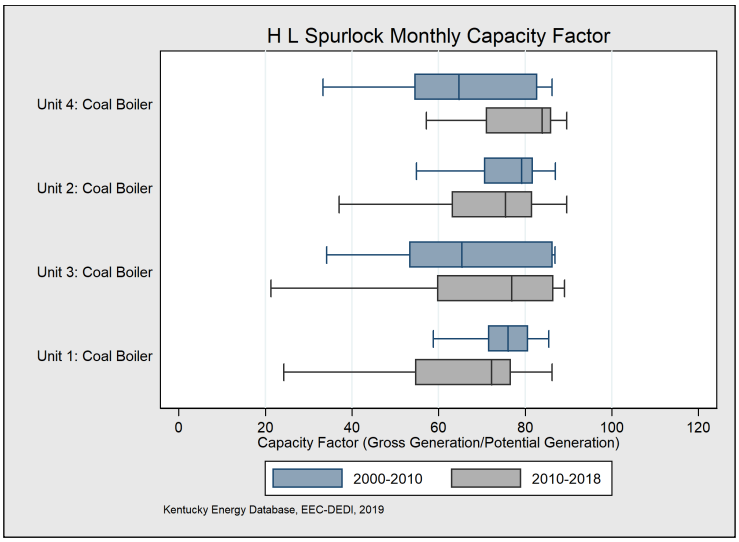
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	2,519	-37%
Rate (lbs./MWh)	4.54	-36%

The Green River Generating Station emitted 22 thousand tons of SO_2 in 2014, a decrease of six% since 2000. The rate of SO_2 emissions reduced by five% during that period, but is the second highest of Kentucky power plants.

The Green River Generating Station emitted 2,519 tons of NO_x in 2014, a reduction of 37% since 2000. The rate of NO_x emissions decreased by 36% during that period.

H. L. Spurlock Power Station



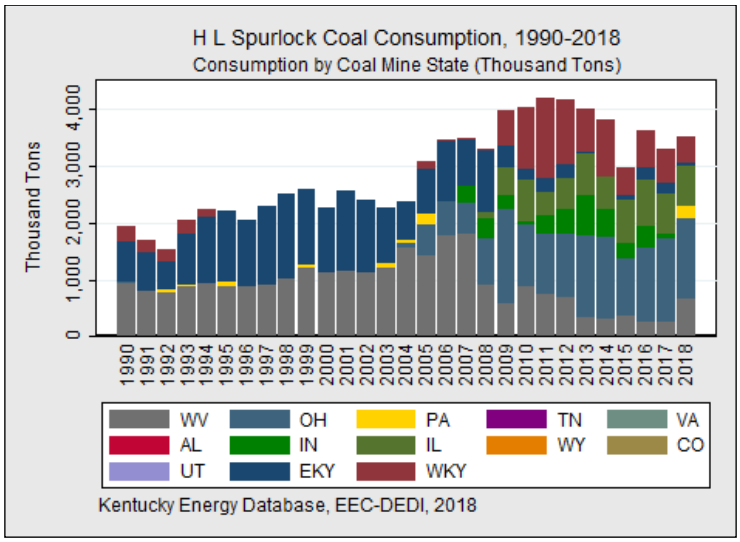


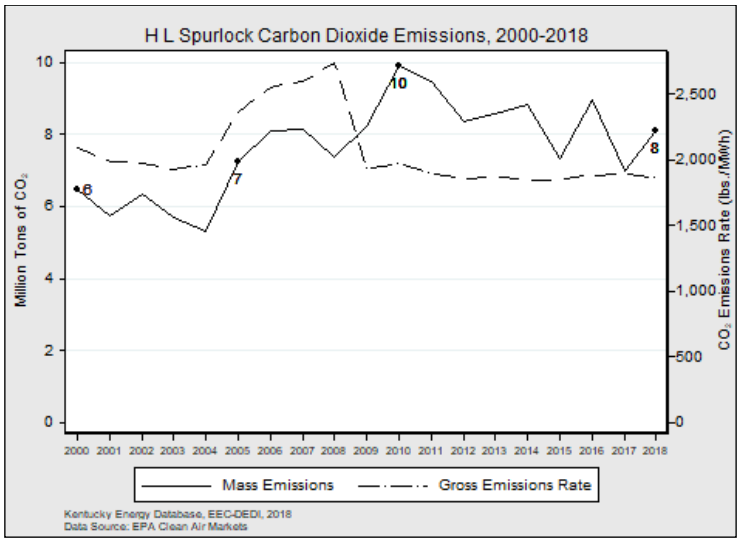
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1977**		**Coal**	**1,346**	**65%**	**8,661**	**7,772**	**1,871**	**0.86**	**0.73**
1	1977		Coal	300	59%	1,735	1,563	1,930	0.98	0.84
2	1981		Coal	510	70%	3,403	3,116	1,935	0.60	0.85
3	2005		Coal	268	70%	1,846	1,634	1,805	1.23	0.56
4	2008		Coal	268	62%	1,677	1,459	1,750	0.86	0.53

The H. L. Spurlock Power Station, located in Mason County, is 41 years old and consists of four coal-fired electricity generating units. The units came online in 1977, 1981, 2005, and 2009, respectively. Spurlock has a total nameplate capacity of 1,346 MW. In 2018, the plant generated 8.6 GWh of electricity and had a plant-wide capacity factor of 65%. To lower sulfur dioxide emissions, desulfurization scrubbers were installed on Unit 3 in 2004, on Unit 2 in 2008, and on Units 1 and 4 in 2009. Spurlock used a mix of coal from Ohio and Union counties in western Kentucky, and from the states of Indiana, Illinois, Ohio, and West Virginia in 2018. From the 1990s through the mid-2000s, Spurlock used a mix of mostly eastern Kentucky and West Virginia coal. Spurlock Power Station is owned and operated by East Kentucky Power Cooperative.

*2014

H. L. Spurlock Power Station

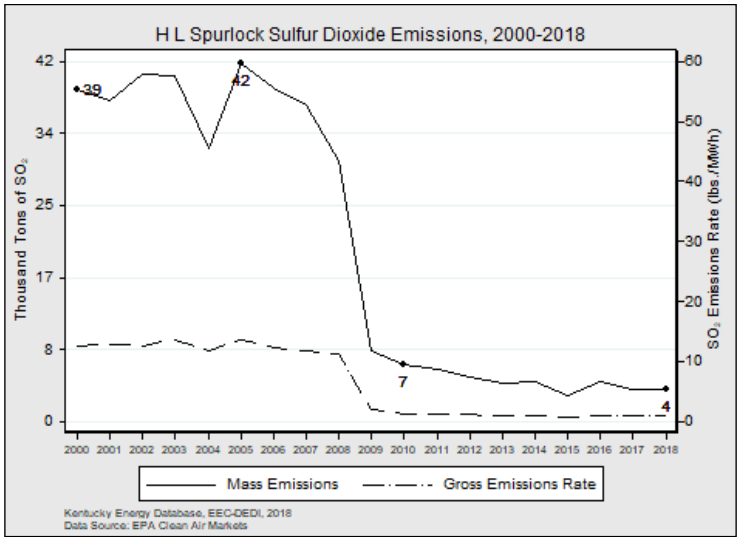


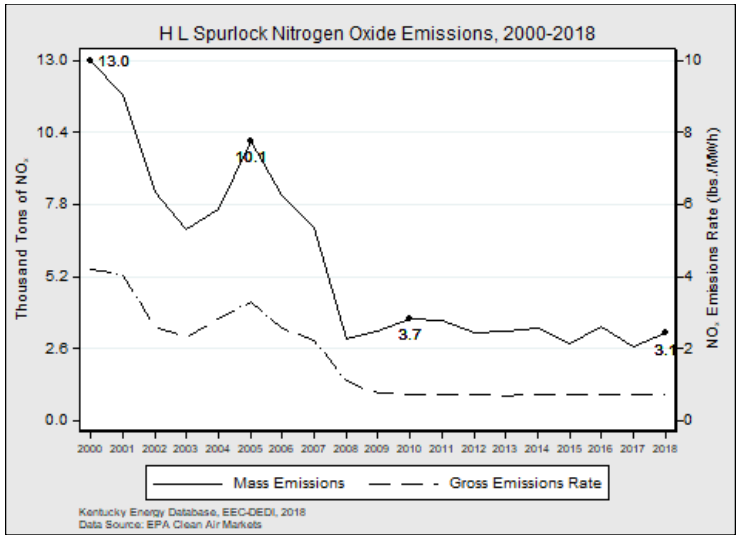


State	2018 Tons	Percentage
Total	3,811,444	100%
Ohio	1,432,105	38%
Western Kentucky	985,592	26%
Illinois	588,114	15%
Indiana	497,504	13%
West Virginia	308,129	8%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	8,100,655	-18%
Rate (lbs./MWh)	1,871	-5%

The H. L. Spurlock Power Station emitted 8.1 million tons of CO_2 in 2018, a decrease of 18% from 2010 levels. The rate of CO_2 emissions decreased by 5% during that period.





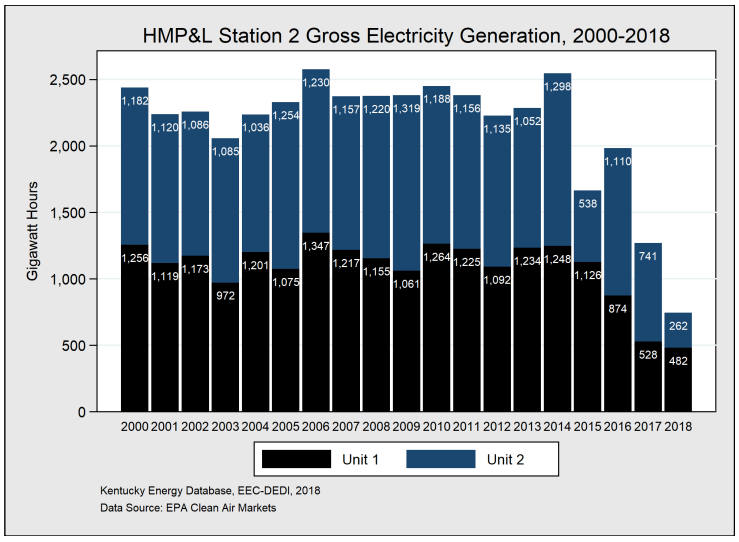
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,738	-43%
Rate (lbs./MWh)	0.86	-35%

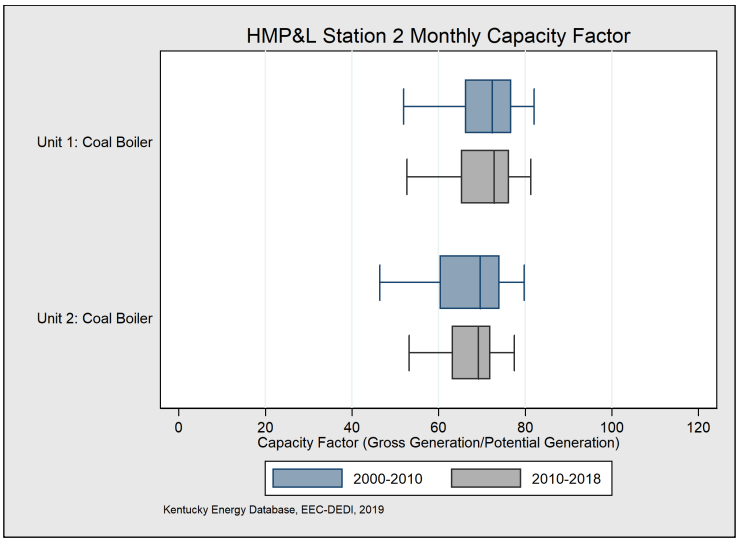
The H. L. Spurlock Power Station emitted 3,738 tons of SO_2 in 2018, a decrease of 43% since 2010. The rate of SO_2 emissions reduced by 35% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,143	-15%
Rate (lbs./MWh)	0.73	-1%

The H. L. Spurlock Power Station emitted 3,143 tons of NO_x in 2018, a reduction of 15% since 2010. The rate of NO_x emissions decreased by 1% during that period.

Henderson Station



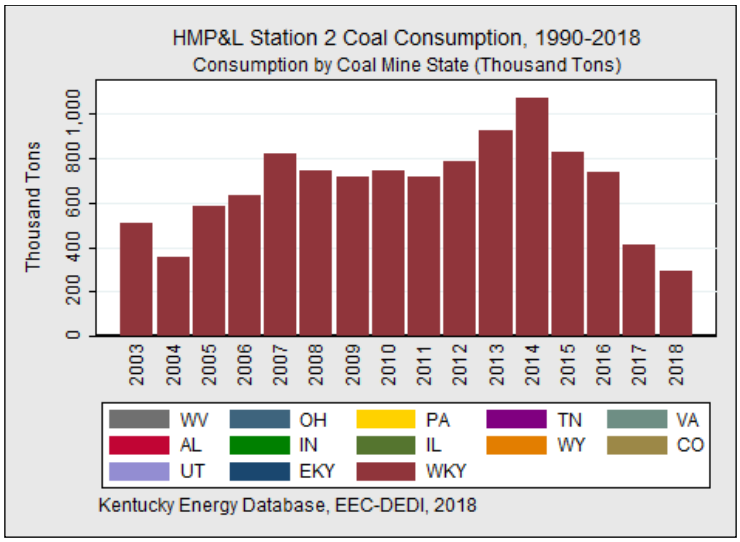


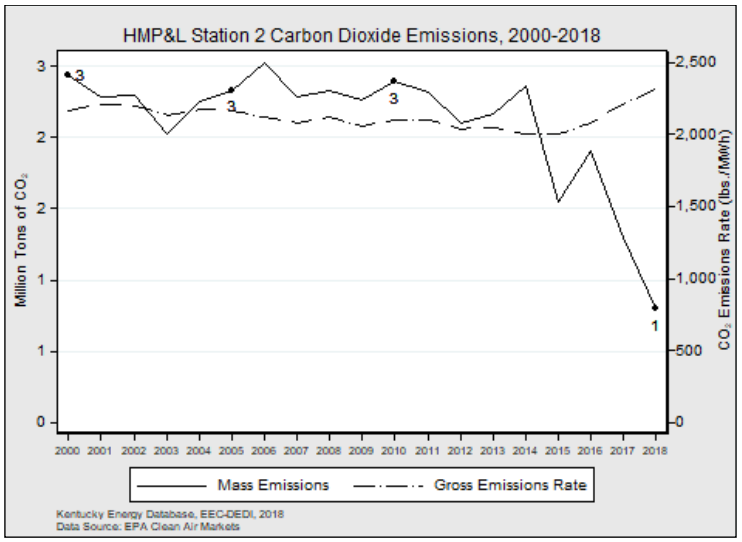
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1973**		**Coal**	**405**	**21%**	**744**	**649**	**2,311**	**2.28**	**1.97**
1	1973	2019	Coal	200	28%	482	426	2,325	1.76	1.80
2	1974	2019	Coal	205	15%	262	223	2,287	3.23	2.29

Henderson Municipal Power and Light (HMP&L) Station 2, located in Webster County, is 45 years old, and consists of two coal-fired electricity generating units. The plant is owned by Henderson Municipal Power & Light, is operated by Big Rivers Election Corporation, and its units came online in 1973 and 1974, respectively. The plant has a total nameplate capacity of 405 MW. In 2018, the plant generated 0.7 GWh of electricity and had a plant -wide capacity factor of 21%. HMP&L used only coal from western Kentucky in 2018. HMP&L ceased operations in 2019.

*2018

Henderson Station

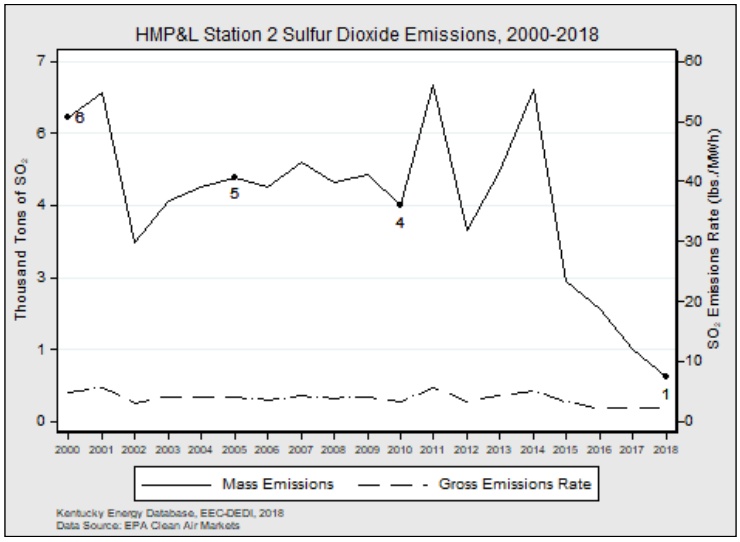


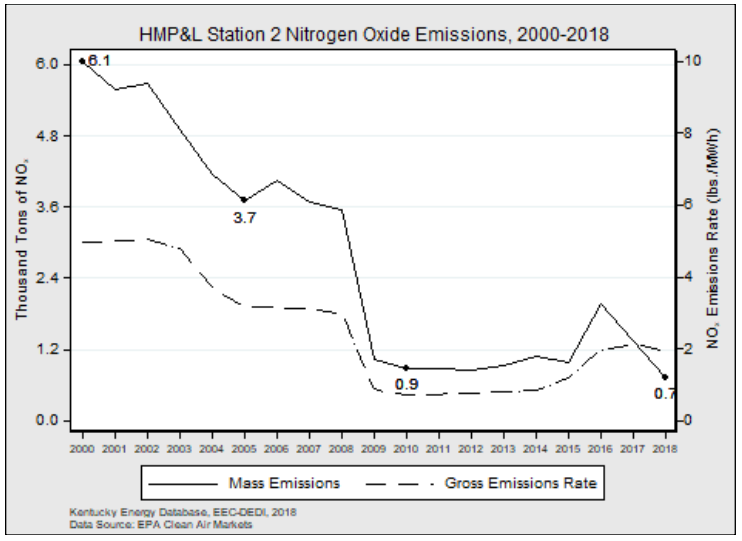


State	2018 Tons	Percentage
Total	1,070,604	100%
Western Kentucky	1,070,604	100%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	860,180	-67%
Rate (lbs./MWh)	2,311	+10%

Henderson Station emitted 860 thousand tons of CO_2 in 2018, a decrease of 67% from 2010 levels. The rate of CO_2 emissions increased by 10% during that period.





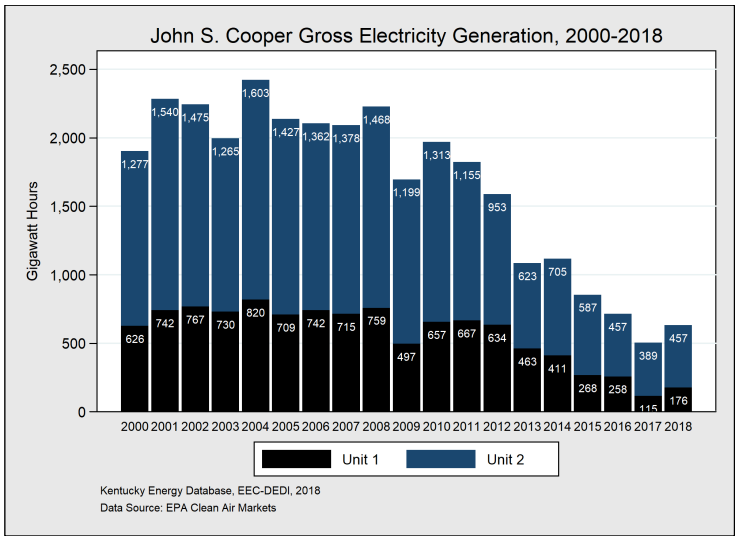
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	847	-80%
Rate (lbs./MWh)	2.28	-33%

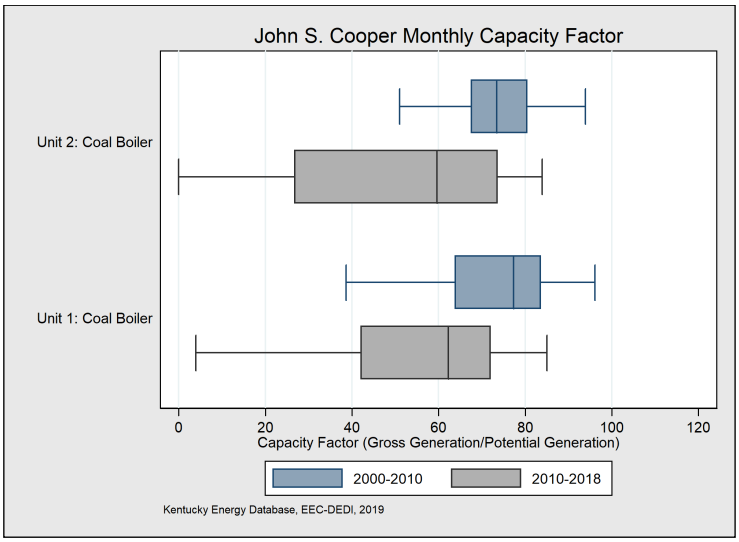
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	733	-17%
Rate (lbs./MWh)	1.97	+175%

Henderson Station emitted 847 tons of SO_2 in 2018, a decrease of 80% since 2010. The rate of SO_2 emissions decreased by 33% during that period.

Henderson Station emitted 733 tons of NO_x in 2018, a reduction of 17% since 2010. The rate of NO_x emissions decreased by 175% during that period.

John S. Cooper Power Station



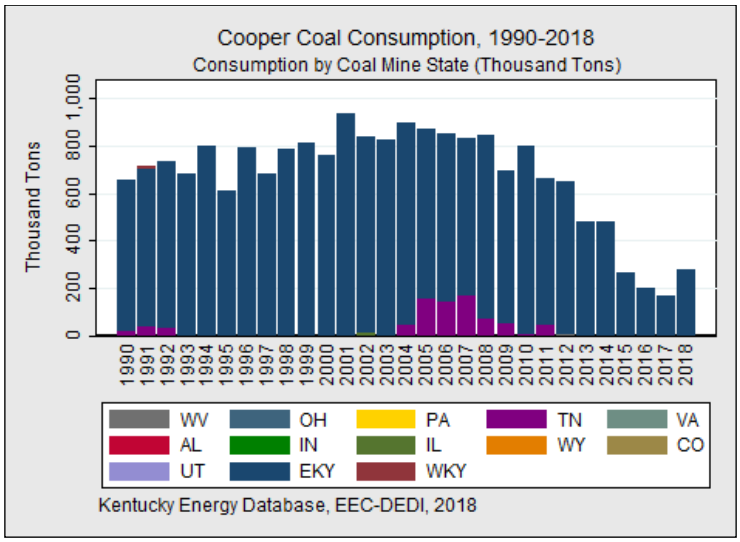


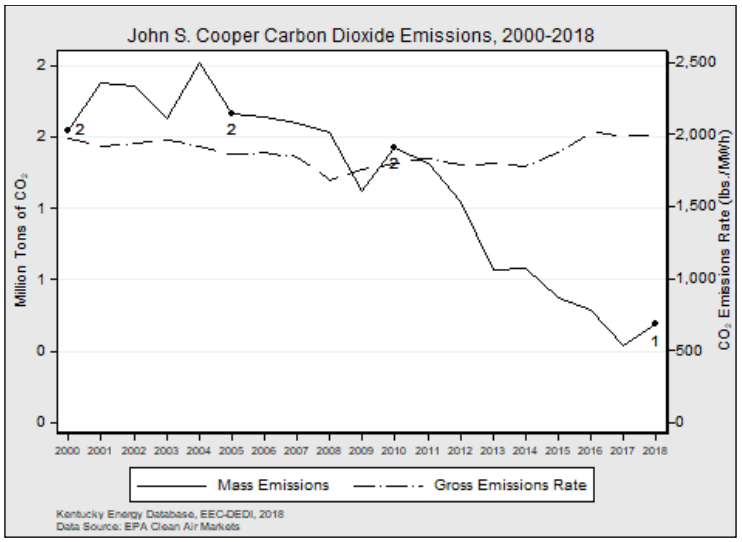
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1965**		**Coal**	**341**	**18%**	**633**	**562**	**1,990**	**0.47**	**1.39**
1	1965		Coal	116	16%	176	163	2,010	0.67	1.88
2	1969		Coal	225	20%	457	399	1,983	0.39	1.20

The John Sherman Cooper Power Station, located in Pulaski County, is 53 years old and consists of two coal-fired electricity generating units. The units came online in 1965 and 1969, respectively. The plant has a total nameplate capacity of 341 MW. In 2018, the plant generated 0.6 GWh of electricity and had a plant-wide capacity factor of 18%. A scrubber was installed on Unit 2 in 2012 to lower sulfur dioxide emissions and a baghouse. Cooper sourced all of its coal from eastern Kentucky in 2018 from Eastern Kentucky. John S. Cooper Power Station is owned and operated by East Kentucky Power Cooperative.

*2018

John S. Cooper Power Station

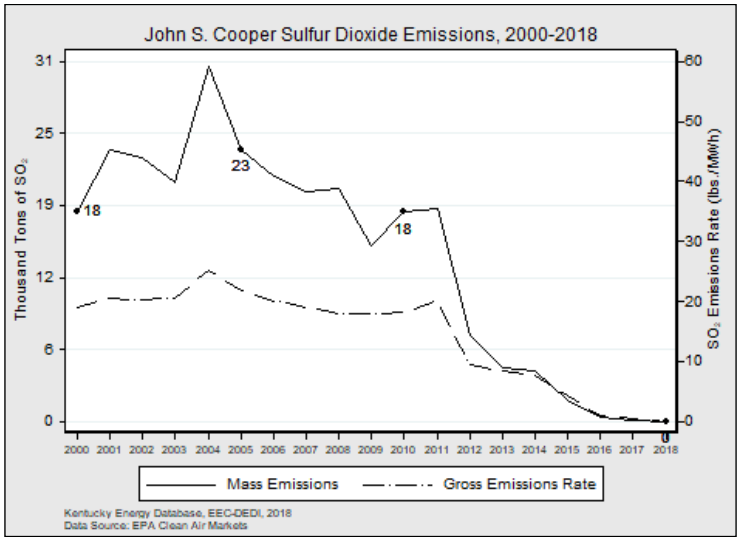


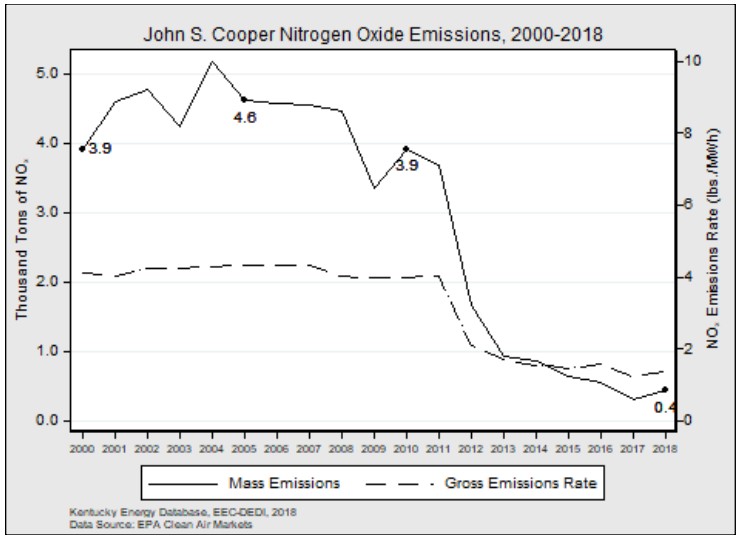


State	2016 Tons	Percentage
Total	477,513	100%
Eastern Kentucky	477,513	100%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	630,193	-64%
Rate (lbs./MWh)	1,990	+11%

The John S. Cooper Power Station emitted 630 thousand tons of CO_2 in 2018, a decrease of 64% from 2010 levels. The rate of CO_2 emissions increased by 11% during that period.





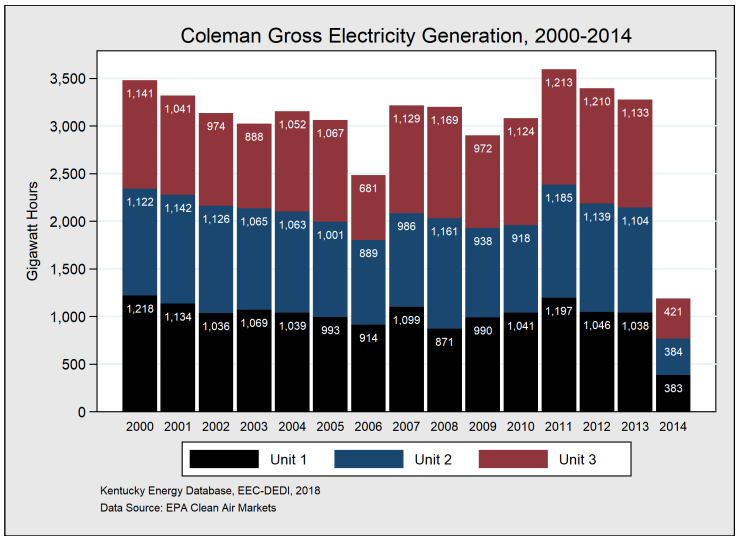
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	148	-99%
Rate (lbs./MWh)	0.47	-97%

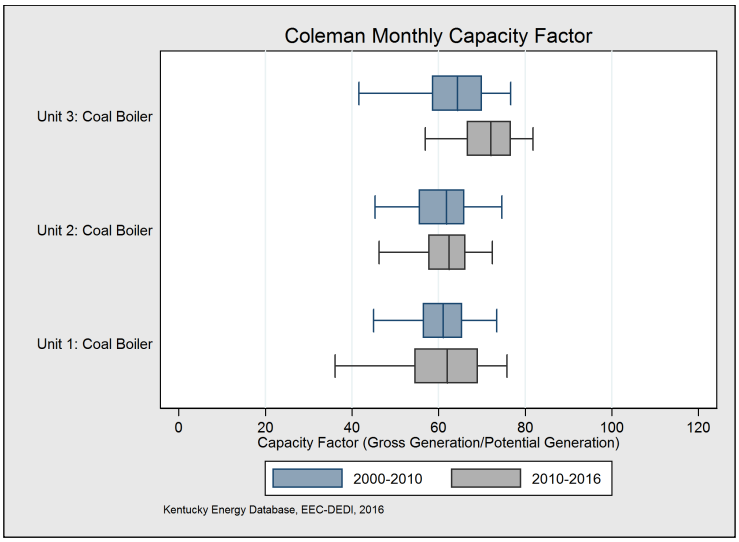
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	439	-89%
Rate (lbs./MWh)	1.39	-65%

The John S. Cooper Power Station emitted 148 tons of SO_2 in 2018, a decrease of 99% since 2010. The rate of SO_2 emissions reduced by 97% during that period.

The John S. Cooper Power Station emitted 439 tons of NO_x in 2018, a reduction of 89% since 2010. The rate of NO_x emissions decreased by 65% during that period.

Kenneth C. Coleman Station



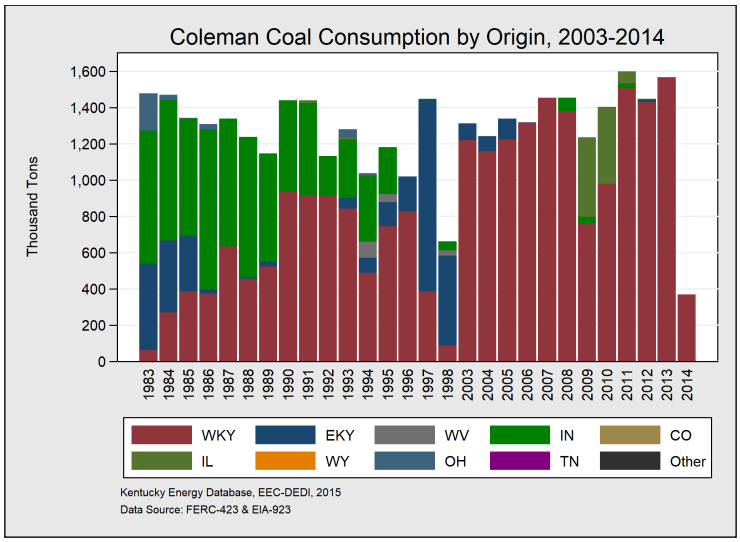


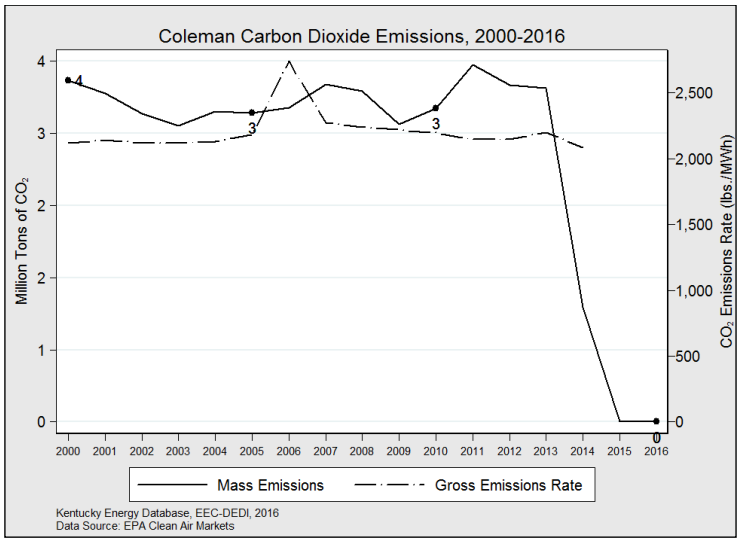
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1969**	**Idled**	**Coal**	**602**	**23%**	**1,188**	**1,065**	**2,086**	**1.56**	**3.62**
1	1969	Idled	Coal	205	21%	383	349	2,080	1.50	3.58
2	1970	Idled	Coal	205	21%	384	328	2,074	1.58	3.61
3	1971	Idled	Coal	192	25%	421	388	2,103	1.58	3.68

Kenneth C. Coleman Station, located in Hawesville in Hancock County consisted of three coal-fired electricity generating units. The plant was owned by Big Rivers Electric Corporation and its units came online in 1969, 1970, and 1971, respectively. Coleman has not produced electricity since May 2014. The plant has a total nameplate capacity of 602 MW. In 2014, the plant generated 1.2 GWh of electricity and had a plant-wide capacity factor of 23%. Coleman had upgrades to control the release of pollutants in 2005, which greatly reduced plant-wide emissions of sulfur dioxide. The plant exclusively used coal from Muhlenberg, Union, and Webster counties in western Kentucky in 2014, and was the major source of its coal for the past decade.

*2014

Kenneth C. Coleman Station

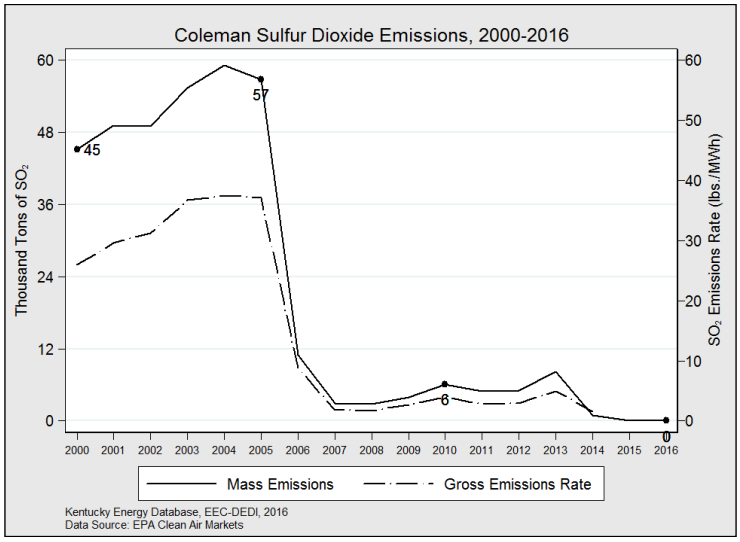


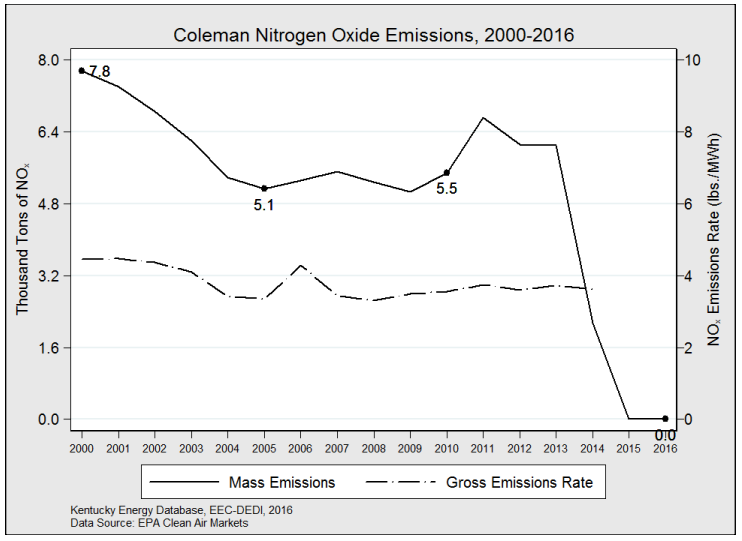


State	2014 Tons	Percentage
Total	369,730	100%
Western Kentucky	369,730	100%

Carbon Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	1,238,322	-66%
Rate (lbs./MWh)	2,086	-2%

The Kenneth C. Coleman Station emitted 1.2 million tons of CO_2 in 2014, a decrease of 66% from 2000 levels. The rate of CO_2 emissions decreased by 2% over the same period.





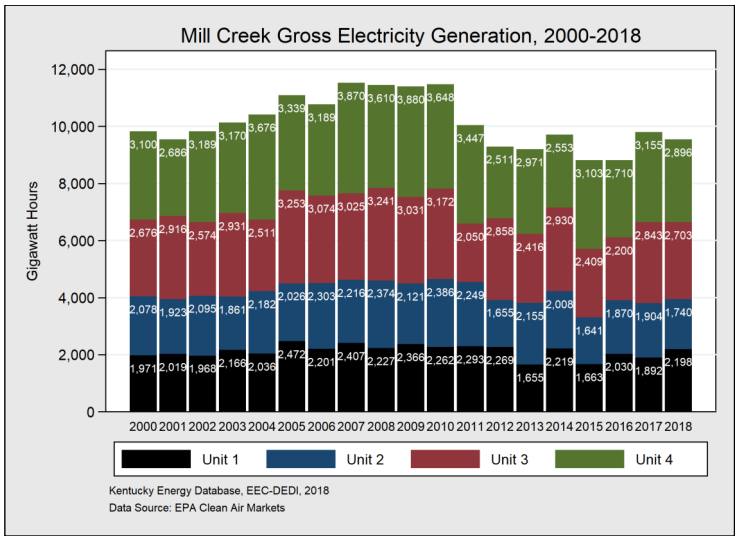
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	923	-98%
Rate (lbs./MWh)	1.56	-94%

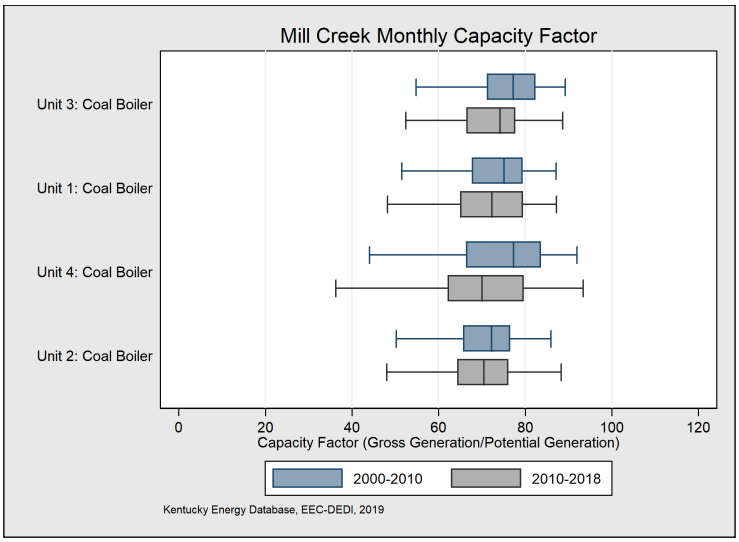
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	2,152	-72%
Rate (lbs./MWh)	3.62	-19%

The Kenneth C. Coleman Station emitted 923 tons of SO_2 in 2014, a decrease of 98% since 2000. The rate of SO_2 emissions decreased by 81% during that period.

The Kenneth C. Coleman Station emitted 2,152 tons of NO_x in 2014, a reduction of 72% since 2000. The rate of NO_x emissions decreased by 19% during that period.

Mill Creek Generating Station



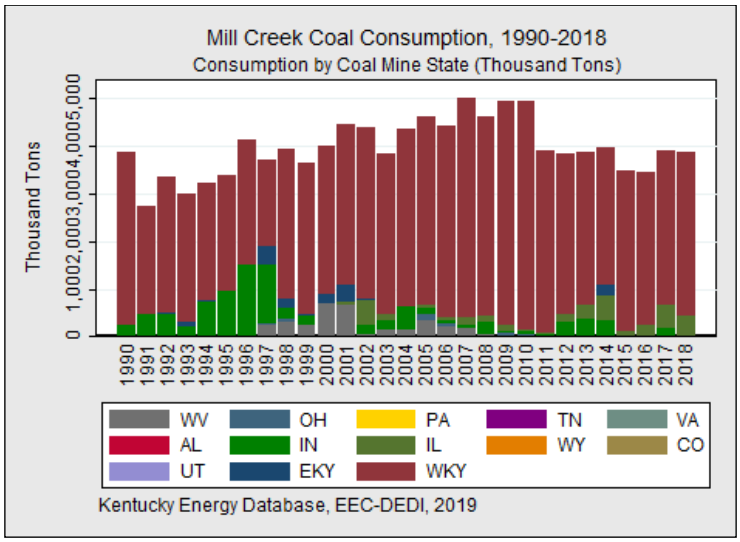


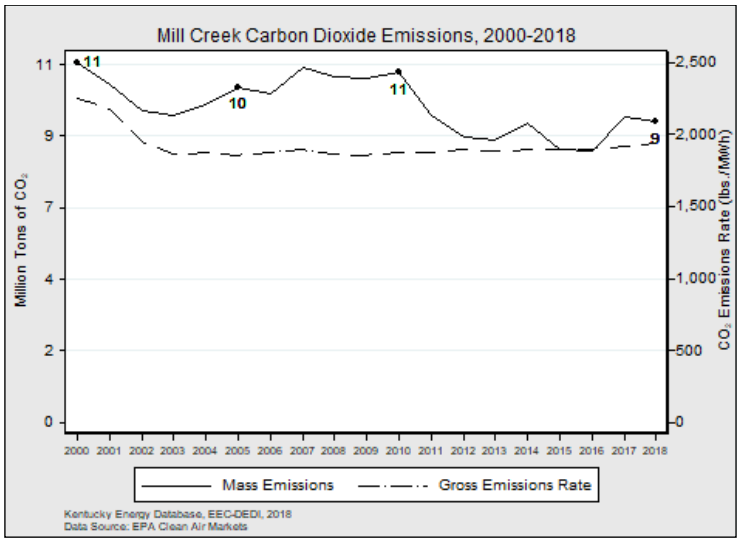
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1972**		**Coal**	**1,472**	**67%**	**9,537**	**8,640**	**1,940**	**0.79**	**1.67**
1	1972		Coal	303	74%	2,198	1,956	1,851	0.62	2.72
2	1974		Coal	301	59%	1,740	1,545	1,854	0.66	2.74
3	1978		Coal	391	71%	2,703	2,467	1,986	0.53	1.02
4	1982		Coal	477	63%	2,896	2,673	2,018	1.23	0.83

The Mill Creek Generating Station, located in Jefferson County, is 46 years old and consists of four coal-fired electricity generating units. The units came online in 1972, 1974, 1978, and 1982, respectively and are owned by Louisville Gas & Electric. The plant has a total nameplate capacity of 1,472 MW and is the third-largest power plant in Kentucky by capacity. In 2018, Mill Creek had a plant-wide capacity factor of 67% and generated 9.5 GWh of electricity. The majority of Mill Creek's coal came from western Kentucky in 2018.

*2014

Mill Creek Generating Station

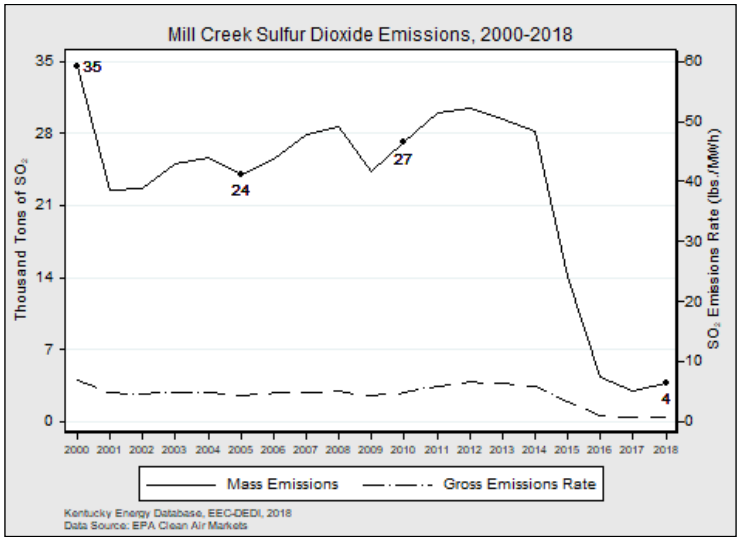


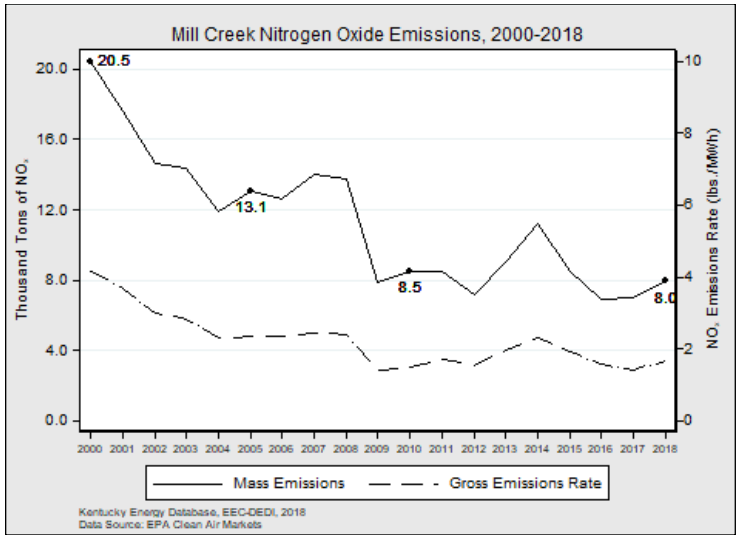


State	2018 Tons	Percentage
Total	3,954,399	100%
Western Kentucky	3,095,324	78%
Indiana	522,728	13%
Illinois	333,227	8%
Eastern Kentucky	3,120	0%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	9,253,662	-14%
Rate (lbs./MWh)	1,940	+3%

The Mill Creek Generating Station emitted 9.2 million tons of CO_2 in 2018, a decrease of 14% from 2010 levels. The rate of CO_2 emissions increased by 3% during that period.





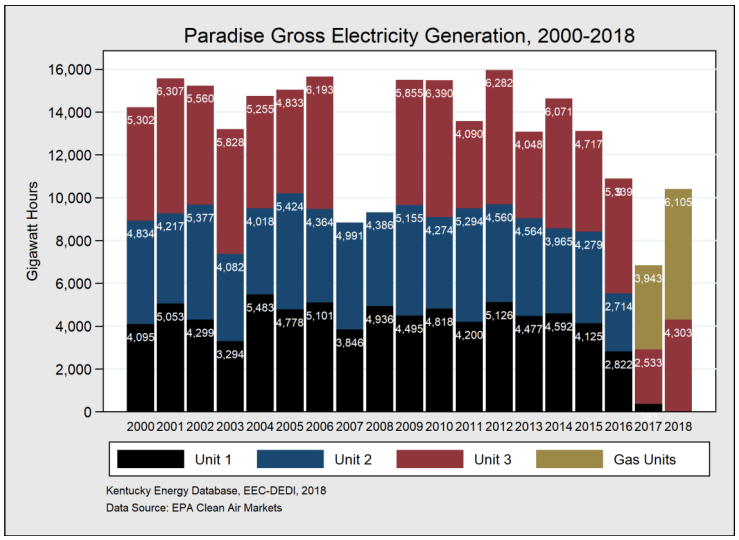
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,752	-86%
Rate (lbs./MWh)	0.79	-83%

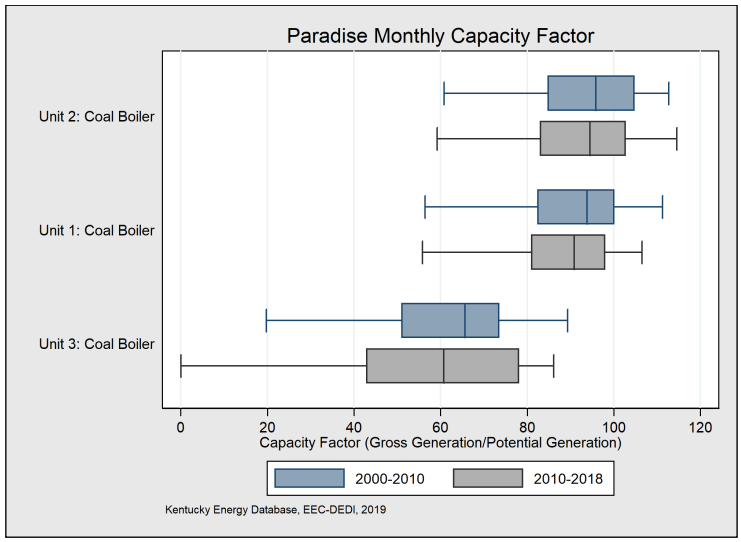
The Mill Creek Generating Station emitted 3,752 tons of SO_2 in 2018, a decrease of 86% since 2010. The rate of SO_2 emissions reduced by 83% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	7,955	-6%
Rate (lbs./MWh)	1.67	+12%

The Mill Creek Generating Station emitted 7,955 tons of NO_x in 2018, a reduction of 6% since 2010. The rate of NO_x emissions increased by 12% during that period.

Paradise Fossil Plant



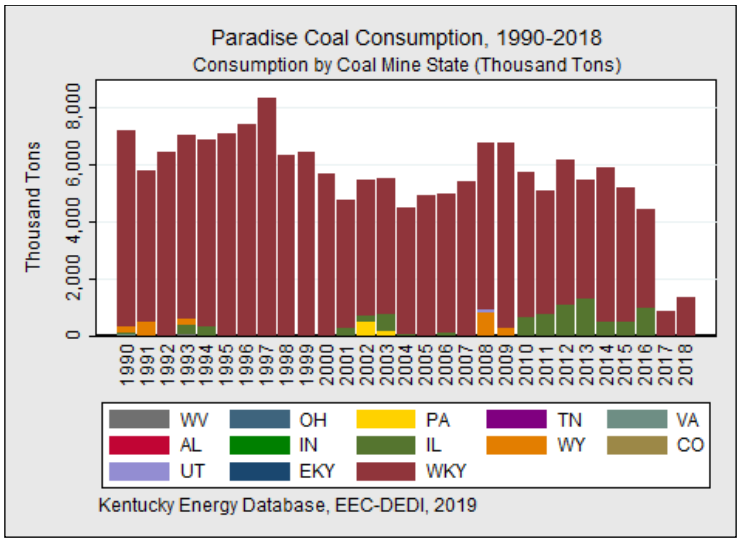


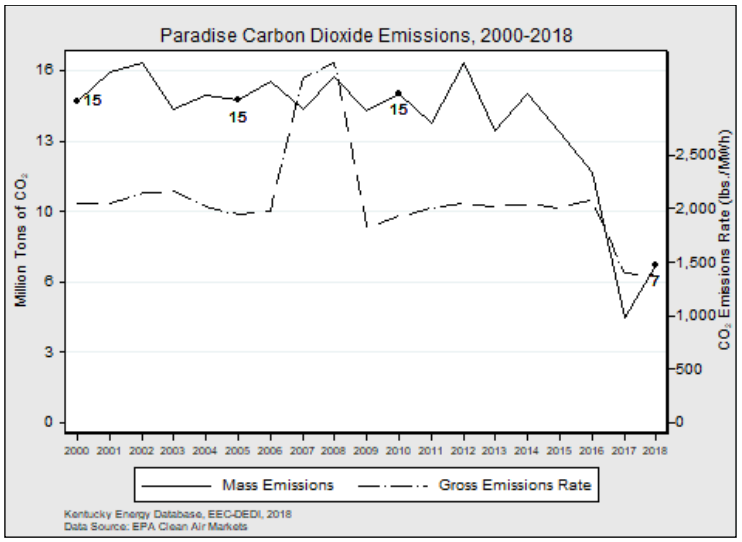
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1963**		**Coal**	**2,131**	**56%**	**10,408**	**9,702**	**1,377**	**0.49**	**0.95**
1	1963	2017	Coal	628	-	-	-	-	-	-
2	1963	2017	Coal	602	-	-	-	-	-	-
3	1970	2020	Coal	971	43%	4,303	3,823	2,191	1.18	2.00
CTG1			Natural Gas	231	67%	2,116	1,357	805	0.004	0.27
CTG2			Natural Gas	231	66%	2,079	1,334	803	0.004	0.21
CTG3			Natural Gas	231	56%	1,911	1,131	802	0.004	0.22
STG1			Natural Gas	467	50%		2,058	16.90	-	0.01

The Paradise Fossil Plant, located in Muhlenberg County on the former site of Paradise, Kentucky, is 55 years old and consisted of three coal-fired electricity generating units. The plant is owned by the Tennessee Valley Authority and its units came online in 1963, 1963, and 1970, respectively. The plant has a total nameplate capacity of 2,201 MW. In 2018, the plant had a plant-wide capacity factor of 56% and generated 10.4 GWh of electricity, more than any power plant in Kentucky. Units 1 and 2 at Paradise retired in 2017 and a natural gas combined-cycle plant was built with a total capacity of 1,160 MW. Unit 3 is scheduled to retire in 2020.

*2018

Paradise Fossil Plant

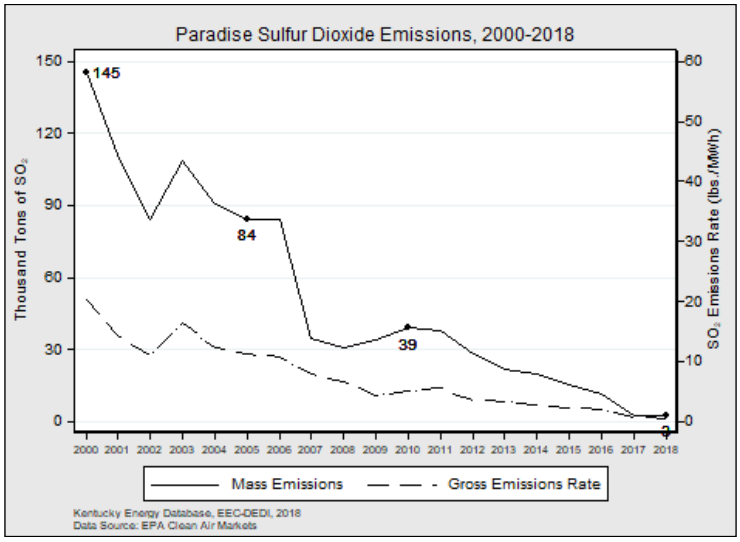


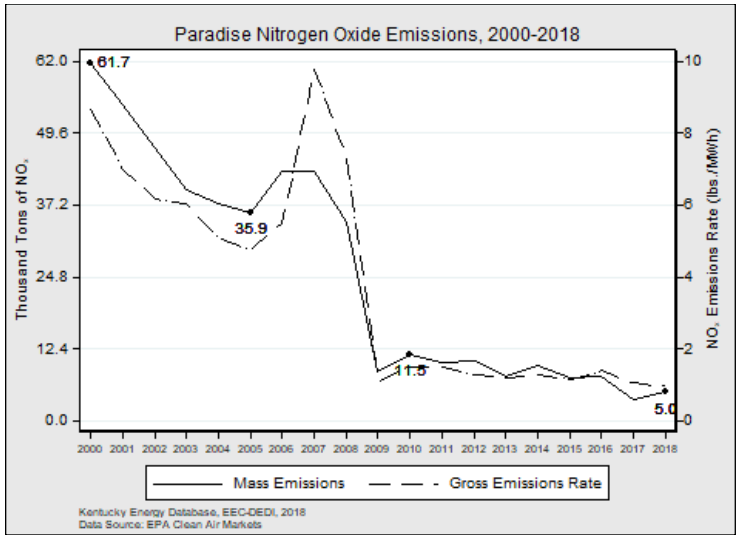


State	2018 Tons	Percentage
Total	5,915,433	100%
Western Kentucky	5,414,270	92%
Illinois	501,163	8%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	7,168,254	-52%
Rate (lbs./MWh)	1,377	-29%

The Paradise Fossil Plant emitted 7.1 million tons of CO_2 in 2018, a decrease of 52% from 2010 levels. The rate of CO_2 emissions decreased 29% from the year 2010.





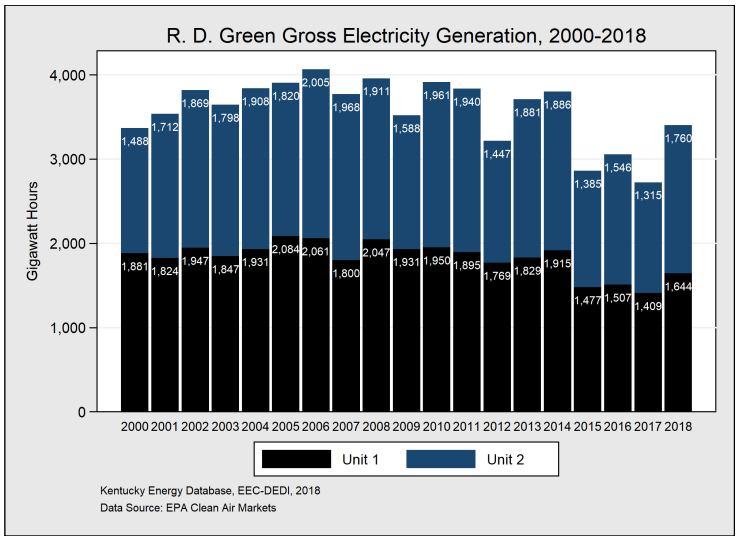
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,551	-93%
Rate (lbs./MWh)	0.49	-90%

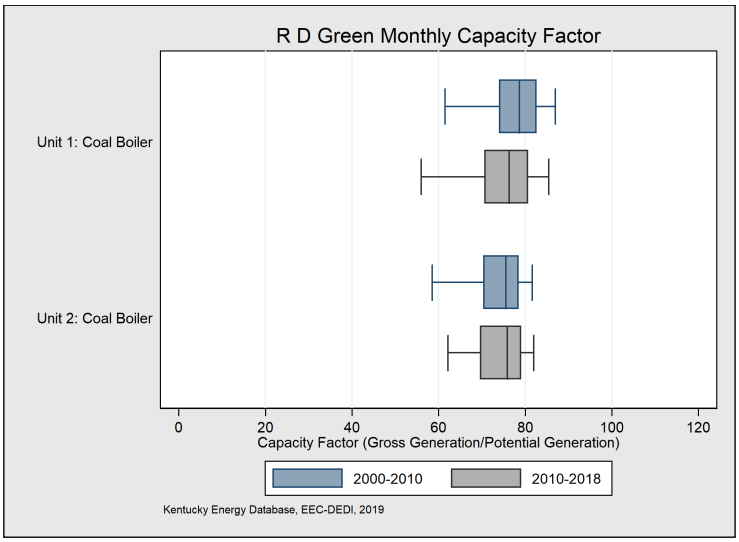
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	4,956	-57%
Rate (lbs./MWh)	0.95	-36%

The Paradise Fossil Plant emitted 2,551tons of SO_2 in 2018, a decrease of 93% since 2010. The rate of SO_2 emissions reduced by 90% during that period.

The Paradise Fossil Plant emitted 4,956 tons of NO_x in 2018, a reduction of 57% since 2010. The rate of NO_x emissions decreased by 36% during that period.

R. D. Green Station



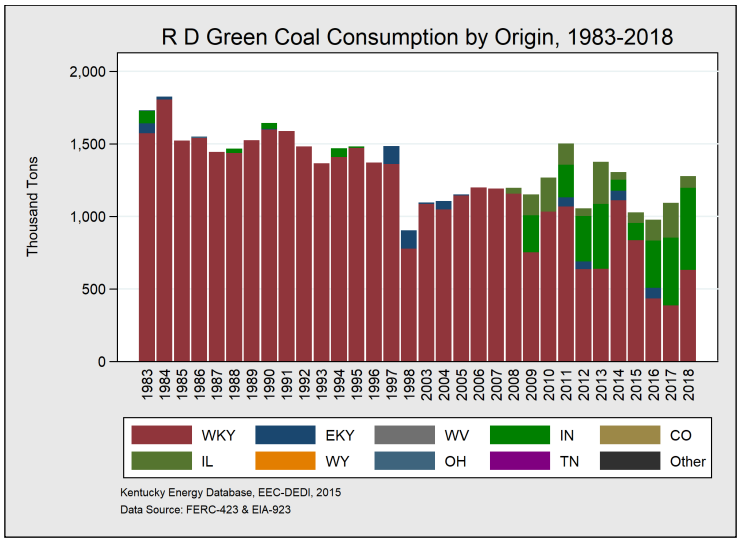


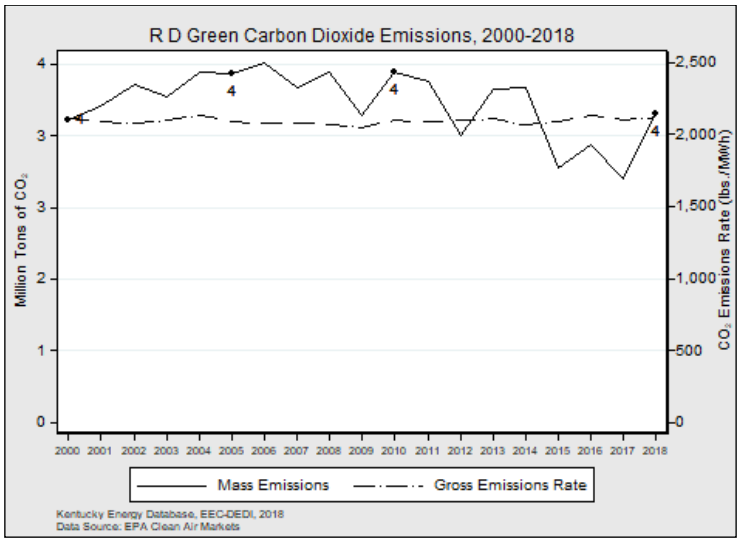
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1979**		**Coal**	**586**	**77%**	**3,404**	**3,059**	**2,118**	**2.42**	**2.01**
1	1979		Coal	293	73%	1,644	1,476	2,058	3.27	1.80
2	1981		Coal	293	81%	1,760	1,583	2,175	1.62	2.21

The R. D. Green Station, located in Webster County, is 39 years old and consists of two coal-fired electricity generating units. The units came online in 1979 and 1981, respectively. The plant is owned by Big Rivers Electric Corporation and has a total nameplate capacity of 586 MW. In 2018, the plant generated 3.4 GWh of electricity and had a plant-wide capacity factor of 77%. Most of the plant's coal came from western Kentucky.

*2018

R. D. Green Station

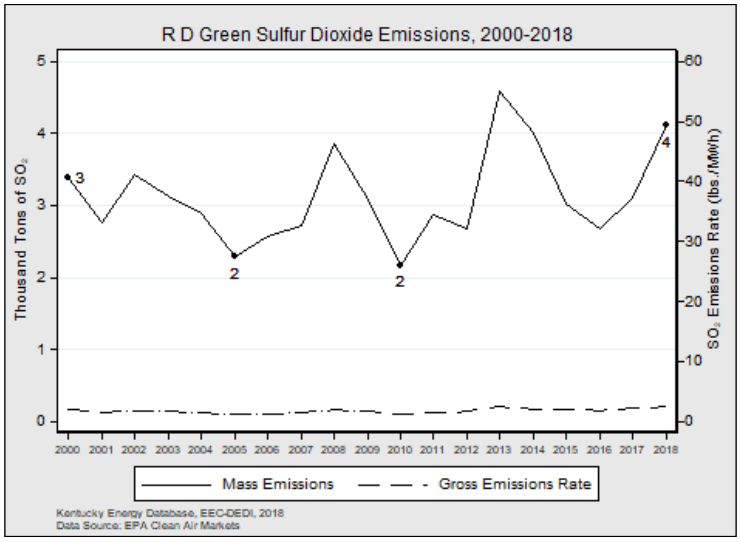


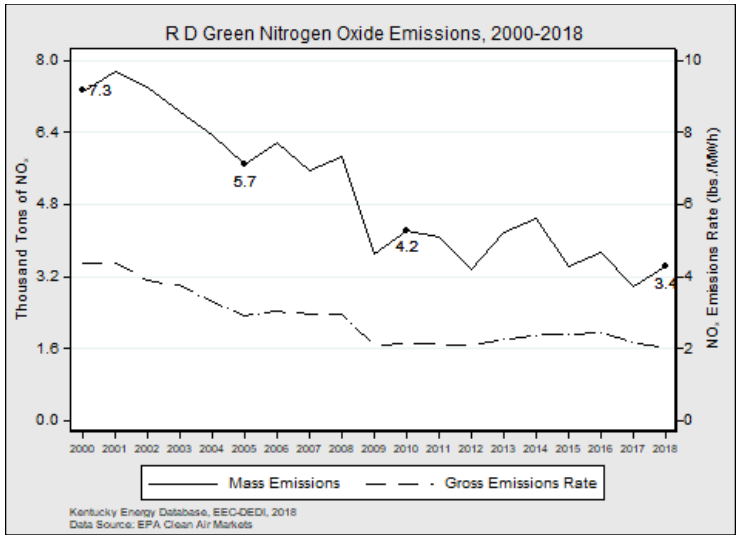


State	2018 Tons	Percentage
Total	1,303,820	100%
Western Kentucky	1,161,670	89%
Indiana	76,380	6%
Illinois	51,238	4%
Eastern Kentucky	14,532	1%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,605,891	-12%
Rate (lbs./MWh)	2,118	+1%

The R.D. Green Station emitted 3.6 million tons of CO_2 in 2018, a decrease of 12% from 2010 levels. The rate of CO_2 emissions increased 1% during that period.





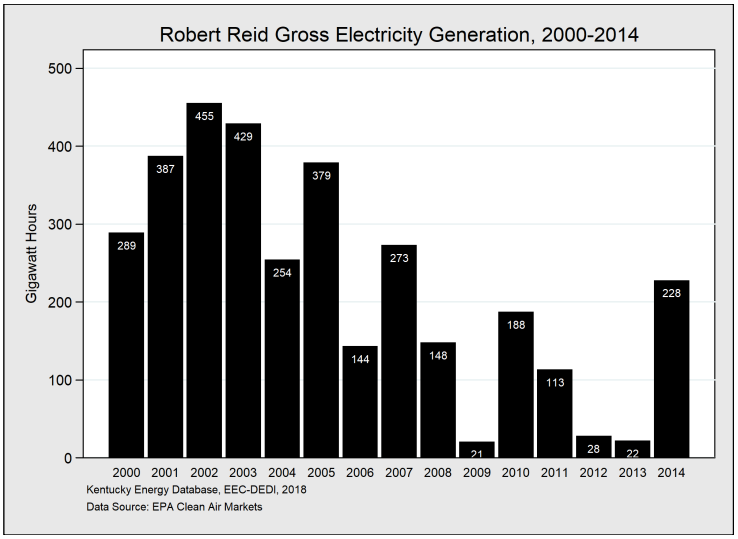
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	4,114	+90%
Rate (lbs./MWh)	2.42	+118%

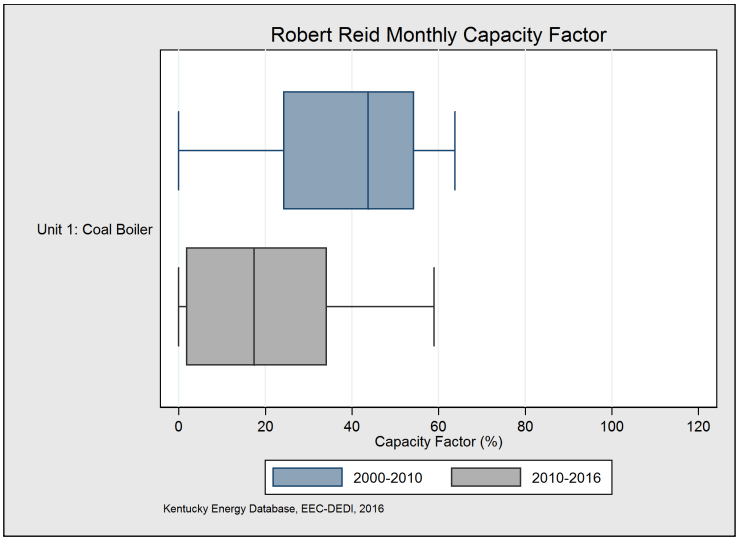
The R.D. Green Station emitted 4,114 tons of SO_2 in 2018, an increase of 90% since 2010. The rate of SO_2 emissions increased by 118% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,421	-19%
Rate (lbs./MWh)	2.01	-7%

The R.D. Green Station emitted 3,421 tons of NO_x in 2018, a reduction of 19% since 2010. The rate of NO_x emissions decreased by 7% during that period.

Robert Reid Power Plant



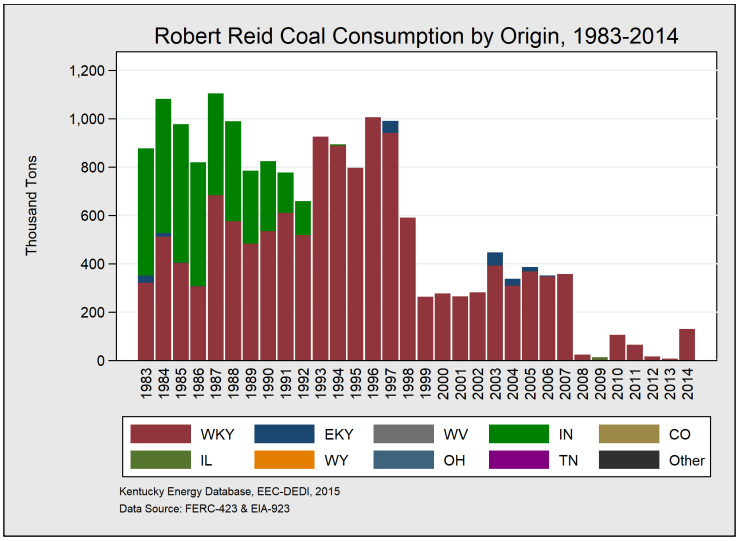


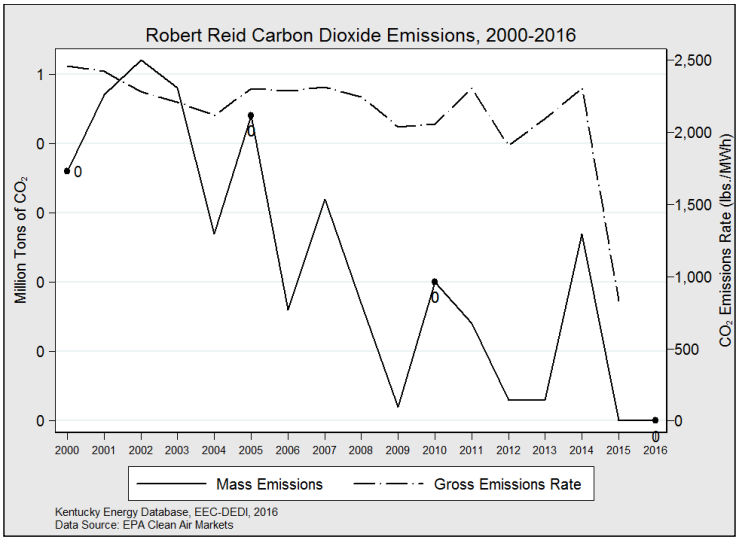
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1966**	**2017**	**Coal**	**96**	**27%**	**228**		**2,327**	**50.37**	**4.72**
1	1966	2017	Coal	96	27%	228		2,327	50.37	4.72

The Robert Reid Power Plant, located in Webster County, is 49 years old and consists of one coal-fired electricity generating unit. The unit came online in 1966, has a nameplate capacity of 96 MW, and is the original generating unit for Big Rivers Electricity Corporation. In 2014, the plant generated 228 GWh of electricity, down from around 455 GWh in 2005. This decline in generation is consistent with announced retirements for the coal units at Robert Reid in 2017. Robert Reid's plant-wide capacity in 2014 was only 27%.

*2014

Robert Reid Power Plant

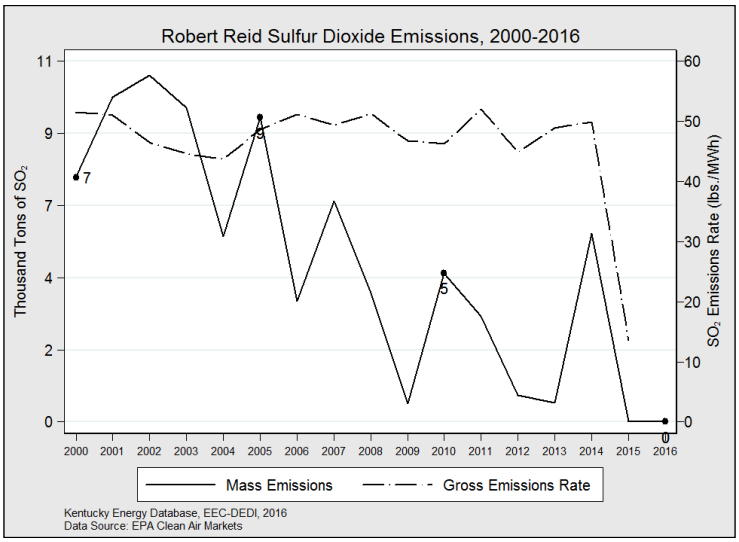


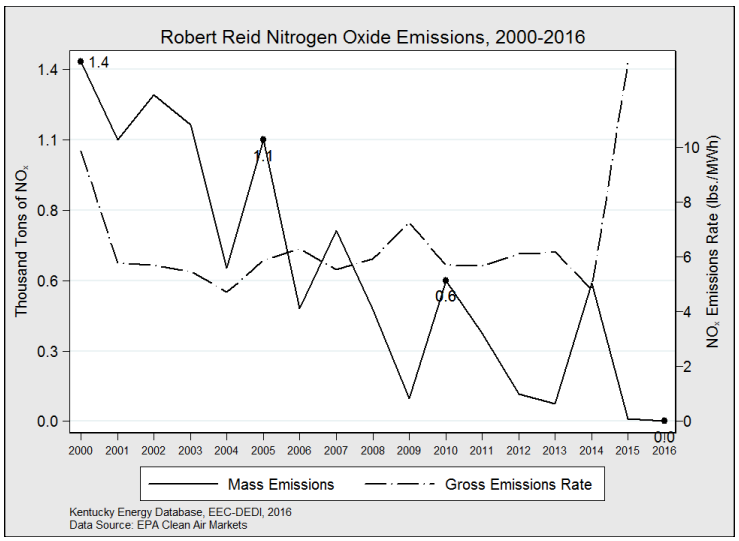


State	2014 Tons	Percentage
Total	12,643	100%
Illinois	9,664	76%
Western Kentucky	2,979	24%

Carbon Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	265,232	-25%
Rate (lbs./MWh)	2,327	-5%

The Robert Reid Power Plant emitted 265 thousand tons of CO_2 in 2014, a decrease of 25% from 2000 levels. The rate of CO_2 emissions decreased by five% during that period, but remains the highest of operating Kentucky power plants.





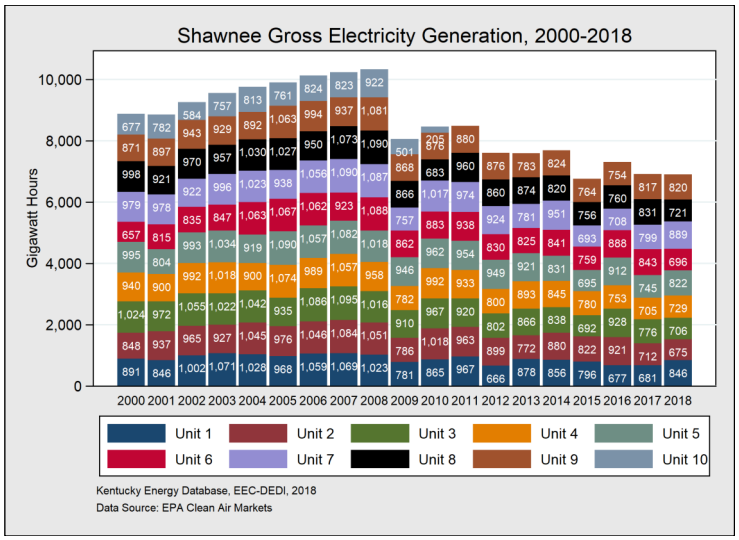
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	5,742	-23%
Rate (lbs./MWh)	50.37	-2%

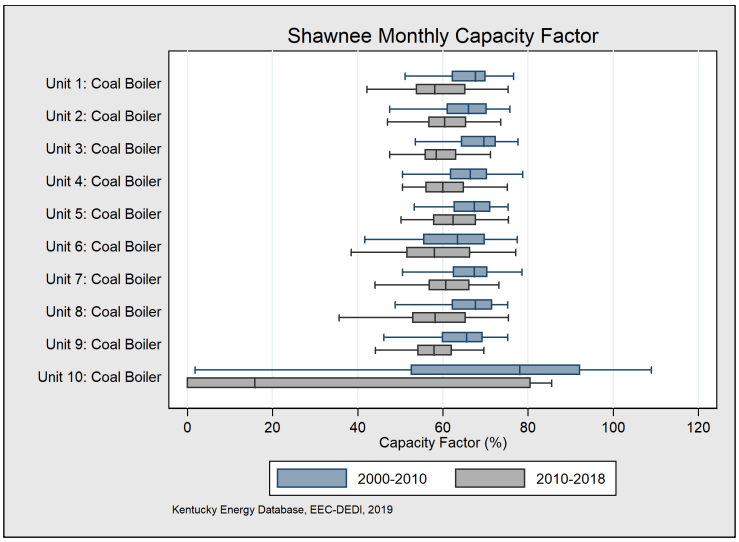
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	539	-62%
Rate (lbs./MWh)	4.72	-52%

The Robert Reid Power Plant emitted 5,742 tons of SO_2 in 2014, a decrease of 23% since 2000. The rate of SO_2 emissions reduced by two% during that period. Robert Reid has the highest rate of SO_2 emissions in the Commonwealth.

The Robert Reid Power Plant emitted 539 tons of NO_x in 2014, a reduction of 62% since 2000. The rate of NO_x emissions decreased by 52% during that period, though Robert Reid has the highest rate of NO_x emissions in Kentucky.

Shawnee Fossil Plant



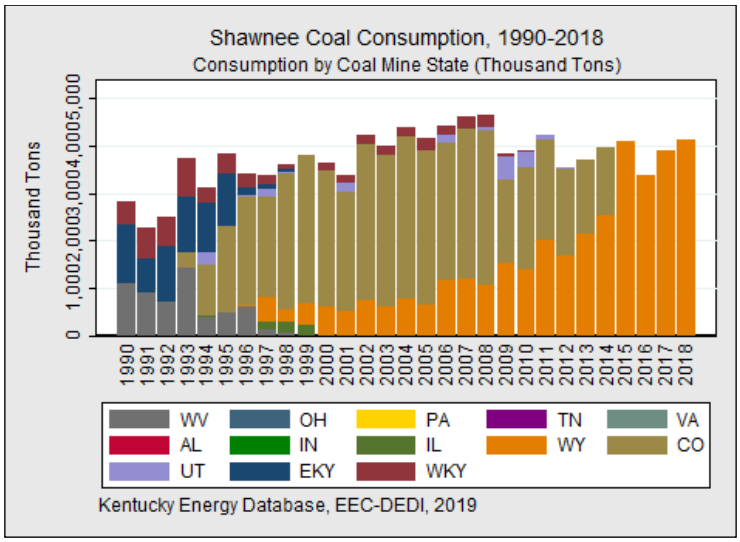


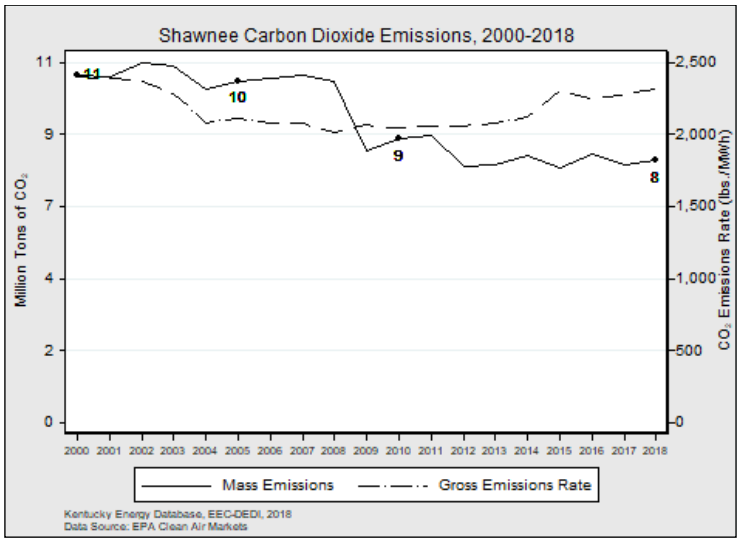
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1953**		**Coal**	**1,206**	**58%**	**6,903**	**6,285**	**2,316**	**4.39**	**2.38**
1	1953		Coal	134	63%	846	765	2,352	3.27	1.92
2	1956		Coal	134	51%	675	610	2,347	3.64	2.10
3	1953		Coal	134	53%	706	646	2,361	3.65	2.12
4	1953		Coal	134	54%	729	658	2,359	3.28	1.96
5	1954		Coal	134	62%	822	751	2,361	3.55	2.08
6	1954		Coal	134	53%	696	638	2,264	5.41	2.86
7	1954		Coal	134	67%	889	816	2,270	5.51	2.79
8	1954		Coal	134	54%	721	652	2,270	5.57	2.78
9	1955		Coal	134	62%	820	749	2,267	5.51	2.80
10	1955	2010	Coal	124						

The Shawnee Fossil Plant, located in McCracken County, is 65 years old and consists of 10 coal-fired electricity generating units, though Unit 10 has not been used since August 2010. The plant is owned by the Tennessee Valley Authority and the units came online in 1953, 1954, 1955, and 1956. The plant has a total nameplate capacity of 1,206 MW from operable units. In 2018, the plant generated 6.9 TWh of electricity and had a plant-wide capacity factor of 58%. Shawnee burned a mix of coal from Wyoming and Colorado as of 2015. Shawnee had been utilized to generate electricity for the United States Enrichment Corporation Paducah Gaseous Diffusion Plant until its closure in 2013, but now largely serves Tennessee's electricity demand.

*2018

Shawnee Fossil Plant

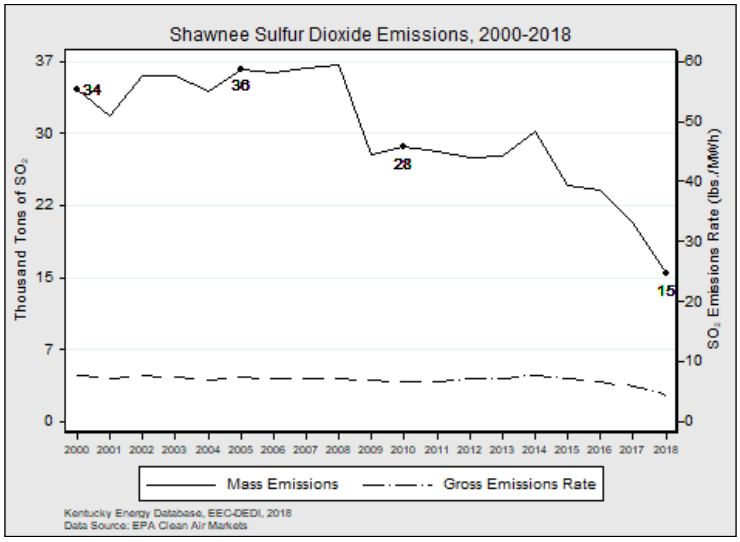


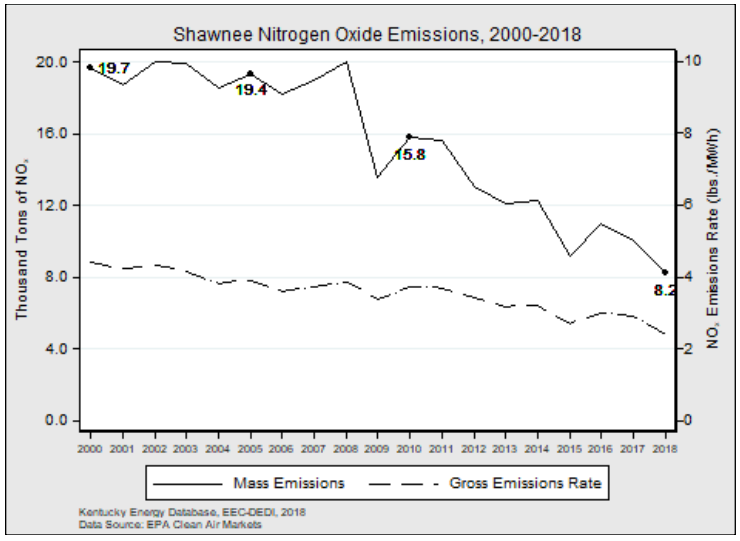


State	2018 Tons	Percentage
Total	3,940,564	100%
Wyoming	2,532,750	64%
Colorado	1,407,814	36%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	7,993,891	-8%
Rate (lbs./MWh)	2,316	+13%

The Shawnee Fossil Plant emitted 7.9 million tons of CO_2 in 2018, a decrease of 8% from 2010 levels. The rate of CO_2 emissions increased by 13% during that period.





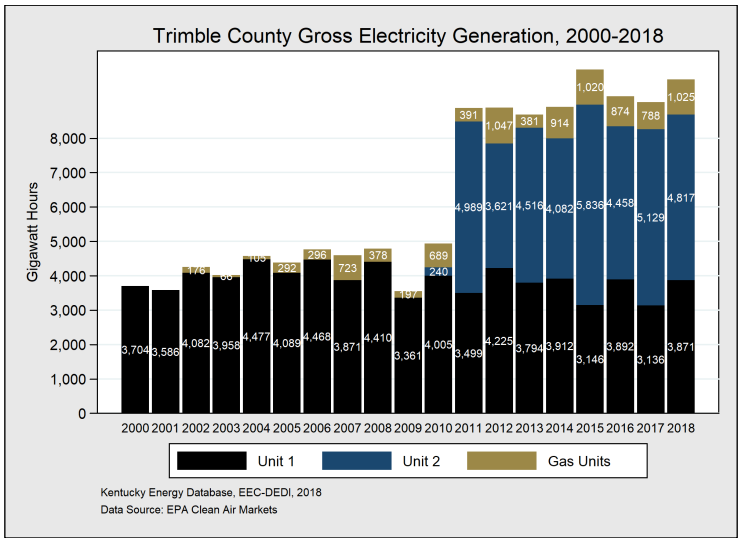
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	15,149	-46%
Rate (lbs./MWh)	4.39	-34%

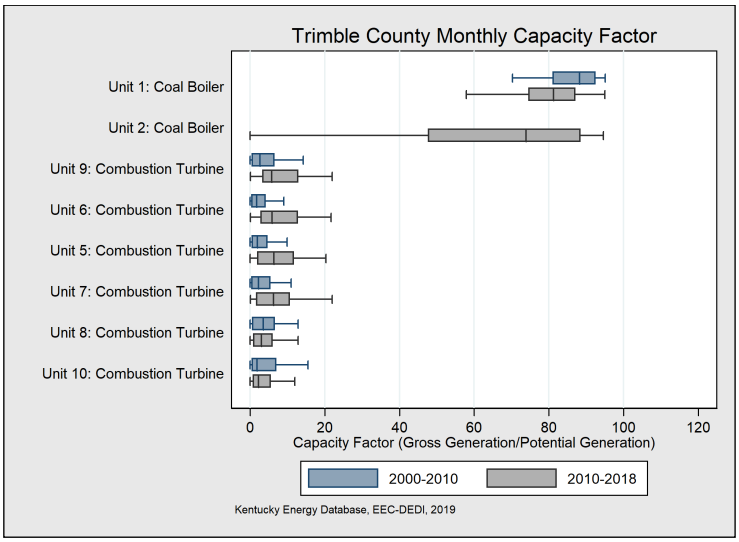
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	8,228	-46%
Rate (lbs./MWh)	2.38	-36%

The Shawnee Fossil Plant emitted 15,000 tons of SO_2 in 2018, a decrease of 46% since 2010. The rate of SO_2 emissions has decreased by 34% since 2010.

The Shawnee Fossil Plant emitted 8,228 tons of NO_x in 2018, a reduction of 46% since 2010. The rate of NO_x emissions decreased by 36% since 2010.

Trimble County Generating Station



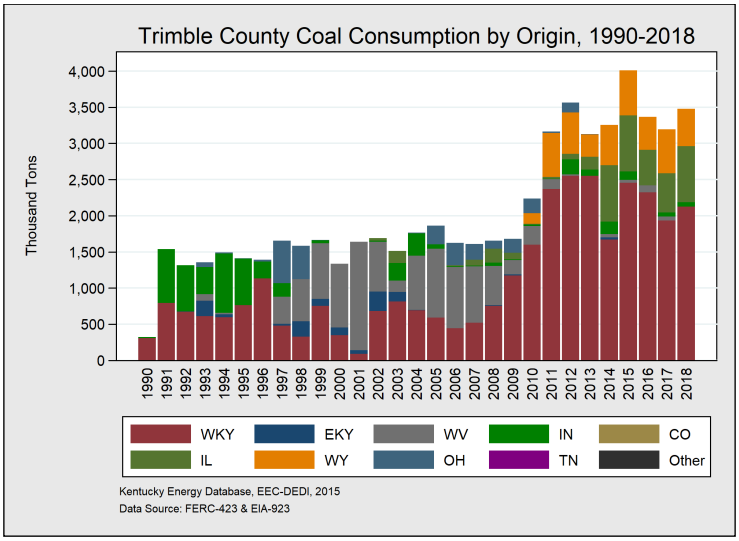


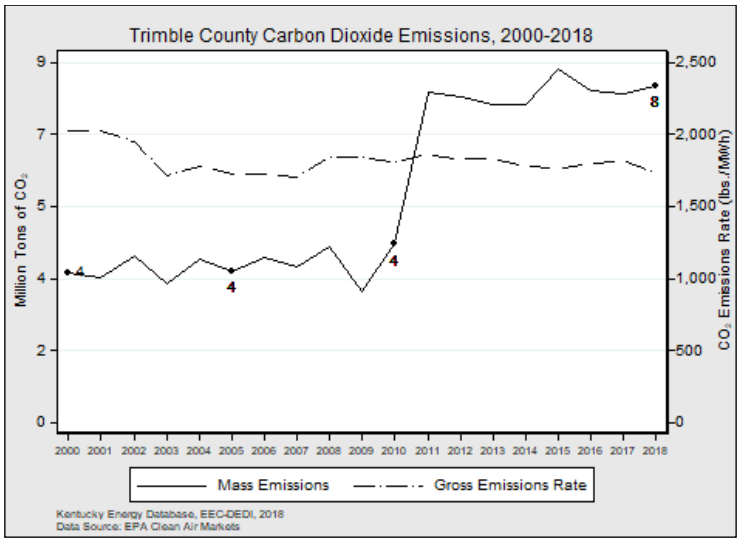
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1990**		**Coal**	**4,370**	**72%**	**9,714**	**8,018**	**1,732**	**0.83**	**0.52**
1	1990		Coal	511	79%	3,871	3,548	1,828	1.238	0.78
2	2010		Coal	732	67%	4,817	4,470	1,748	0.67	0.35
5	2002		Natural Gas	157	10%	172		1,349	0.007	0.40
6	2002		Natural Gas	157	10%	182		1,341	0.007	0.39
7	2004		Natural Gas	157	14%	246		1,269	0.006	0.36
8	2004		Natural Gas	157	13%	225		1,271	0.006	0.32
9	2004		Natural Gas	157	9%	156		1,302	0.007	0.36
10	2004		Natural Gas	157	2%	43		1,308	0.007	0.35

The Trimble County Generating Station, near Bedford, consists of two coal-fired electricity generating units and six natural gas combustion turbines. The combustion turbines are used only to meet peak demand because they are more expensive to run, but are easily dispatched with electricity demand changes. The plant is 28 years old, making it the youngest coal-fired electricity generation plant in Kentucky. The coal units came online in 1990 and 2010, respectively. Trimble County Generating Station's coal units have a total nameplate capacity of 1,243 MW. In 2018, the plant generated 9.7 TWh of electricity, 8,688 GWh from coal and 1,024 GWh from natural gas. The plant's coal units had a combined capacity factor of 72%. Trimble County is owned jointly by Louisville Gas & Electric, Illinois Municipal Electric Agency, and Indiana Municipal Power Agency.

*2014

Trimble County Generating Station

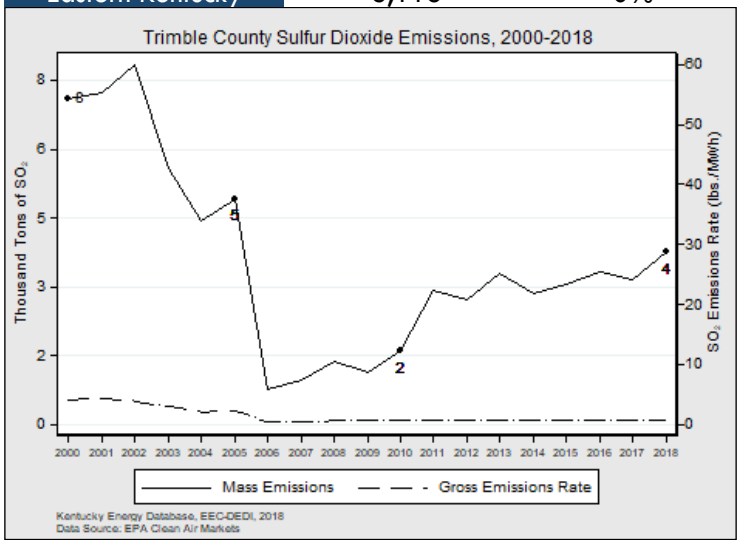


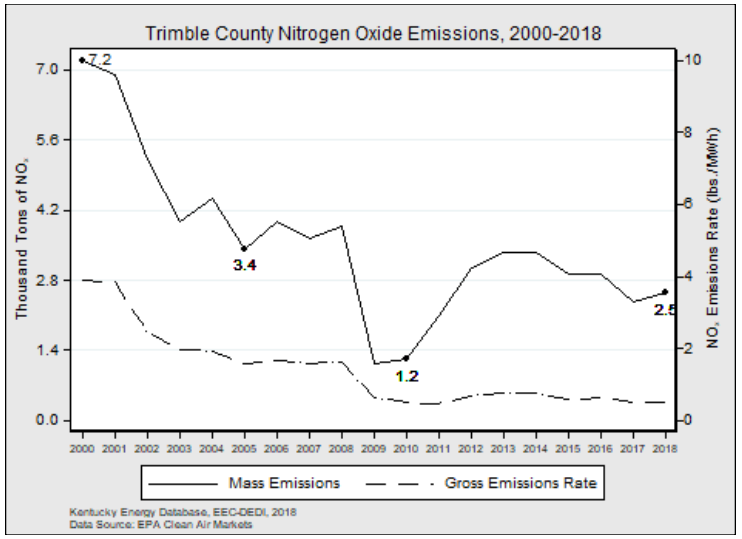


State	2018 Tons	Percentage
Total	3,253,066	100%
Western Kentucky	1,699,398	52%
Illinois	777,258	24%
Wyoming	555,436	17%
Indiana	173,111	5%
West Virginia	44,747	1%
Eastern Kentucky	3,116	0%

Carbon Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	8,415,639	+88%
Rate (lbs./MWh)	1,732	-4%

The Trimble County Generating Station emitted 8.4 million tons of CO_2 in 2018, an increase of 88% since 2010. However, the rate of CO_2 emissions decreased by 4% during that period as Unit 2 started in 2010.





Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	4,008	+134%
Rate (lbs./MWh)	0.83	+19%

The Trimble County Generating Station emitted 4,008 tons of SO_2 in 2018, an increase of 134% since 2010. The rate of SO_2 emissions increased by 19% during that period.

Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,544	+109%
Rate (lbs./MWh)	0.52	+6%

The Trimble County Generating Station emitted 2,544 tons of NO_x in 2018, an increase of 109% since 2010. The rate of NO_x emissions increased by 6% during that period.

Acknowledgements

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