APPENDIX A:

Emergency Support Functions

(ESF)

Appendix A: EMERGENCY SUPPORT FUNCTION (ESF)

ESF 1 - Transportation, Provides overall supervision of the Commonwealth transportation infrastructure to include identifying road closures on all state and local roads as well as conducting usability inspections of bridges and other transportation support structures throughout the Commonwealth for use as emergency supply and evacuation routes. Provides for coordination, control, and allocation of transportation assets in support of the movement of emergency resources including the evacuation of people, and the redistribution of food and fuel supplies. They also contract for repair and/or reconstruction of transportation infrastructure. ESF 1 also provides for coordination, control and allocation of assets for emergency ice, snow, and debris removal.

ESF 2 – Communications, Coordinates the delivery of emergency communications systems and equipment to first responders and emergency managers. ESF 2, in coordination with the Commonwealth Office of Technology and commercial providers, assists in the restoration of commercial communications to government agencies.

ESF 3 - Public Works and Engineering, Identifies and procures engineering and construction services necessary to provide or restore critical public facilities such as water and sewer systems damaged during disasters. Procured services include provisions of emergency power supplies for critical facilities, potable water and sewer infrastructure, coordination of emergency repairs to public facilities, appropriate construction services (e.g. electrical, plumbing, soils), and emergency demolition or stabilization of damaged structures and facilities designated as hazards to public health.

ESF 4 – Firefighting, Provides for mobilization and deployment, and assists in coordinating structural firefighting resources to combat forest and wild land or urban incidents. ESF 4 provides incident management assistance for on-scene incident command and control operations.

ESF 5 - Emergency Management, Provides for the overall coordination of the Commonwealth's emergency operations in support of state and local governments. For decision-making purposes, ESF 5 collects, analyzes, and disseminates critical information on emergency operation.

ESF 6 - Mass Care, Emergency Assistance, Temporary Housing, and Human Services

Coordinates sheltering, feeding, and first aid for disaster victims and pets. ESF 6 also provides for temporary housing, food, clothing, and special human needs in situations that do not warrant mass-care systems.

ESF 7 – Logistics, Coordinates the acquisition of response resources through mutual aid agreements and procurement procedures for all functional areas or groups, as needed. Provides for coordination and documentation of personnel, equipment, supplies, facilities, and services used during disaster response and initial relief operations.

ESF 8 - Public Health and Medical Services, Coordinates care and treatment for the ill and injured and mobilizes trained health and medical personnel and other emergency medical supplies, materials and facilities. ESF 8 provides public health and environmental sanitation services, disease and vector control, and the collection, identification, and protection of human remains.

ESF 9 - Search and Rescue, Coordinates resources for ground, water, and airborne activities to locate, identify, and remove from a stricken area, persons lost or trapped in buildings and other structures from stricken area. SAR also provides for specialized emergency response and rescue operations. Performs health and wellness assessments.

ESF 10 – Oil and Hazardous Materials Response, Coordinates effective local, state, federal, and private sector efforts in reducing or removing the danger to public health, safety, and the environment from threatened or actual incidents involving oil or hazardous material releases

ESF 11 – Agriculture and Natural Resources, Coordinates response to any incident, real or perceived, relating to the appearance of a communicable disease or condition within the Commonwealth of Kentucky's animal or plant population that could have a direct impact on productivity, exporting animal and plant products, and public health.

ESF 12 – Energy, Coordinates all energy resources within the Commonwealth for use during an emergency. Coordinates with the private sector for the emergency repair and restoration of critical public energy utilities, (i.e. gas, electricity, etc.). Coordinates the rationing and distribution of emergency power and fuel, as necessary.

ESF 13 - Public Safety and Security, Coordinates for the protection of life and property by enforcing laws, orders, and regulations, including the movement of persons from threatened or hazardous areas. Provides for area security, traffic, and access control in impacted areas.

ESF 14 - Cross-Sector Business and Infrastructure, Supports the coordination of cross-sector operations, including stabilization of key supply chains and community lifelines, among infrastructure owners and operators, businesses, and their government partners.

ESF 15 - External Affairs, Coordinates the Joint Information Center (JIC) and provides emergency public information through the Joint Information System (JIS). ESF 15 coordinates all public affairs messages and public information requirements and constructs the executive messages in support of incident or emergency requirements.

Attachment 1:

Energy Emergency Response Playbook for States and Territories

U.S. DEPARTMENT OF ENERGY | Office of Cybersecurity, Energy Security, and Emergency Response

NASEO
National Association of State Energy Officials

Energy Emergency Response Playbook for States and Territories

May 2022

This resource was produced by the U.S. Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response (CESER) to aid states in energy emergency planning. States may choose to incorporate parts or all of the provided material (optional) in their State Energy Security Plans (SESPs). States are encouraged to adapt or supplement the provided material to align with existing state roles, authorities, and plans; and to better address state-specific needs and situations.

Acknowledgement

The *Energy Emergency Response Playbook for States and Territories* was developed through the partnership with U.S. Department of Energy's (DOE) Office of Cybersecurity, Energy, Security, and Emergency Response (CESER) and the National Association of State Energy Officials (NASEO). Brandi Martin (DOE CESER) led the development of the Playbook with support from Campbell Delahoyde (NASEO), and Kirsten Verclas (NASEO).

The Playbook was authored by ICF including Kevin DeCorla-Souza, Matt Kelly, Jennifer Matthews, Anne Ressler, and Jason Pazirandeh. Review and comments were provided by emergency response officials at DOE CESER, including Kate Marks, Ken Buell, Christian Cando, and Bill Eaton; and NASEO staff. Converge Strategies, LLC also contributed to the playbook.

The authors also thank the following state and territorial energy officials and public utility commissioners for their contributions, review, and comments to inform the contents of this playbook:

- **Ben Bolton**, Tennessee Department of Environment and Conservation
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Disclaimer

Introduction

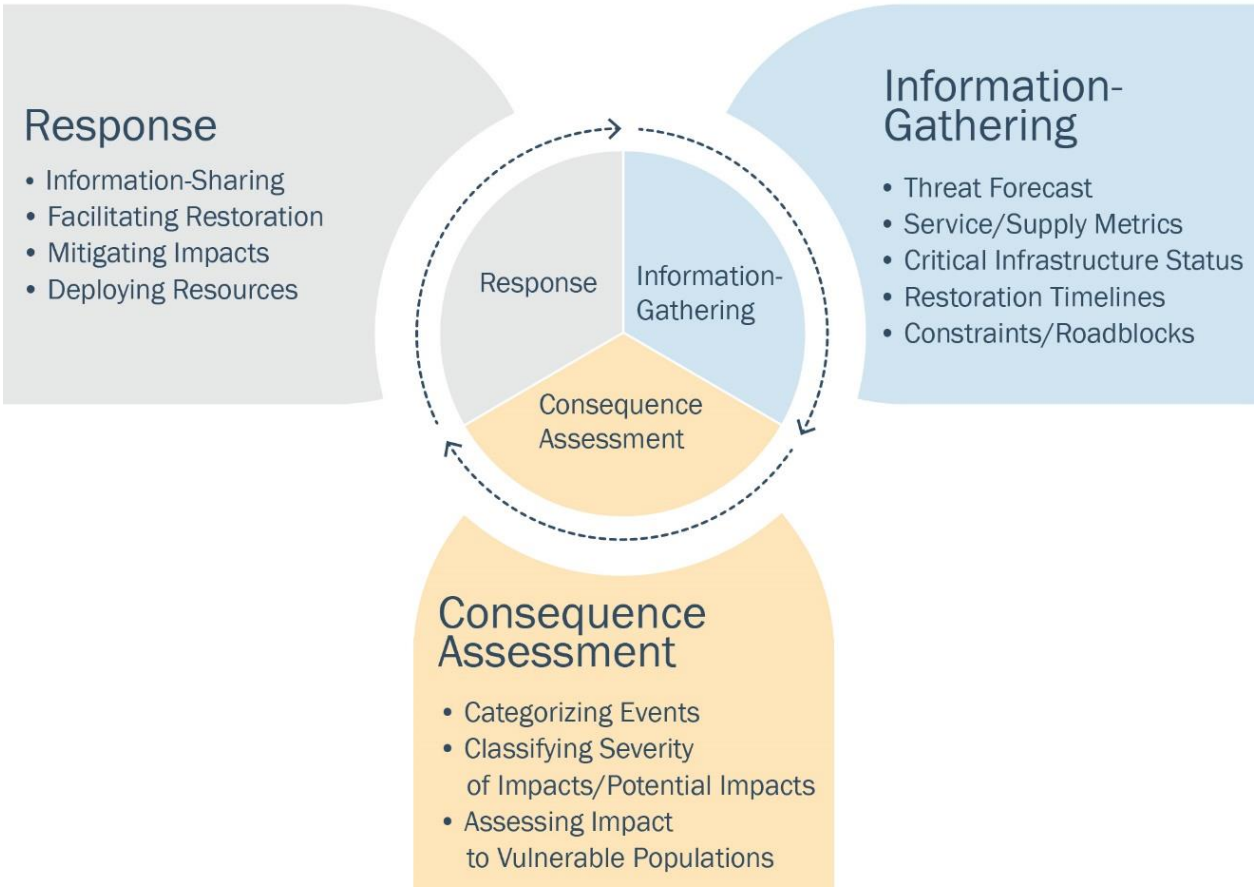
The *Energy Emergency Response Playbook for States and Territories* provides State Energy Offices with preparing for, responding to, and recovering from energy emergencies. The Playbook is intended to complement (but not replace) State Energy Security Plans (SESPs) by providing guidance on how and when to utilize authorities and response actions detailed in SESPs. This Playbook presumes that SESPs are in place and that state emergency response roles and responsibilities are defined and understood.

This Playbook provides a starting point for energy emergency response planning, including a framework for evaluating energy emergencies, guidance and templates for emergency response actions, and other supplemental planning, monitoring, and response resources. This Playbook is not intended to be prescriptive or suggest non-statutory expansion of State Energy Office responsibilities or purview during energy emergencies. Responsibilities may vary significantly from state to state.

Playbook users (state and territorial energy officials) are encouraged to add to, edit, and expand this Playbook to include additional state-specific actions, resources, and responsibilities. Users are encouraged to make structural edits that best meet their unique needs or to best integrate with existing plans, policies, and procedures. After customizing this Playbook to fit state-specific structures and authorities, states may incorporate the Playbook as part of their SESPs.

Playbook Structure

Emergency management is a continuous cycle of Preparedness → Response → Recovery → Mitigation. This Playbook focuses on the Response part of the cycle. Responding to energy emergencies involves an iterative process of gathering information, assessing the actual or potential consequences of the incident, and taking action to share critical information, facilitate system restoration, and mitigate impacts to dependent lifeline sectors and consumers. This process is repeated over the course of an emergency with response actions adapting to changing conditions as the situation evolves.



This Playbook is arranged into three sections that align with the three stages of the Response Cycle. Each section provides guidance and resources that are tailored to emergencies involving power, liquid fuel, and natural gas systems. Supplemental information is provided in the appendices.

The Playbook includes:

Error! Reference source not found. provides a list of informational resources for monitoring energy supply, inventories, and markets, as well as weather-related threats..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. provides guidance for categorizing and assessing the consequence of an event to inform a proportional response..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. identifies response measures by the event type, actor, event consequence, and the time phase of the emergency event..... (page **Error! Bookmark not defined.**)

The Playbook includes appendices with supplemental information for emergency response planning:

Error! Reference source not found. describes resources identified in the Information Gathering/Situational Awareness chapter, including descriptions of each tool and examples of how these tools can be used to monitor energy markets and inform response activities..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. provides a template for creating a list of key energy emergency response contacts..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. provides a list of threats and their associated potential impacts to energy systems..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. provides flow diagrams that summarize the electricity, natural gas, liquid fuels, and propane supply chains..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. summarize the interdependencies within the energy sector and between the energy sector and other lifeline sectors..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. outlines challenges and considerations for remote locations during energy emergencies..... (page **Error! Bookmark not defined.**)

Error! Reference source not found. provides considerations for vulnerable populations during energy emergencies..... (page **Error! Bookmark not defined.**)

APPENDIX B:

Chapter 39A Kentucky Revised Statutes

Appendix B: Chapter 39A Kentucky Revised Statues

39A.100 Emergency powers of Governor and local chief executive officers.

(1) In the event of the occurrence or threatened or impending occurrence of any of the situations or events contemplated by KRS 39A.010, 39A.020, or 39A.030, the Governor may declare, in writing, that a state of emergency exists. The Governor shall have and may exercise the following emergency powers during the period in which the state of emergency exists:

(a) To enforce all laws, and administrative regulations relating to disaster and emergency response and to assume direct operational control of all disaster and emergency response forces and activities in the Commonwealth;

(b) To require state agencies and to request local governments, local agencies, and special districts to respond to the emergency or disaster in the manner directed;

(c) To seize, take, or condemn property, excluding firearms and ammunition, components of firearms and ammunition, or a combination thereof, for the protection of the public or at the request of the President, the Armed Forces, or the Federal Emergency Management Agency of the United States, including:

1. All means of transportation and communication;

2. All stocks of fuel of whatever nature;

3. Food, clothing, equipment, materials, medicines, and all supplies; and

4. Facilities, including buildings and plants;

(d) To sell, lend, give, or distribute any of the property under paragraph (c) of this subsection among the inhabitants of the Commonwealth and to account to the State Treasurer for any funds received for the property;

(e) To make compensation for the property seized, taken, or condemned under paragraph (c) of this subsection;

(f) To exclude all nonessential, unauthorized, disruptive, or otherwise uncooperative personnel from the scene of the emergency, and to command those persons or groups assembled at the scene to disperse. A person who refuses to leave an area in which a written order of evacuation has been issued in accordance with a written declaration of emergency or a disaster may be forcibly removed to a place of safety or shelter, or may, if this is resisted, be arrested by a peace officer. Forcible removal or arrest shall not be

exercised as options until all reasonable efforts for voluntary compliance have been exhausted;

(g) To declare curfews and establish their limits;

(h) To prohibit or limit the sale or consumption of goods, excluding firearms and ammunition, components of firearms and ammunition, or a combination thereof, or commodities for the duration of the emergency;

(i) To grant emergency authority to pharmacists pursuant to KRS 315.500, for the duration of the emergency;

(j) Except as prohibited by this section or other law, to perform and exercise other functions, powers, and duties deemed necessary to promote and secure the safety and protection of the civilian population;

(k) To request any assistance from agencies of the United States as necessary and appropriate to meet the needs of the people of the Commonwealth; and

(l) Upon the recommendation of the Secretary of State, to declare by executive order a different time, place, or manner for holding elections in an election area for which a state of emergency has been declared for part or all of the election area. The election shall be held within thirty-five (35) days from the date of the suspended or delayed election. The State Board of Elections shall establish procedures for election officials to follow. Any procedures established under this paragraph shall be subject to the approval of the Secretary of State and the Governor by respective executive orders.

(2) In the event of the occurrence or threatened or impending occurrence of any of the situations or events contemplated by KRS 39A.010, 39A.020, or 39A.030, which in the judgment of a local chief executive officer is of such severity or complexity as to require the exercise of extraordinary emergency measures, the county judge/executive of a county other than an urban-county government, or mayor of a city or urban-county government, or chief executive of other local governments or their designees as provided by ordinance of the affected county, city, or urban county may declare in writing that a state of emergency exists, and thereafter, subject to any orders of the Governor, shall have and may exercise for the period as the state of emergency exists or continues, the following emergency powers:

(a) To enforce all laws and administrative regulations relating to disaster and emergency response and to direct all local disaster and emergency response forces and operations in the affected county, city, urban-county, or charter county;

(b) To exclude all nonessential, unauthorized, disruptive, or uncooperative personnel from the scene of the emergency, and to command persons or groups of persons at the scene to disperse. A person who refuses to leave an area in which a written order of evacuation has been issued in accordance with a written declaration of emergency or a disaster may be forcibly removed to a place of safety or shelter, or may, if this is resisted, be arrested by a peace officer. Forcible removal or arrest shall not be exercised as options until all reasonable efforts for voluntary compliance have been exhausted;

(c) To declare curfews and establish their limits;

(d) To order immediate purchase or rental of, contract for, or otherwise procure, without regard to procurement codes or budget requirements, the goods and services essential for protection of public health and safety or to maintain or to restore essential public services; and

(e) To request emergency assistance from any local government or special district and, through the Governor, to request emergency assistance from any state agency and to initiate requests for federal assistance as are necessary for protection of public health and safety or for continuation of essential public services.

(3) Nothing in this section shall be construed to allow any governmental entity to impose additional restrictions on the lawful possession, transfer, sale, transport, carrying, storage, display, or use of firearms and ammunition or components of firearms and ammunition.

Effective: April 15, 2020
History: Amended 2020 Ky. Acts ch. 91, sec. 74, effective April 15, 2020. -- Amended 2010 Ky. Acts ch. 22, sec. 3, effective July 15, 2010. -- Amended 2006 Ky. Acts ch. 7, sec. 1, effective March 8, 2006; and ch. 240, sec. 10, effective July 12, 2006. -- Amended 2005 Ky. Acts ch. 91, sec. 1, effective June 20, 2005. -- Created 1998 Ky. Acts ch. 226, sec. 9, effective July 15, 1998

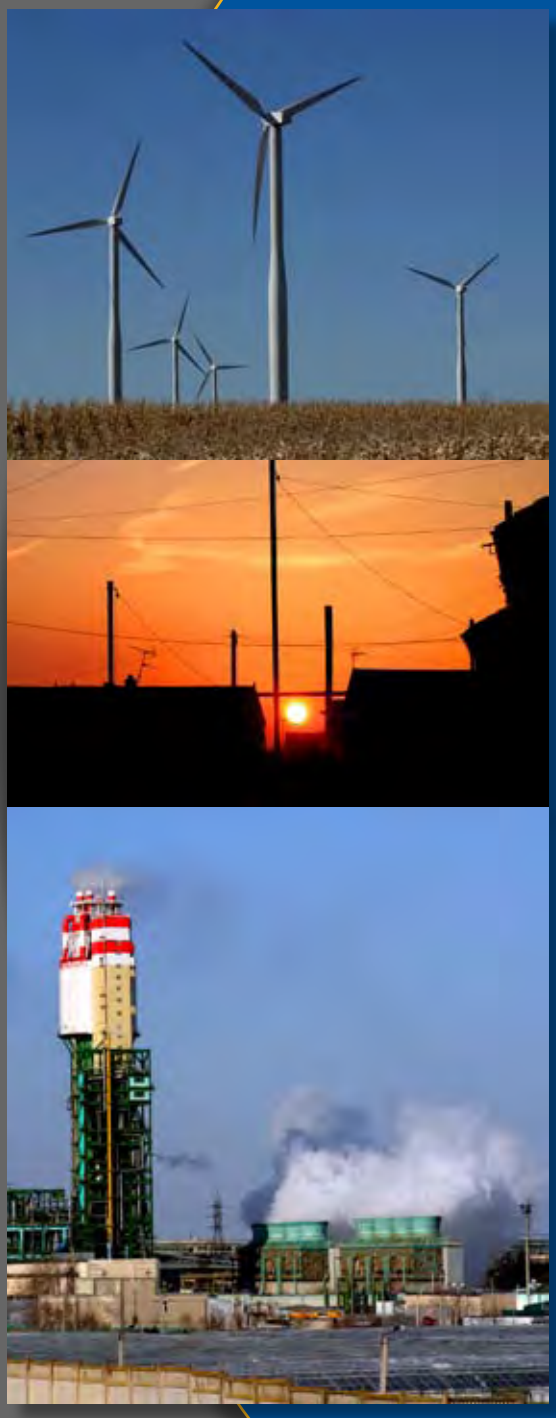
https://apps.legislature.ky.gov/law/statutes/chapter.aspx?id=37202

APPENDIX C:

Kentucky Energy Sector Emergency Response Contact List

APPENDIX D:

NASEO Energy Security Plan Guidance



State Energy Assurance Guidelines

National Association of State Energy Officials

Transforming America's Energy Future

National Association of Regulatory Utility Commissioners — Dedicated to Public Service — 1889

Version 3.1
December 2009

Attachment 1:

DOE Energy Security Plan Guidance

STATE ENERGY SECURITY PLAN GUIDANCE

The energy sector is uniquely critical as all other critical infrastructure sectors depend on power and/or fuel to operate. An impact on critical energy infrastructure can directly affect the security and resilience within and across other critical infrastructure sectors – threatening public safety, the economy, and national security.

Energy Security Planning ensures a **reliable** and **resilient** supply of energy through efforts to **identify, assess, and mitigate risks** to energy infrastructure and to **plan for, respond to and recover** from events that disrupt energy supply. Our nation's energy infrastructure and delivery systems are vulnerable to a variety of threats and hazards, including severe weather (exacerbated by climate change), cyberattacks, system failures, pandemics, and deliberate physical attacks. Because most of the nation's critical infrastructure is owned and operated by private companies, both the government and private sector have a mutual incentive to reduce the risk of disruptions to critical infrastructure. It is the responsibility of state and local officials to work with energy providers, across government agencies and with relevant stakeholders to reduce the risk, vulnerabilities, and consequences of an energy disruption or emergency and provide for rapid recovery.

State energy security plans (SESP) are an essential part of energy security planning. SESPs describe the state's energy landscape, people, processes, and the state's strategy to build energy resilience. More specifically, the plans detail how a state, working with energy partners, can secure their energy infrastructure against all physical and cybersecurity threats; mitigate the risk of energy supply disruptions to the State; enhance the response to, and recovery from, energy disruptions; and ensure that the state has secure, reliable, and resilient energy infrastructure.

The purpose of this guidance is to provide clarity and detail on the six elements outlined in Section 40108 of the bipartisan *Infrastructure Investment and Jobs Act* (IIJA) hereafter referred to as the "BIL." The U.S. Department of Energy's (DOE) goal is to support states and provide additional clarification beyond the text of the BIL.

The guidance below is the DOE's interpretation of how the six elements could be met – it is not exhaustive. Other methods for meeting the six elements are also acceptable. The example plan layout below provides a logical flow of information, organizing the six elements into practical sections that reduce redundancies. DOE understands that states are working from existing energy security plans and that each of those plans is different. DOE anticipates that states will use different approaches to address the six elements described in the BIL. States do not have to follow this exact format or flow listed below. This is intended to provide examples and to serve as a reference only.

The guidance also references drop-in resources from the Office of Cybersecurity, Energy Security and Emergency Response (CESER) that will be available in early May 2022. Use of these resources is optional. States can use part or the full "drop-in" and customize for their state needs. These resources are intended to assist states in satisfying the elements outlined in the BIL.

BIL 40108 Provision Excerpt:

FINANCIAL ASSISTANCE FOR STATE ENERGY SECURITY PLANS. —Federal financial assistance made available to a State under this part may be used for the development, implementation, review, and revision of a State energy security plan that—

1) assesses the existing circumstances in the State; and
2) proposes methods to strengthen the ability of the State, in consultation with owners and operators of energy infrastructure in the State
    a. to **secure** the energy infrastructure of the State against all physical and cybersecurity threats;
    b. to **mitigate** the **risk** of energy supply disruptions to the State; and to **enhance the response** to, and **recovery** from, energy disruptions; and
    c. to ensure that the State has **reliable**, secure, and resilient energy infrastructure.

Contents of Plan. --A State energy security plan shall--

(1) address all energy sources and regulated and unregulated energy providers;

(2) provide a State energy profile, including an assessment of energy production, transmission, distribution, and end-use;

(3) address potential hazards to each energy sector or system, including--
- physical threats and vulnerabilities; and ``
- cybersecurity threats and vulnerabilities; ``

(4) provide a risk assessment of energy infrastructure and cross-sector interdependencies;

(5) provide a risk mitigation approach to enhance reliability and end-use resilience; and

(6) address
- multi-State and regional coordination, planning, and response; and
- coordination with Indian Tribes with respect to planning and response; and
- to the extent practicable, encourage mutual assistance in cyber and physical response plans.

STATE ENERGY SECURITY PLAN FRAMEWORK

SECTION	DESCRIPTION	Relative BIL Section (Elements 1-6)
1. Intro / Navigation	• Describes purpose of each section	
2. Energy Landscape and Risk Profiles	**State Energy Profile:** Provide baseline data, maps, and other information on state markets and infrastructure for all energy sources (electricity, liquid fuels, and natural gas), including: • **Production** – in-state energy production, including electricity generation by fuel and oil and gas upstream production and refining/processing • **Transmission** - interstate energy transfers and imports, including information on major pipelines, transmission lines, and marine and rail infrastructure • **Distribution** – overview of energy providers in the state, including electric utilities, natural gas local distribution companies, and liquid fuels terminal operators and fuel distributors • **End-Use**- energy demands, including information on seasonal and intraday variability, demands by sector, and any state-specific fuel specifications As appropriate, the profile should include discussion of wider interstate and regional energy markets.	1 address all energy sources and regulated and unregulated energy providers; 2 provide a State energy profile, including an assessment of energy production, transmission, distribution, and end-use;
	Threats/Vulnerabilities: Provide information on threats and vulnerabilities to state or regional energy sectors or systems. • Threat information includes anything that can expose a vulnerability and damage, destroy, or disrupt energy systems, including natural, technological, manmade/physical, and cybersecurity hazards. • Vulnerabilities are weaknesses within infrastructure, processes, and systems, or the degree of susceptibility to various threats. Vulnerabilities may be specific to the threat, energy type, and infrastructure component. Information for this section can be drawn from several sources, including DOE state risk profiles, state hazard mitigation plans, state integrated resource plans, utility emergency plans, and after-action reports for previous incidents, and discussions with energy system operators and other stakeholders.	3 address potential hazards to each energy sector or system, including— a. physical threats and vulnerabilities; and b. cybersecurity threats and vulnerabilities;
	Assessing risk to energy infrastructure is a complex, ever evolving, and continuous process with many different stakeholders and systems. Knowing how susceptible an energy asset is to a disruption (natural or man-made) allows decision makers to focus resources on better protecting the most vulnerable assets. **Assessment:** Conduct risk assessments and analyze cross-sector interdependencies for energy infrastructure assets within the state.	4 provide a risk assessment of energy infrastructure and cross-sector interdependencies;

	• Risk Assessment of Energy Infrastructure: Risk is defined as the potential for loss, damage, or destruction of key resources or energy system assets resulting from exposure to a threat. Risk assessments consider the consequence of an asset's loss, the vulnerability of an asset to specific threats, and the likelihood that an asset will be exposed to a specific threat. Certain energy infrastructure assets may be especially important to ensuring energy infrastructure continuity. Being able to identify the assets that are most critical to the infrastructure or that provide significant support to other critical infrastructure systems helps to determine overall risk and prioritize mitigation strategies more effectively. *(Risk assessments may help inform prioritization of 40101 funds)* Cross-Sector Interdependencies: consider interdependencies between the energy sector and other sectors and between different energy sub-sectors (electricity, liquid fuels, and natural gas). Understanding the interconnected nature of energy infrastructure and the interdependencies can identify the possible cascading impacts of a disruption.	
3. Energy Security and Emergency Response Authorities	a) Provide relevant authorities, doctrines, and guiding statutes for energy security and emergency response activities, including federal, state, and local government authorities and emergency response structures.	**1** assesses the existing circumstances in the State
4. Energy Security Planning & Preparedness	a) Document State Energy Office roles and responsibilities, which may include monitoring energy markets, mutual assistance work, holding/ participating in staff training & exercises, engaging with stakeholders, updating the energy security plan, completing after-action reports, and undergoing continuous improvement b) Roles of Other State Entities c) Describe Tribal Coordination d) Describe coordination, planning and response activities with neighboring states and the region. Include city and county coordination as appropriate.	**6** a) address i. multi-State and regional coordination, planning, and response; and ii. coordination with Indian Tribes with respect to planning and response; iii. encourage mutual assistance in cyber and physical response plans.
5. Energy Emergency Response	Describe response actions /authorities for energy emergencies, including power outages/electricity shortages, liquid fuels shortages, and natural gas shortages. Components may include: a) Response Cycle Overview b) Information Gathering/Situational Awareness c) Event Consequence Assessment d) Response Actions	**6, 2b** … mitigate the risk of energy supply disruptions to the State; and to enhance the response to, and recovery from, energy disruptions;
6. Energy Resiliency & Hazard Mitigation	a) Mitigation approach: provide a strategy for reducing the potential consequences of energy disruptions. The mitigation strategy should describe how energy sector stakeholders will accomplish the goals of strengthening energy sector reliability, enhancing energy supply resilience for end-users, and securing critical energy infrastructure. The approach to prioritize funding and implementation should leverage a risk assessment if feasible. Specific projects and activities can be mentioned. *b) Link to 40101 (optional)*	**5** provide a risk mitigation approach to enhance reliability and end-use resilience; and other entities responsible for— a. maintaining fuel or electric reliability; and b. securing energy infrastructure.
7. Appendix		

STATE ENERGY SECURITY PLAN (SESP) DETAILED FRAMEWORK

1) INTRO/NAVIGATION

2) ENERGY & RISK PROFILES (1, 2, 3, 4)

a) **State Energy Profile:** Overview of energy supply, demand, import/export, and infrastructure. Includes EIA data, maps, and lists of key infrastructure and service providers. For all energy types: Electricity (includes: coal, nuclear, and renewable energy), Natural Gas, and Liquid Fuels (includes: biofuels and propane)

i) *CESER instructions: How to develop a profile using EIA Data*

ii) *Limited example based on EIA data with appropriate analysis*

b) **Threats/Vulnerabilities:**

i) Threats

(1) Data on historic emergency events and energy disruptions

(a) CESER State and Regional Risk Profiles

(2) Cybersecurity Threats

(a) *Drop-in: Cyber IT / OT overview and 2 graphics*

(b) *Drop-In: Conversation guidance to gather state specific information*

ii) Vulnerabilities

(1) Descriptions of vulnerabilities

(a) *Drop-In: CESER developed supply chain graphics for each energy type*

c) **Risk Assessment:**

(1) Cross-Sector Interdependencies:

(a) Description of interdependencies

(b) *Drop-In: CESER developed 3 diagrams*

(2) Risk Assessment of Critical Infrastructure:

(a) State Critical Infrastructure Analysis

3) ENERGY SECURITY AND EMERGENCY RESPONSE AUTHORITIES (1)

a) **Relevant Authorities, Doctrines, and Guiding Statutes**

i) Requirements to have SESP and plan to maintain and strengthen

ii) Authorities

(1) Relevant Federal Authorities & Organization Structure

(a) *Drop-In: Federal Authorities*

(2) Relevant State Authorities

(a) emergency response laws and authorities' relevant to energy resources

(b) Other state departments or agencies which deal with interdependent sectors (Air Quality, Transportation, Water/Wastewater, Health, etc.

(3) Relevant local and tribal authorities (e.g., home rule)

4) ENERGY SECURITY PLANNING & PREPAREDENESS (6)

a) **State Energy Office Roles and Responsibilities**
   i) State Energy Office Responsibilities
      (1) **Monitoring Energy Markets**
         (a) Monitor market and supply data
         (b) Review DOE CESER communications on threats/events
      (2) **Assess Mitigation, Impact and Response Actions** (e.g., conservation, regulatory, consumer protection, waivers, supply acquisition, subsidies)
      (3) **State Energy Emergency Assurance Coordinators (EEAC) Program**
         (a) Drop-In: EEAC overview
      (4) **Stakeholder Engagement**
         (a) Sustain relationships with public and private energy suppliers and other key stakeholders
         (b) Maintain stakeholder contact lists
            (i) Drop-In: Contact list template (part of emergency playbook)
      (5) **Staff Training and Exercises**
      (6) **After Action Reporting, Evaluation, and Continuous Improvement**
      (7) **State emergency response responsibilities**
         (a) Coordination and Roles
         (b) Public Information Program
         (c) With non-government and private sector entities (NASEO included)
         (d) With other states (Multi-State Coordination)
         (e) With federal government
         (f) Contacts (refer to annex)

b) **Roles of Other State Entities Relating to Energy Security**
   i) Governor's Office
   ii) Governor's Energy Advisor
   iii) Public Utility Commissions (PUC)
   iv) Emergency Management Agencies (EMA)
   v) Homeland Security Agency (HSA)
   vi) Fusion Center

c) **Tribal Coordination**
   i) Coordination with Indian Tribes with respect to planning and response;

d) **Regional Structures and Coordination**
   i) Applicable elements from other states' plans in region
   ii) Regional implementation plans and any agreements/MOUs/plans related to mutual assistance to cyber and physical responses.

5) ENERGY EMERGENCY RESPONSE (6, 2B)

(Drop-In: CESER/NASEO customizable state Energy Emergency Response Playbook)

a) **Response Cycle Overview**
   i) Information Gathering a Consequence Assessment a Response

b) **Information Gathering/Situational Awareness** (for each energy type)
   i) Situational Awareness Tools (e.g., DOE tools, EIA tools)
   ii) Weather Threat Monitoring Tools (e.g., NOAA hurricane tracks, blizzard forecasts)
   iii) Industry, Peer, and Regional Outreach

c) **Consequence Assessment Guidelines** (for each energy type)
   i) Guidance on Event Classification/Ratings: Tiers of event consequences

ii) Event Assessment Factors:
(1) Threat Information (identify threats to energy infrastructure)
(2) Impacts to energy consumers
(3) Impacts to critical energy delivery systems (e.g., critical power plants)
(4) Impacts to bulk/ wholesale energy markets (e.g., bulk fuel stocks)

d) **Response Actions**
i) Response Action Matrices
(1) Event Type (Power Outage, Natural Gas Shortage, Liquid Fuels Shortage, Multi-System Failure)
(a) Event consequence tiers and event stage (pre-event, response/restoration)

6) ENERGY RESILIENCY & HAZARD MITIGATION (5)

a) **State approach** (prioritization, grants, public-private partnerships)
i) *Drop-In: CESER developed a simple list of general mitigation measures (e.g., system segmentation, smart grids, backup generation at gas stations) as well as measures by hazard type. (e.g., raising substations in flood prone areas)*

7) APPENDICIES

a) **Appendix: SESP Connection to Relevant State Plans**
i) Long term State Energy Plans
ii) Hazard Mitigation Plans
iii) Climate Adaptation Plans
iv) Resilience Plans
v) Critical Infrastructure Protection Plans
vi) State COOP plans
vii) Utility Integrated Resource Plans
viii) Citizen Service Programs (LIHEAP, WAP, assistance programs, etc.)
ix) Others

b) **Other Relevant Energy Sector Risk Assessments/Resources**
i) NIPP, THIRA – energy integration, Cybersecurity Risk Assessments

c) **Appendix: Data/Situational Tools** *(Drop-in: included in emergency playbook)*
i) EAGLE-I
ii) ISO System Condition Pages
iii) EIA: Grid Monitor, Weekly Petroleum Status Report, Heating Fuels and Energy Atlas
iv) Natural Gas Pipeline Online Bulletin Boards

APPENDIX E:

Kentucky Energy Profile 2019

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

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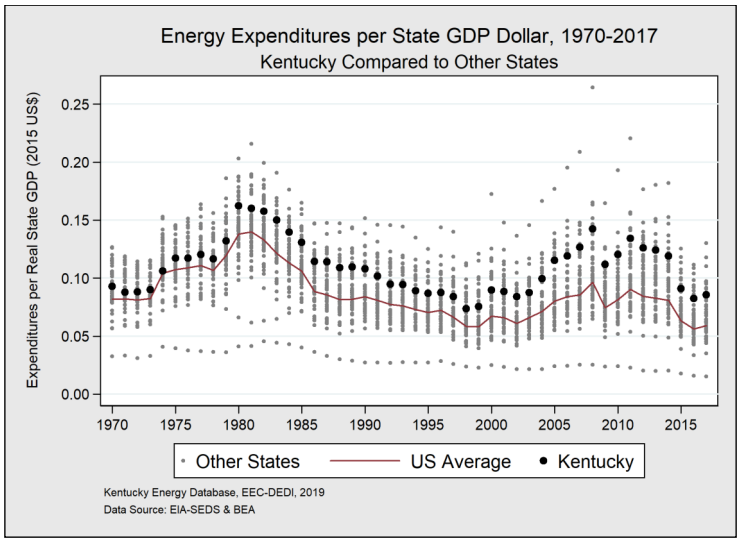
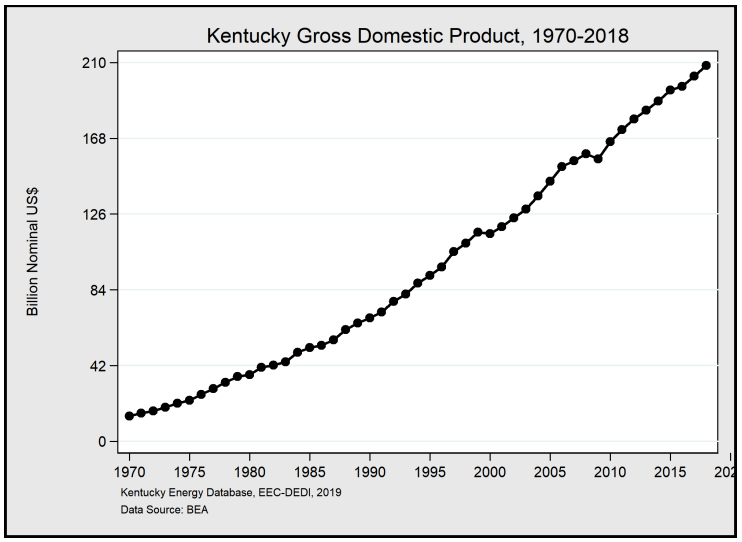
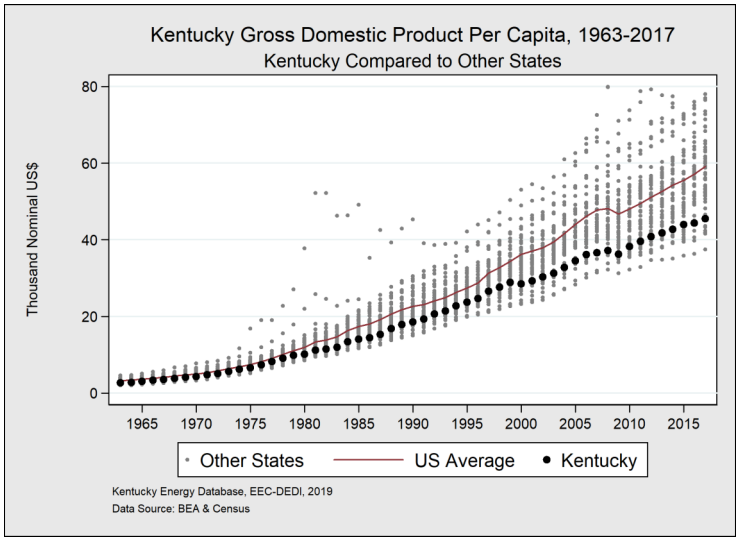
General Statistics



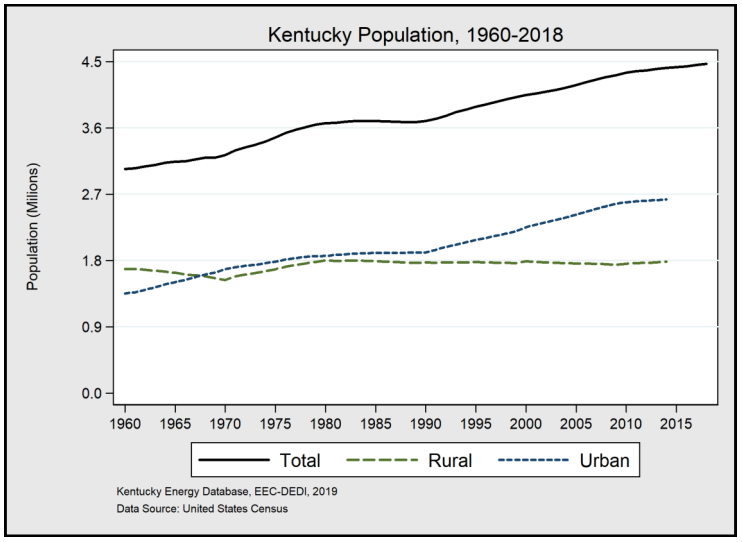
In 2017, on average $0.09 was spent in Kentucky on energy to produce one dollar of state Gross Domestic Product (GDP). Kentucky ranked 13th in energy intensity of GDP in 2017, and increased its intensity by 4% from 2016. Kentucky is home to large, energy-intensive, manufacturing operations which cause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

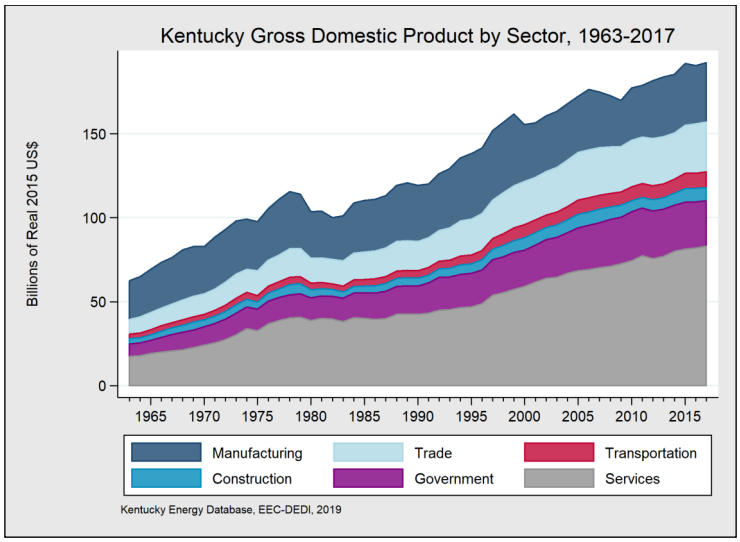


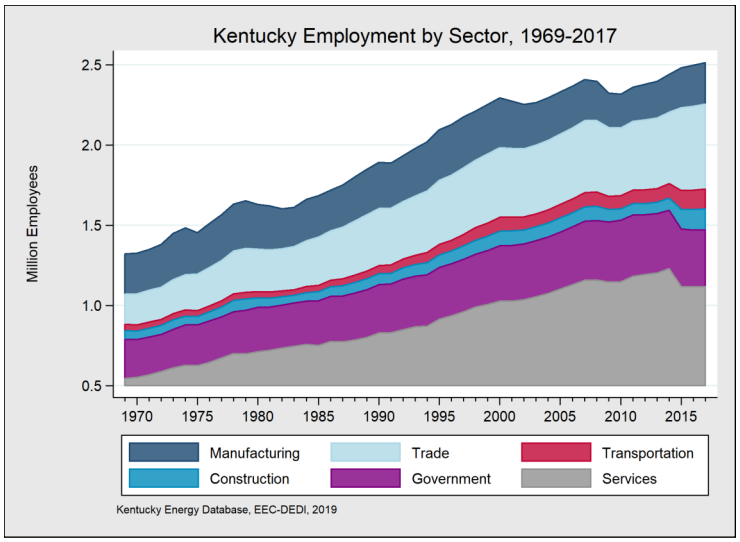
In 2017, Kentucky's GDP per capita was $45,464, an increase of 2.6% from 2016. Kentucky ranked 45th in the nation in terms of GDP per capita and below the national average of $59,140 in 2017.



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.

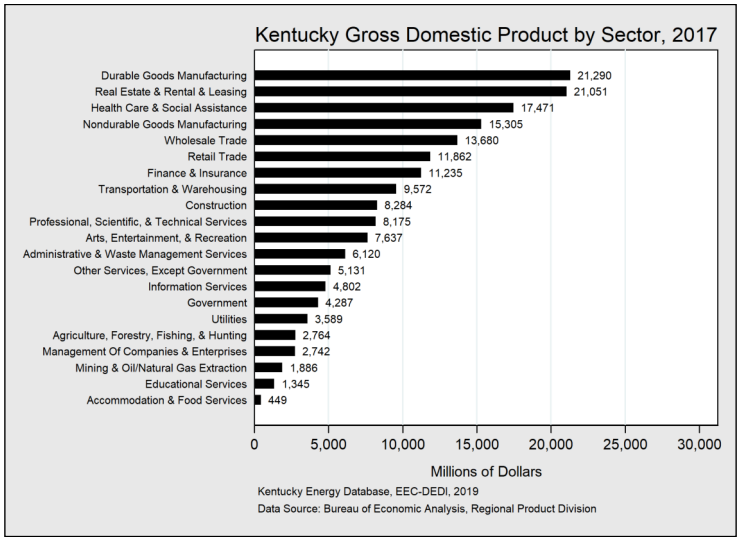
Kentucky's Economy

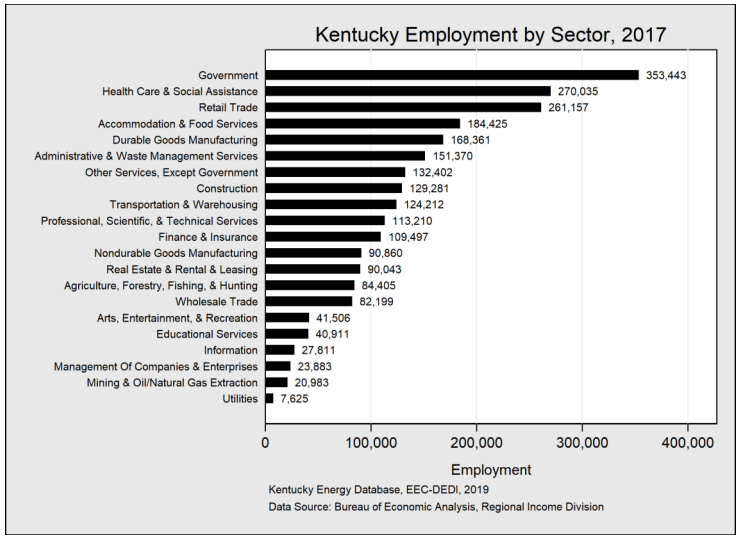




GDP from most sectors has risen gradually in the last 50 years, with output from the service sector rising the most. Manufacturing GDP has been relatively more volatile than that from other sectors, with peaks of output in 1999 and 2006 followed by significant decreases thereafter. After adjusting for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

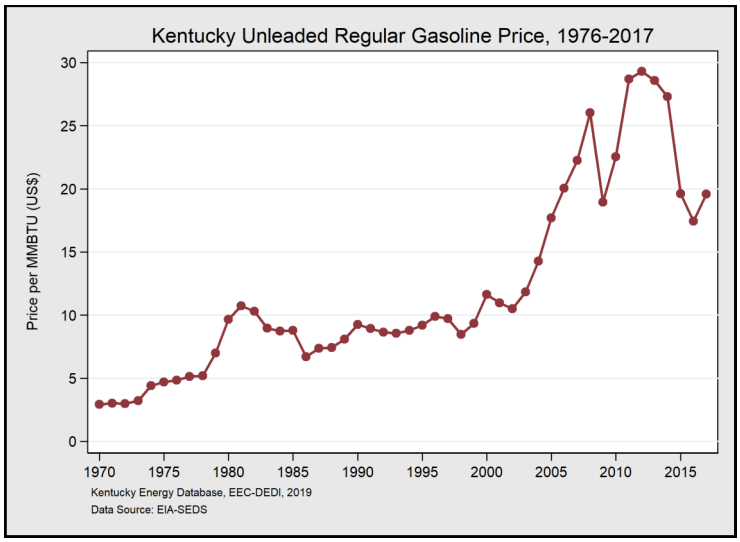




Durable goods manufacturing has the largest portion of state GDP with 10.5%, followed by real estate and rental leasing with approximately 10.5% of the total as well. Nondurable goods manufacturing contributes 7.6%.

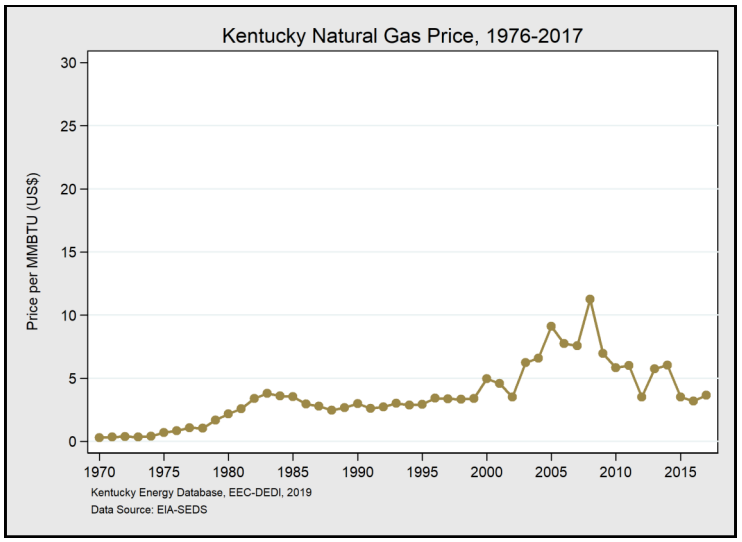
In 2017, the public sector was the single largest employer in Kentucky. Government employment was approximately 14% of total employment, healthcare was 10.7%, and retail trade 10.4%. Employment is defined as the average number of full -time and part-time jobs where wages or salaries are paid.

Kentucky Commodity Prices



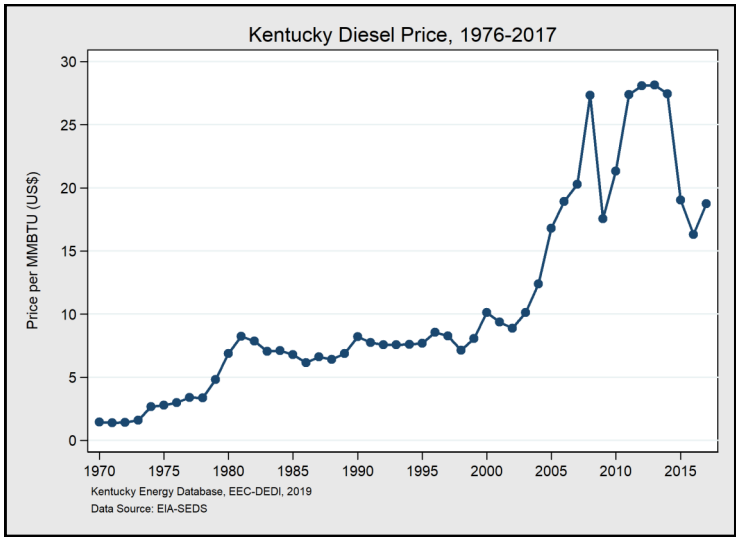
Fuel Type	U.S.$/MMBtu	% Change
Gasoline	19.57	+12.3%

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



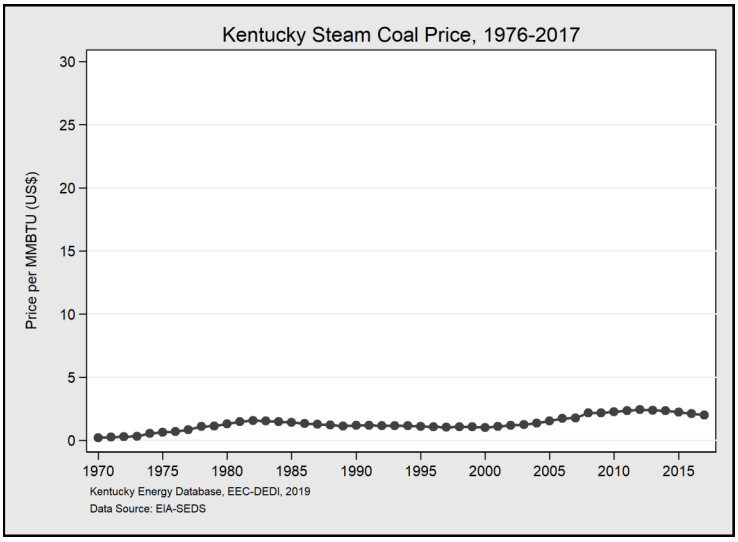
Fuel Type	U.S.$/MMBtu	% Change
Natural Gas	3.64	+14.1%

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%

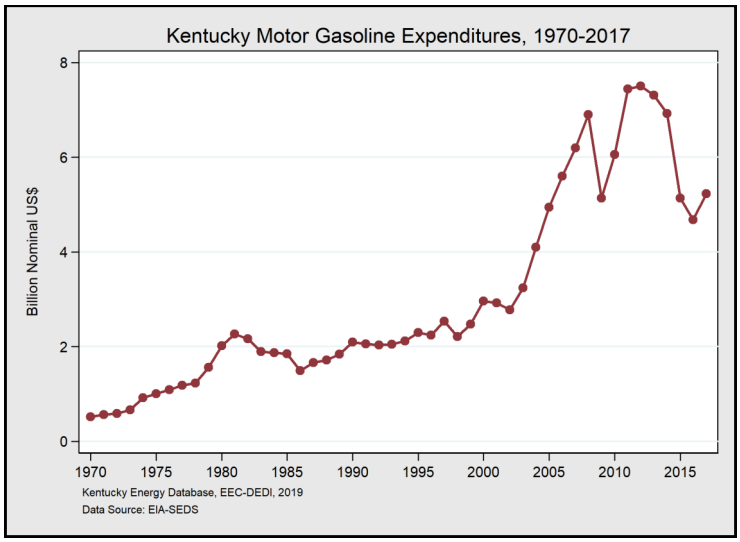
The average retail price of diesel in Kentucky in 2017 was $18.74 per million Btus, a 15% decrease in the price of diesel compared with 2016.



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

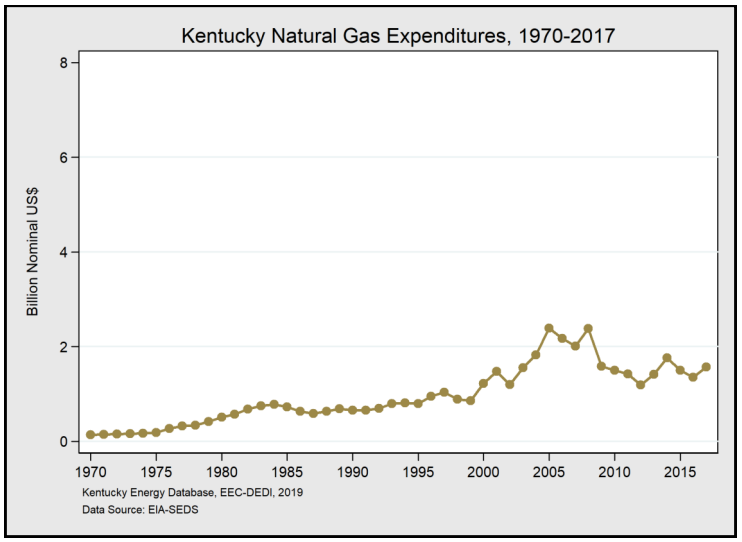
The average price of steam coal in Kentucky in 2017 was $1.99 per million Btus, a 5.7% decrease in the price of steam coal compared with 2016.

Kentucky Commodity Expenditures



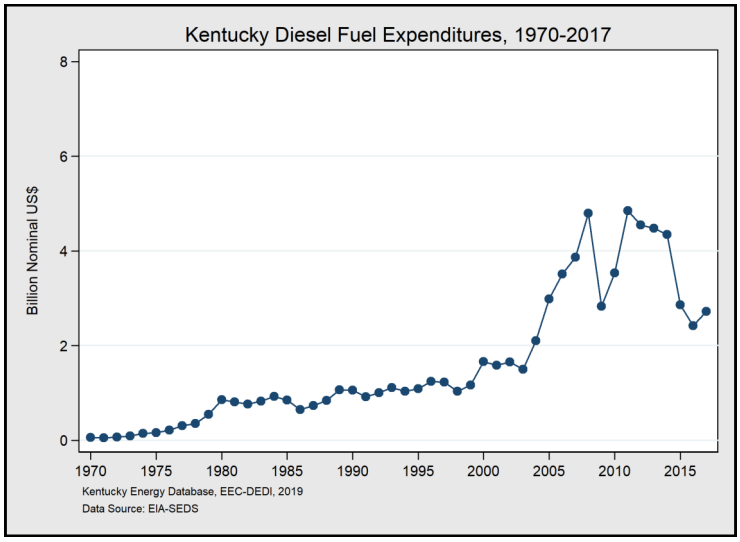
Fuel Type	Million U.S.$	% of Total
Gasoline	5,233	30.2%

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.



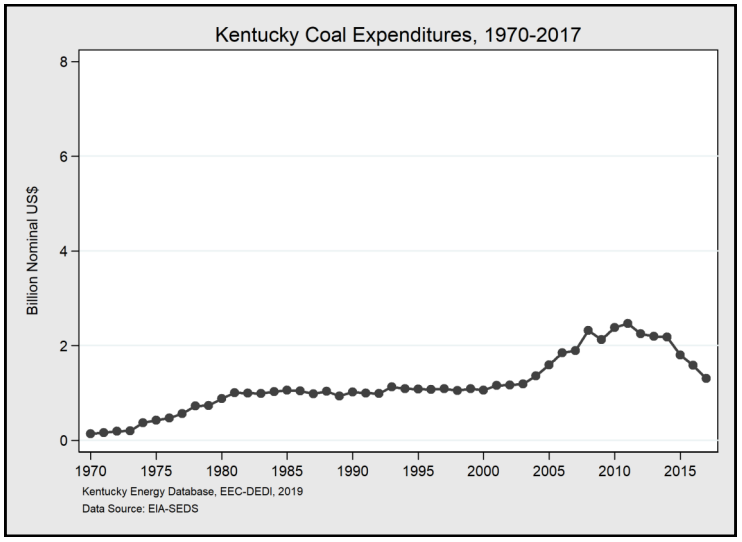
Fuel Type	Million U.S.$	% of Total
Natural Gas	1,507	9%

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.



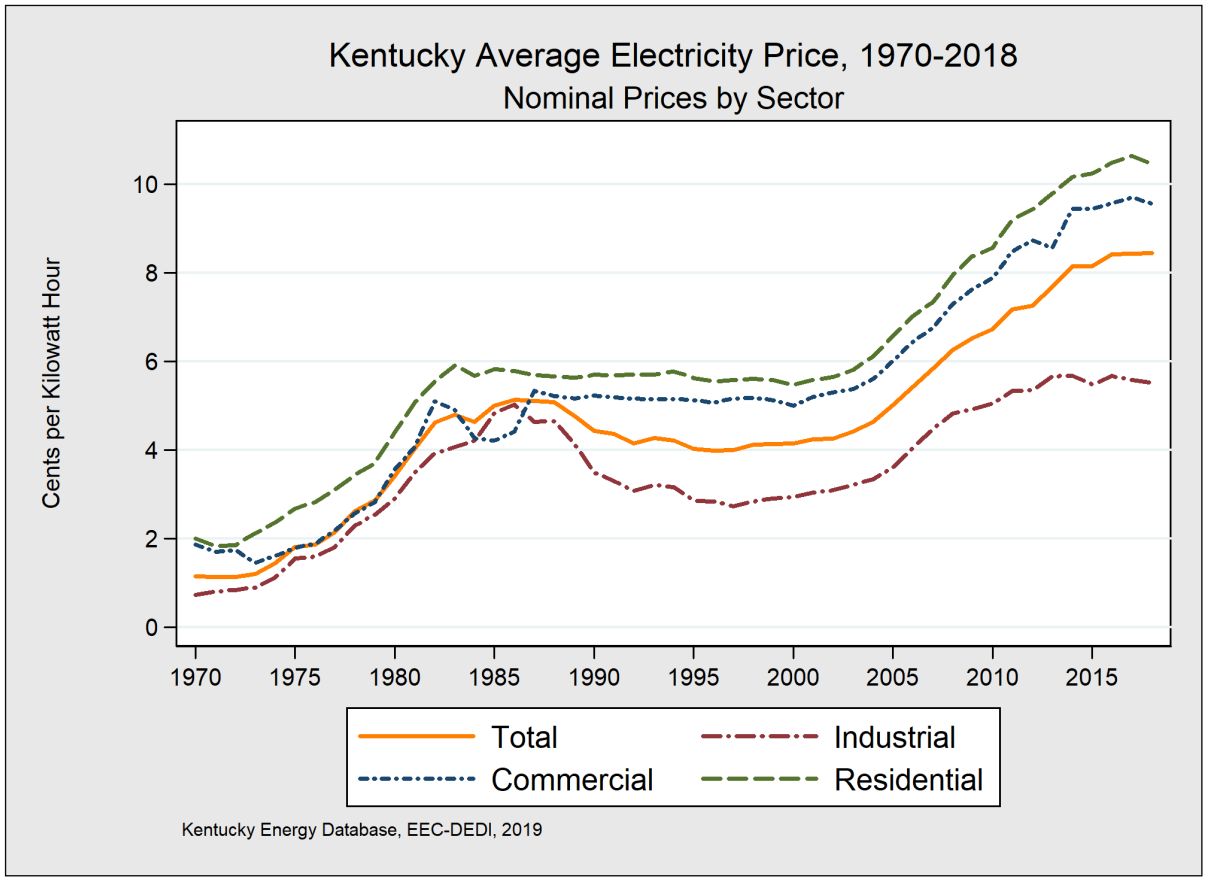
Fuel Type	Million U.S.$	% of Total
Coal	1,303	7.5%

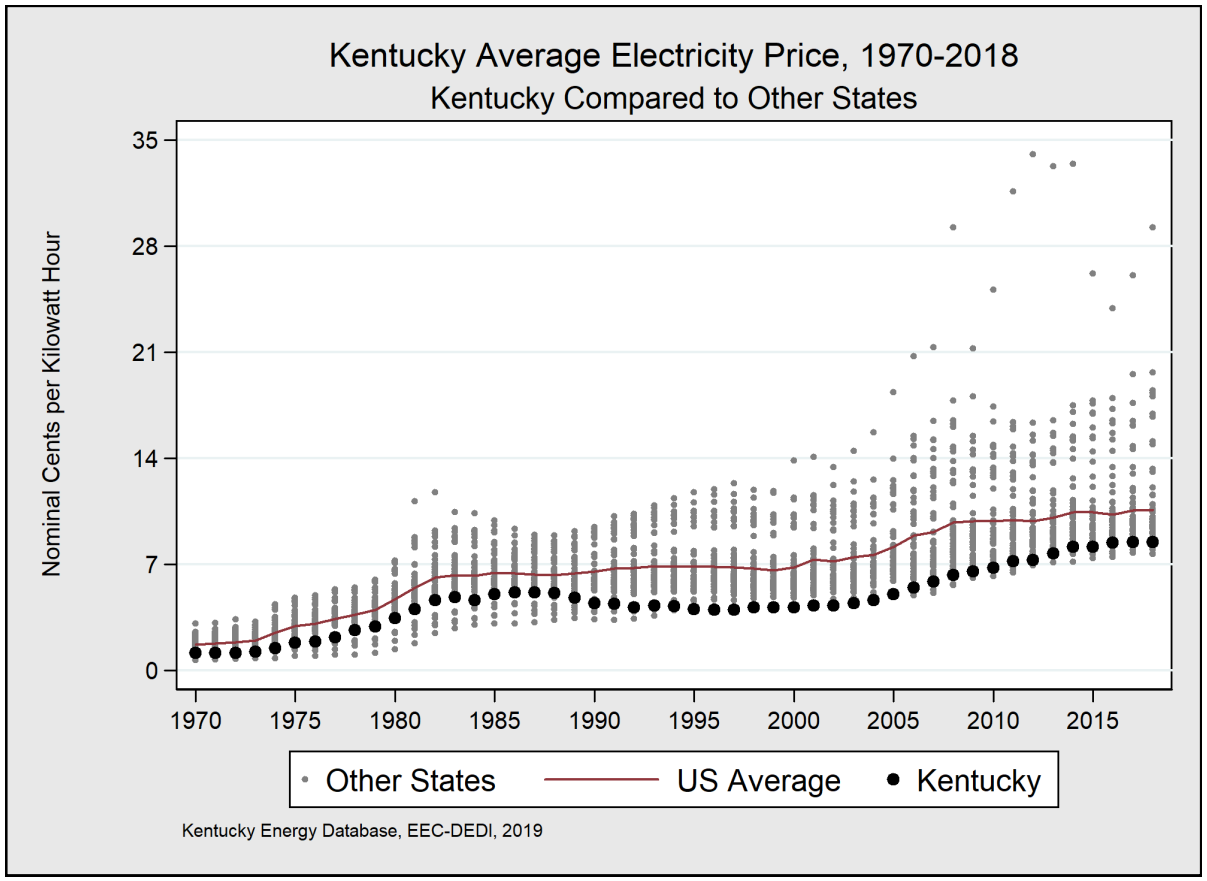
Coal expenditures in Kentucky were approximately $1.3 billion in 2017. Spending on coal decreased by 17.8% from 2016 and accounted for 7.5% of energy expenditures in the state.

Average Price of Electricity by State

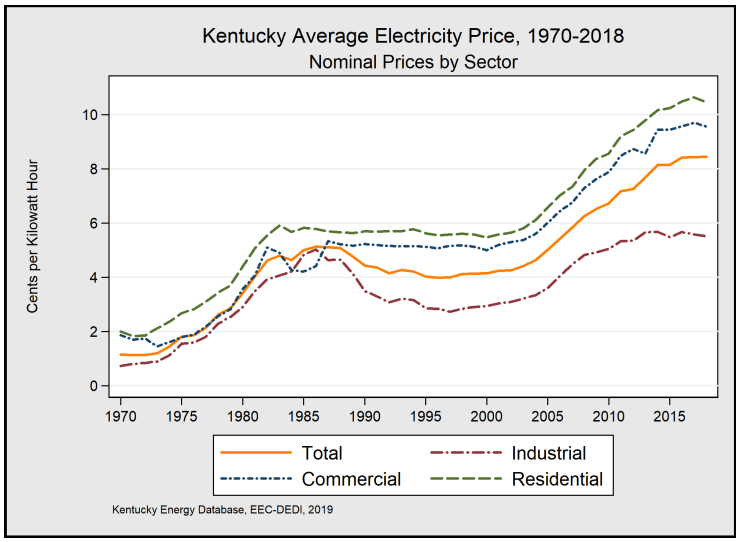
Rank	State	Primary Generation Source	2018 Industrial Price (Cents/kWh)	2018 Total Price (Cents/kWh)	Inflation Adjusted 1 Year Change	Inflation Adjusted 5 Year Change
1	Louisiana	Natural Gas	5.35	7.71	-3.4%	-1.0%
2	Arkansas	Coal	5.64	7.78	-8.1%	+8.9%
3	Washington	Hydroelectric	4.71	8.00	-1.6%	-0.7%
4	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%

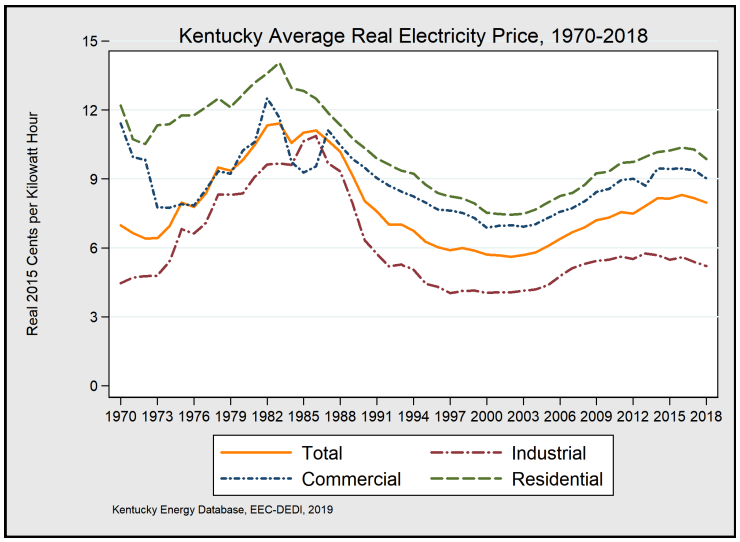
Average Price of Electricity by State





Kentucky Electricity Prices





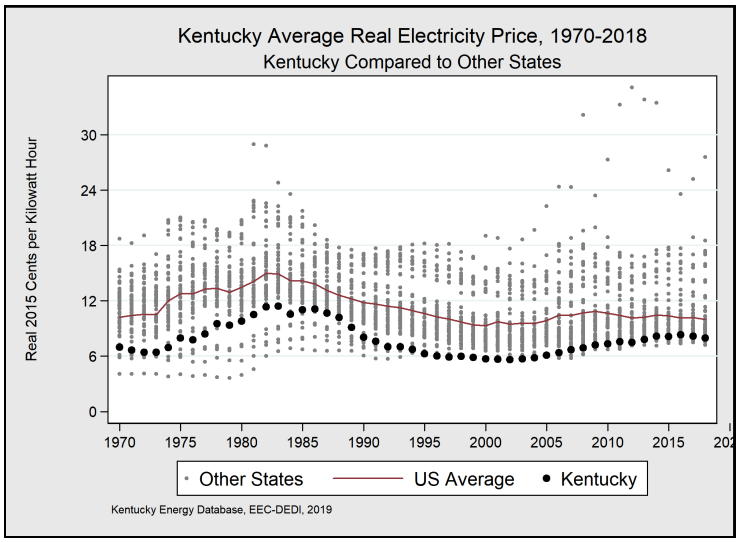
Sector	Nominal Cents/kWh	Since 2010
Average	8.52	+26.6%
Residential	10.60	+23.7%
Commercial	9.74	+23.6%
Industrial	5.68	+12.5%

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

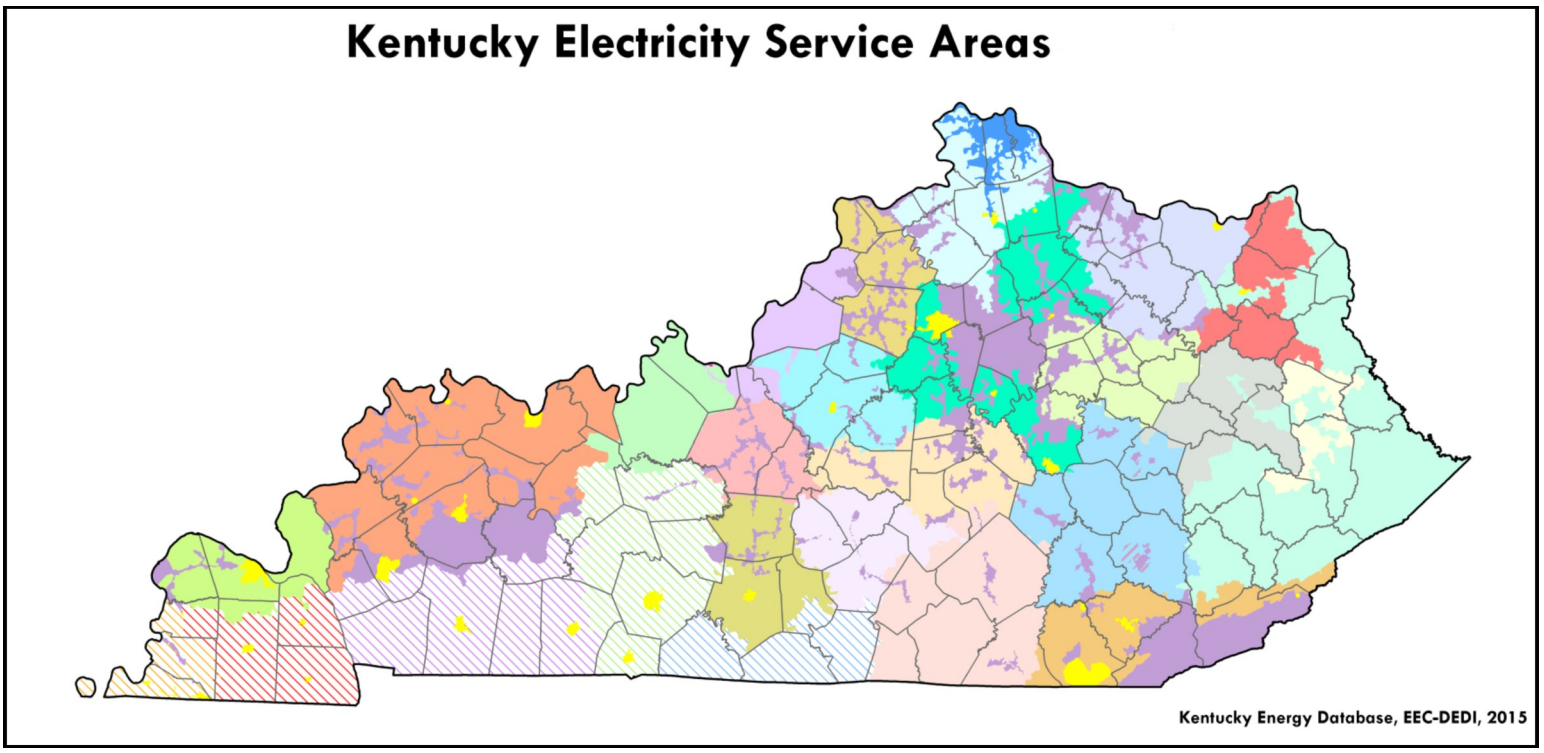
Utility	Average	Commercial	Industrial	Residential	Residential Bill
Barbourville	9.50	9.50	8.51	10.58	$104.74
Big Sandy Rural Elec Co-op	10.86	10.41	7.59	11.26	$136.79
Blue Grass Energy Co-op	9.25	9.90	5.91	10.45	$139.49
City of Bardstown	8.61	9.10	8.03	9.19	$107.16
City of Benton	11.06	11.35	8.03	12.02	$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

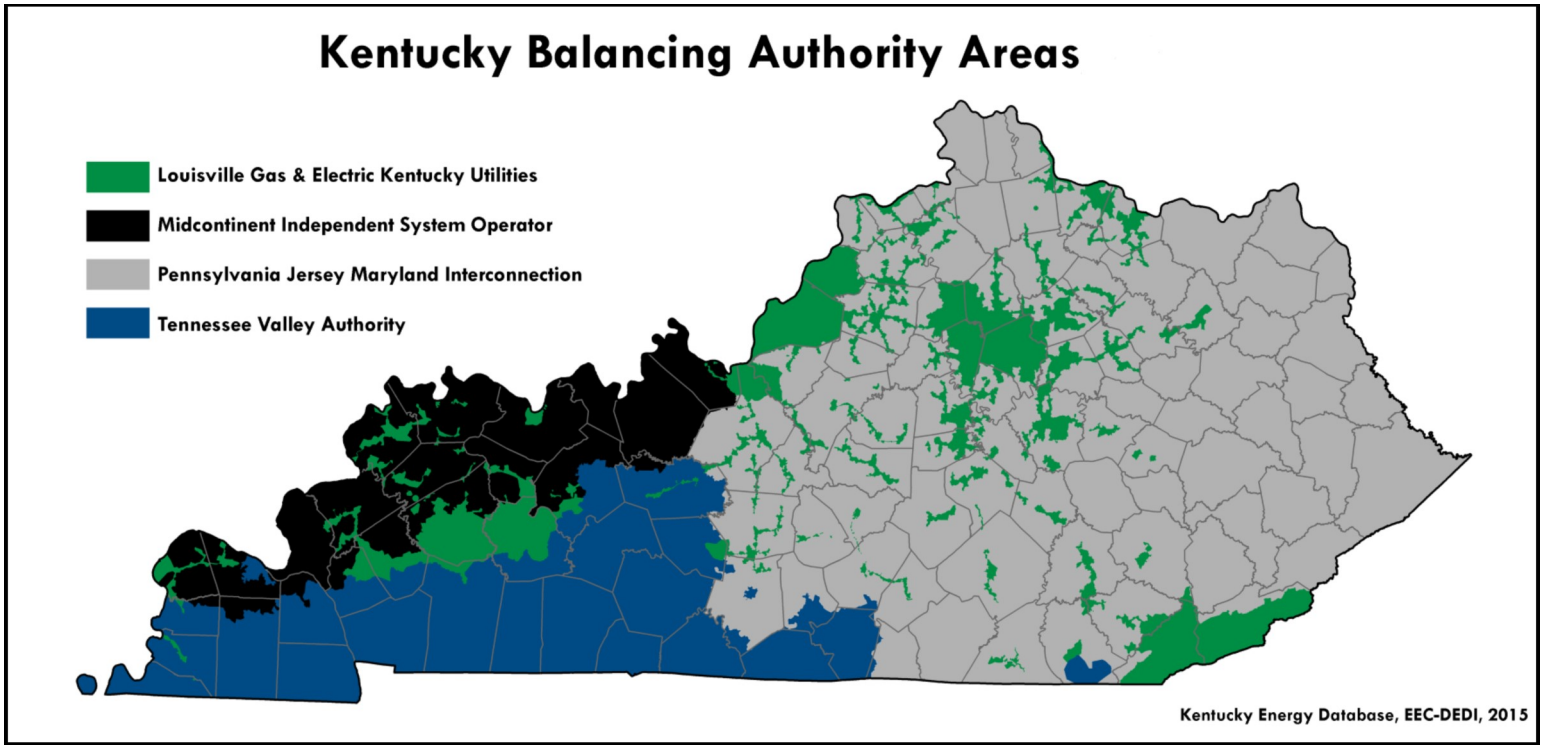


All Municipal Utilities		Kentucky Utilities*	
Big Sandy RECC†		Licking Valley RECC†	
Blue Grass ECC†		Louisville Gas & Electric*	
Clark ECC†		Meade County RECC‡	
Cumberland Valley RECC†		Nolin RECC†	
Duke Energy Kentucky*		Owen ECC†	
Farmers RECC†		Pennyrile RECC§	
Fleming-Mason ECC†		Salt River ECC†	
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

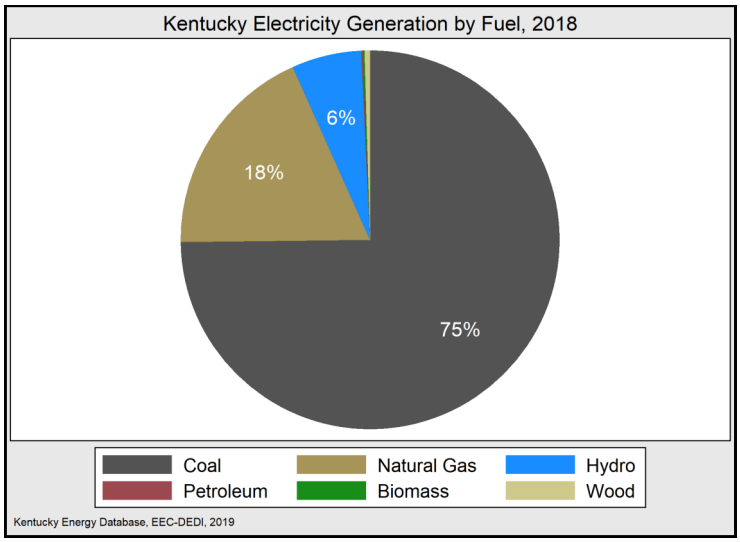
Electric suppliers fall into two categories: IOUs and RECCs. There are four investor-owned companies in Kentucky: Duke Energy Kentucky, Kentucky Power Company (aka. American Electric Power), Kentucky Utilities (KU), and Louisville Gas and Electric (LG&E). Each of these companies generates or purchases 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.

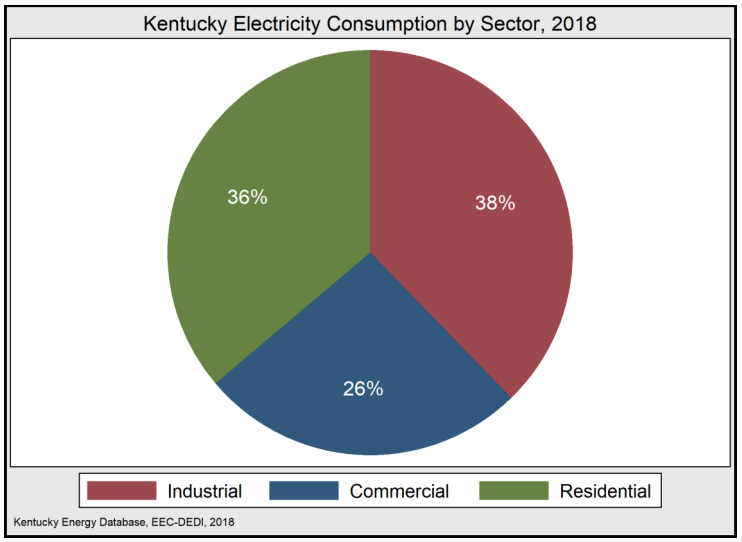
There are 24 RECCs in the state, 19 RECCs that are regulated by the PSC. A distribution cooperative typically receives power from its respective generation and transmission cooperative at a substation in the distributor's service territory. Five RECCs and ten municipal utilities purchase electricity 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.

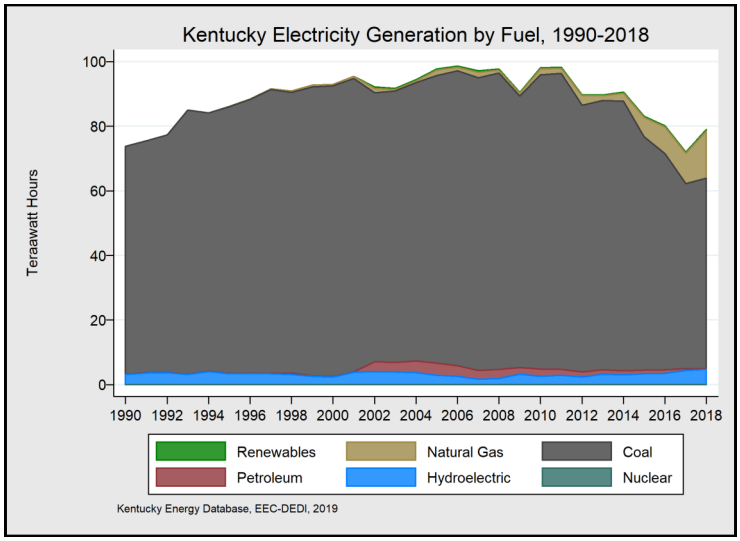
Kentucky Electricity

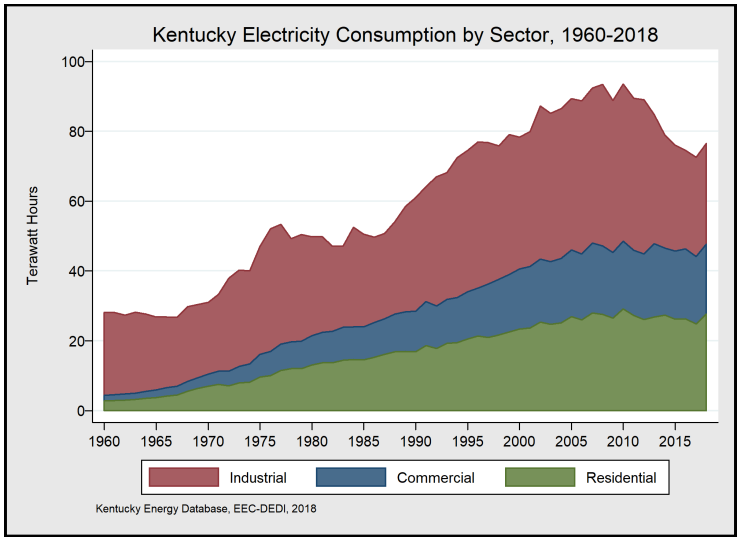




Fuel Type	Gigawatt Hours	1 Year Change
Total	79,191	+9.8%
Coal	59,168	+3.4%
Hydro	4,723	+5.8%
Natural Gas	14,606	+55.5%
Petroleum	88	-83.0%
Wood & Biomass	375	+7.9%

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%



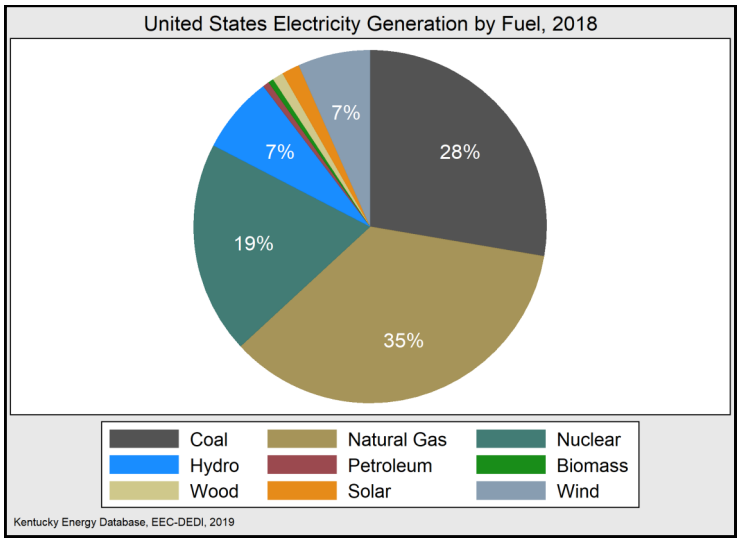


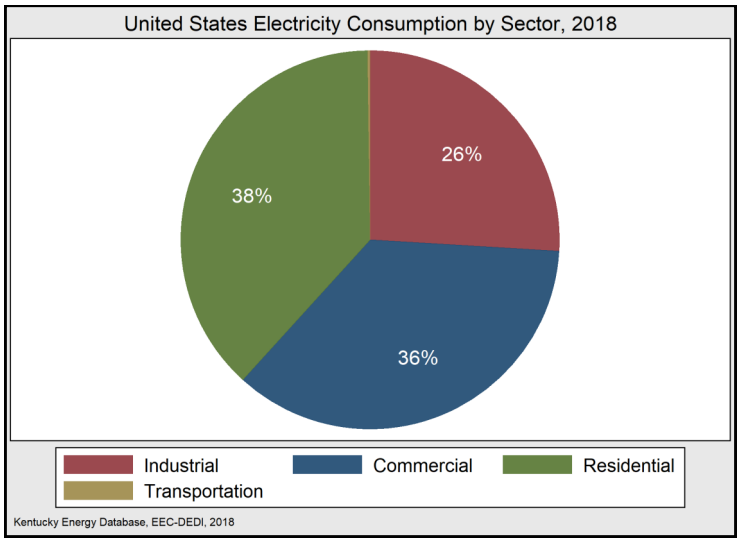
Of the electricity generated in Kentucky in 2018, 75% was derived through the combustion of coal. Coal-fired electricity generation decreased substantially. Natural gas facilities were the second-largest source of electricity. Hydroelectric power increased slightly and produced the third most of all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

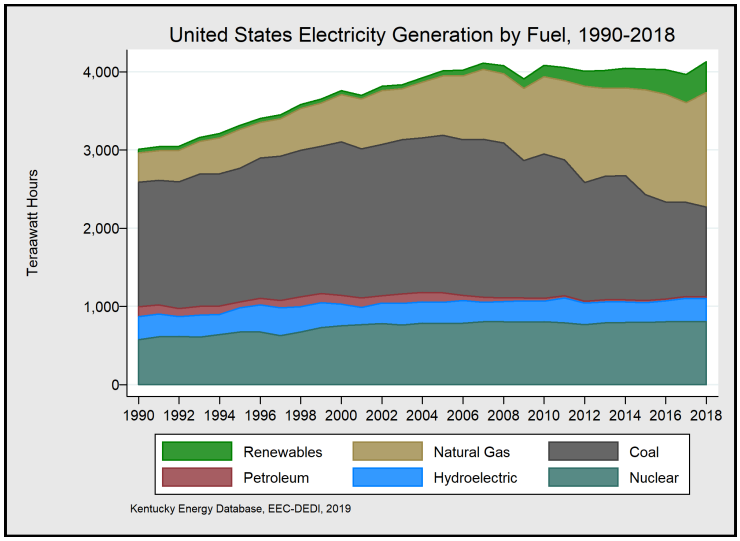
United States Electricity

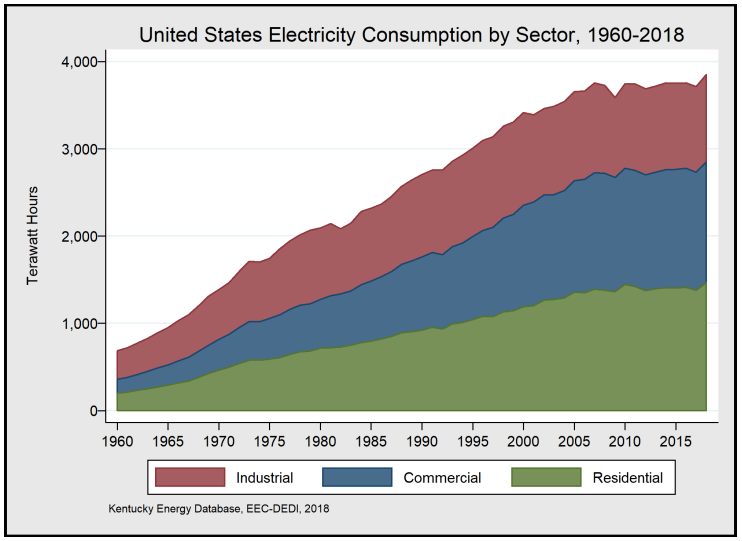




Fuel Type	Gigawatt Hours	1 Year Change
Total	4,177,810	+4.1%
Natural Gas	1,468,013	+15.3%
Coal	1,146,393	-5.1%
Nuclear	807,078	+0.3%
Hydro	291,724	-2.8%
Wind	274,952	+8.1%

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%

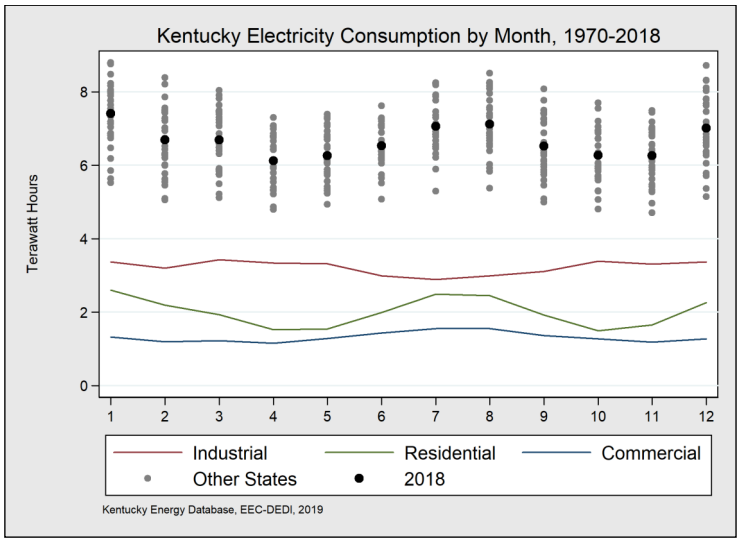




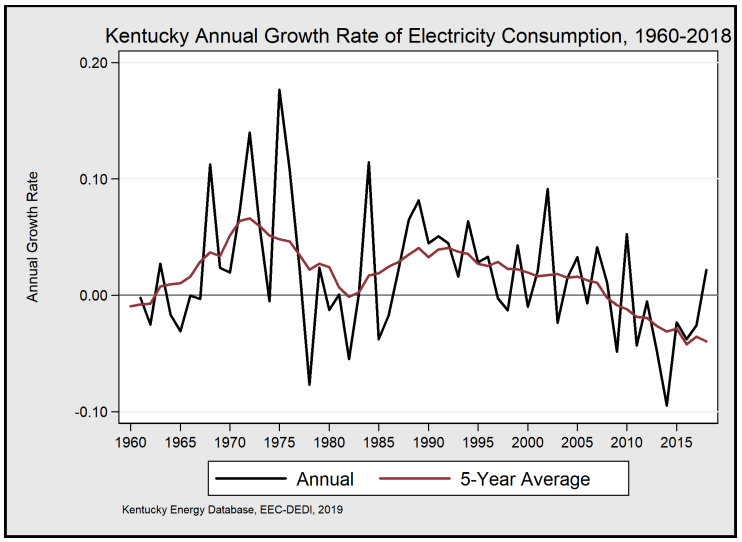
The United States generated more than four petawatt-hours in 2018, an increase of 4.1%. Electricity generation from natural gas became the largest source of electricity at 35% of total, and increased by 15.3% compared to 2017. Wind electricity generated 7% of total electricity requirements. Nuclear and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

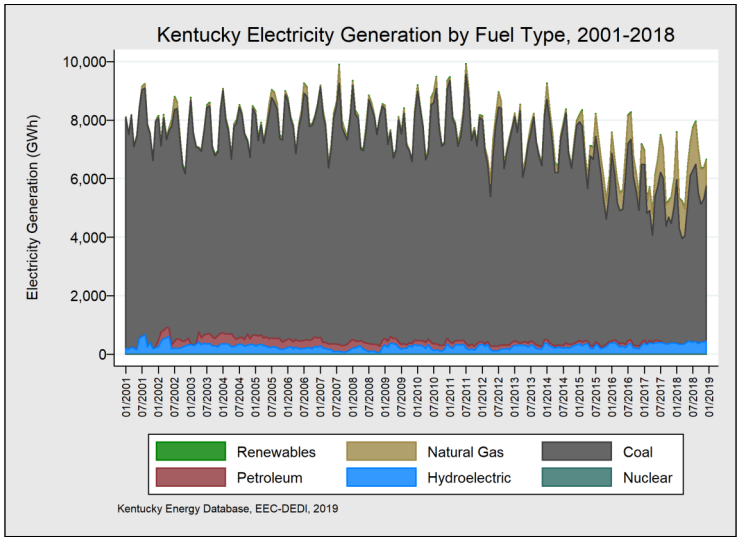
Kentucky Monthly Electricity



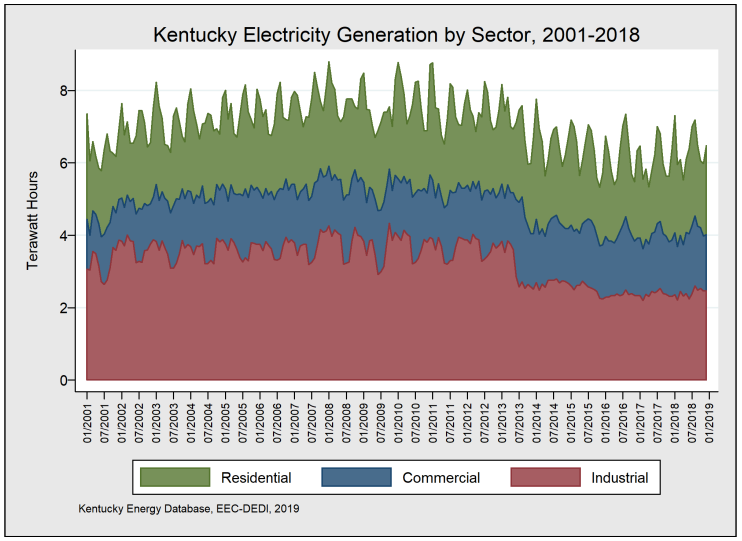
Seasonal fluctuations in Kentucky's electricity consumption are largely the result of the residential sector, which utilizes electricity for air conditioning in the summer and heating in the winter. On average, the highest demand for electricity in Kentucky occurs in summer and winter.



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.

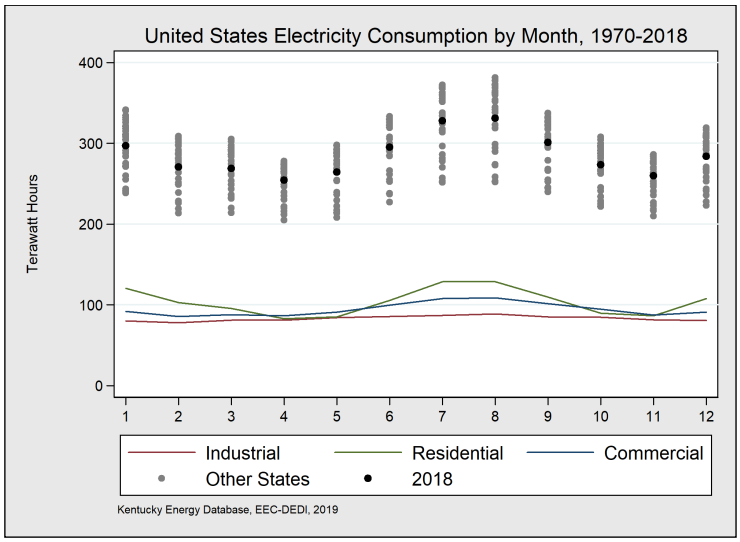


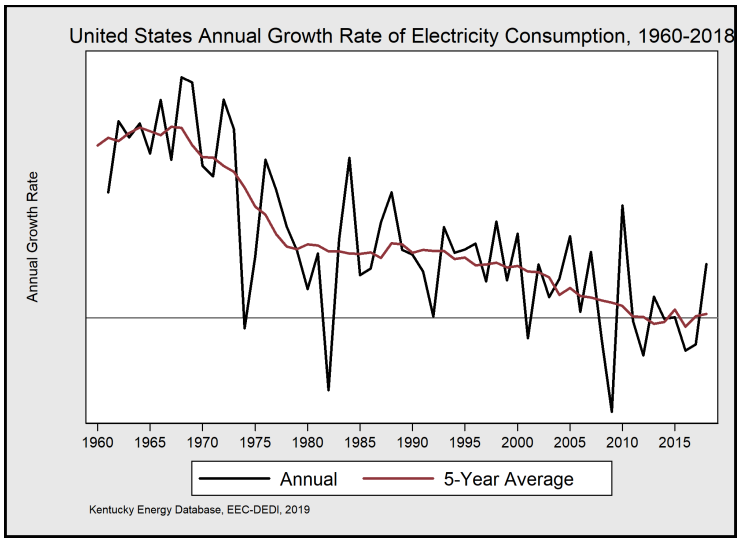
Coal-fired generation supplies the vast majority of electricity in Kentucky. During the spring and fall, electricity demand is lower and some coal plants go offline for maintenance.



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.

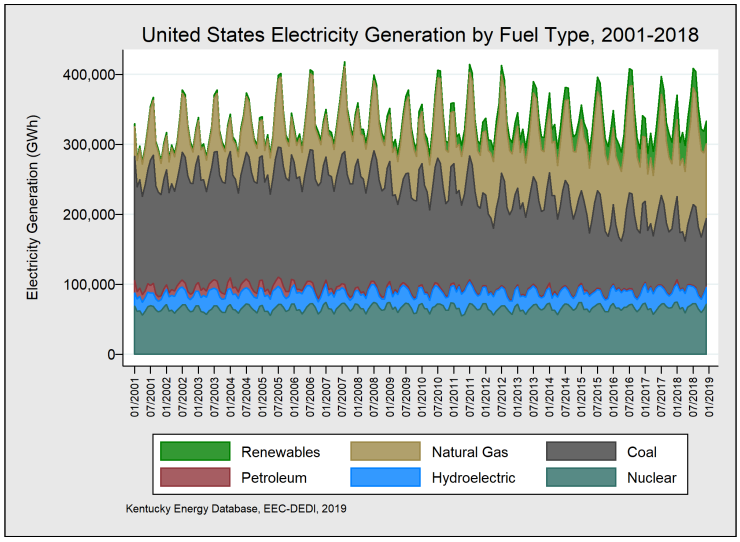
United States Monthly Electricity

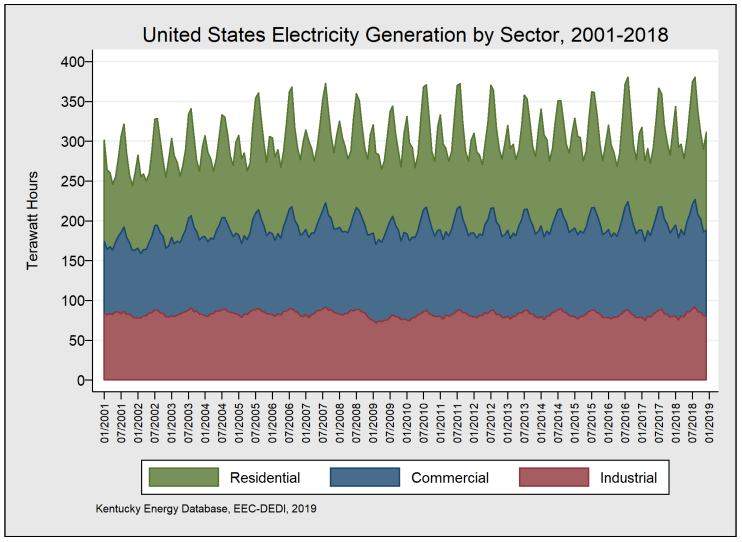




Electricity demand in the United States is approximately the same across all sectors during spring and fall, but demand for heating and air conditioning increases residential and commercial electricity demand in the summer and winter. In contrast, industrial demand is fairly constant throughout the year. 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

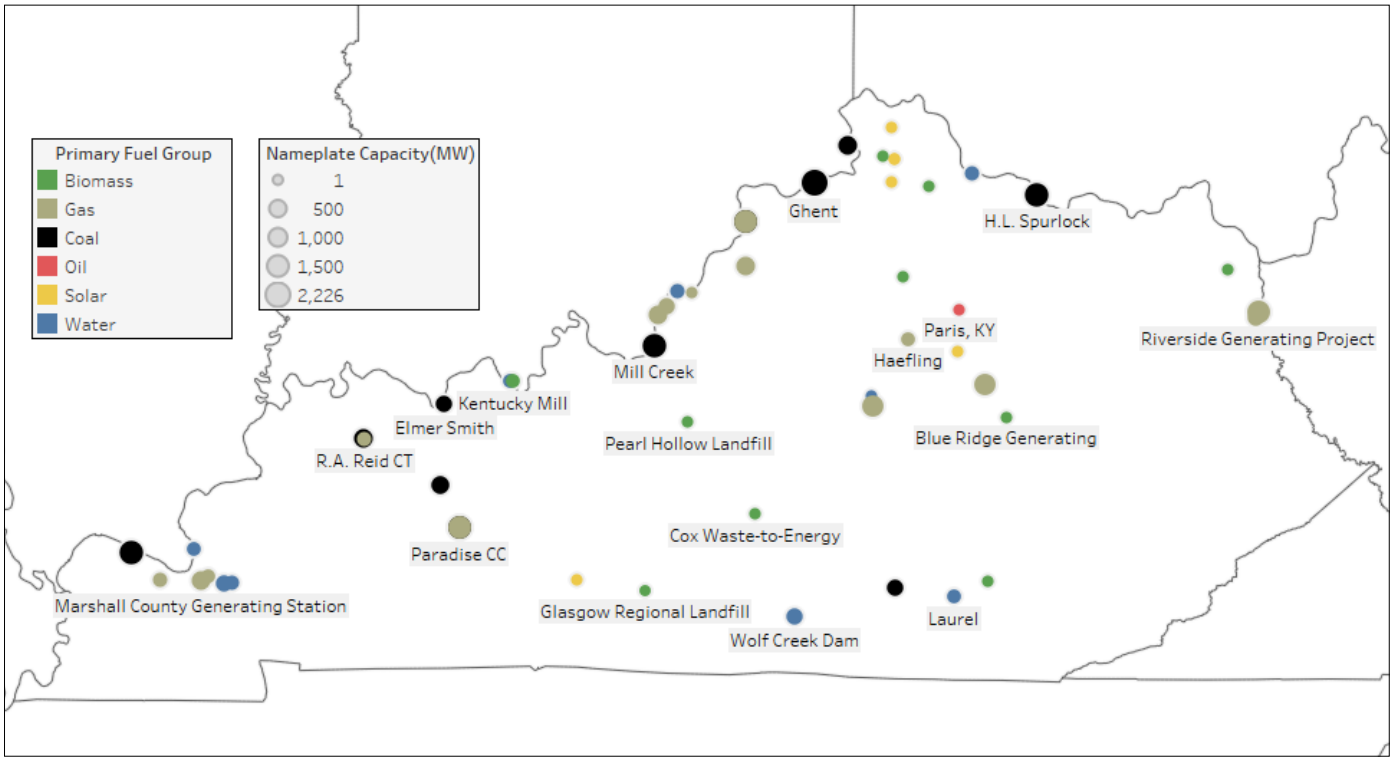
The capacity factor of a generating unit is a ratio of actual power output from a unit versus the maximum possible output from a unit over a period of time. To calculate the maximum possible output of a unit, the rated nameplate capacity (MW) is multiplied by time (typically, hours per year). The actual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

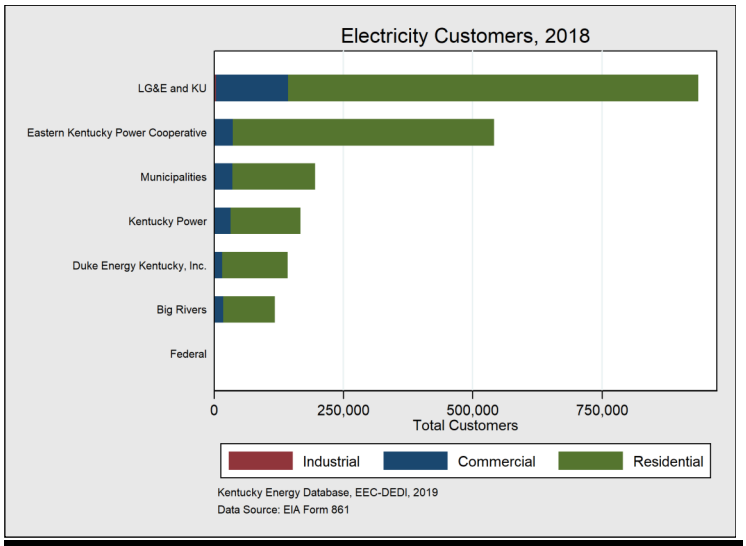
	Name	Online Year	Owner
25	Glasgow Regional Landfill	2015	EKPC
26	Green Valley Landfill	2003	EKPC
27	Laurel Ridge Landfill	2003	EKPC
28	City of Paris	1934	City of Paris
29	Pearl Hollow Landfill	2006	EKPC
30	Pendleton County Landfill	2007	EKPC
31	Barkley	1966	USCE - Nashville District
32	Cannelton Dam	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

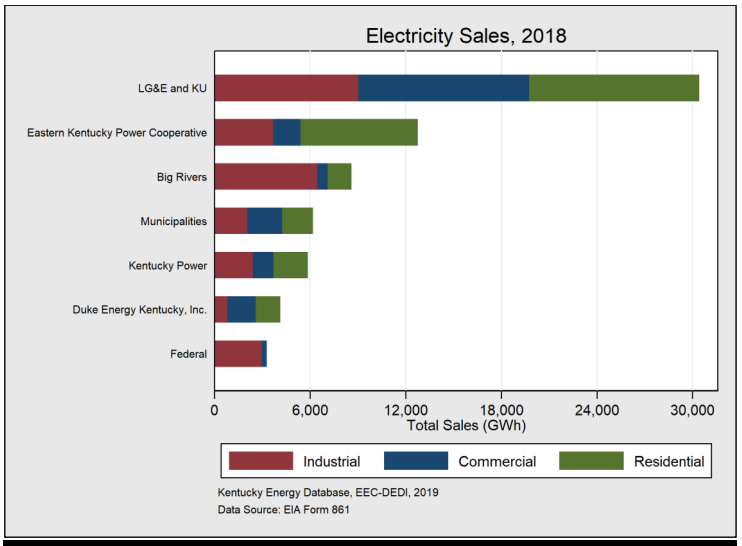
Power Plants in Kentucky



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.

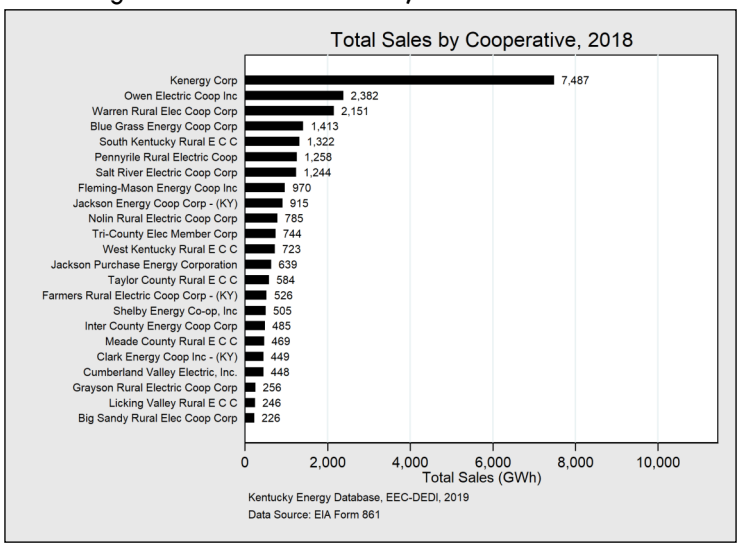
Electricity Utilities in Kentucky

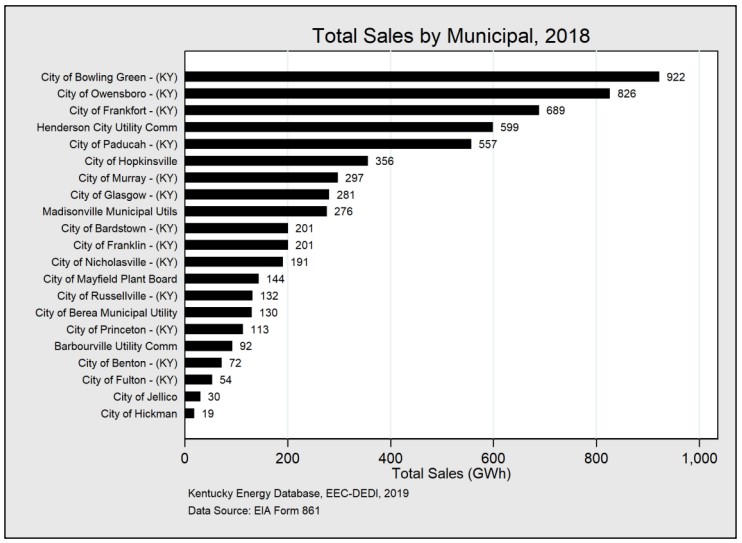




Entity	Consumers	Percentage
Total	2,273,234	100%
LG&E and KU	936,698	41.2%
EKPC	541,504	23.8%
Municipalities	194,964	8.6%
TVA	173,701	7.6%
Kentucky Power	166,603	7.3%
Duke Energy	142,393	6.3%
Big Rivers	117,371	5.2%

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%

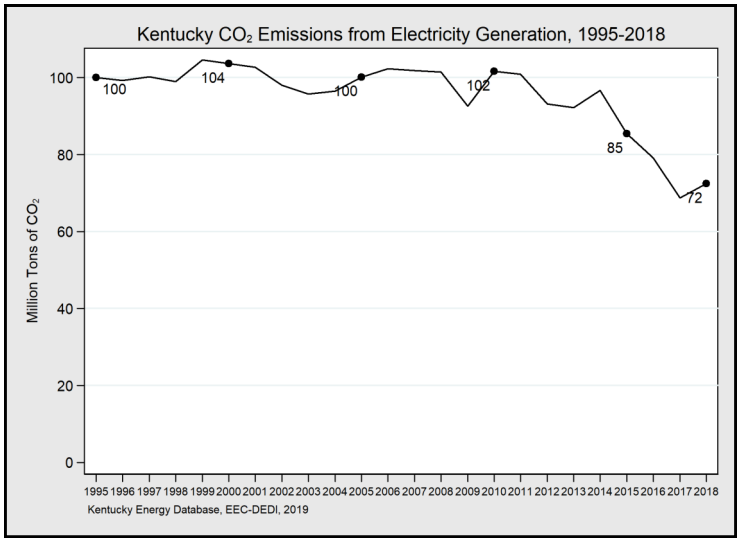


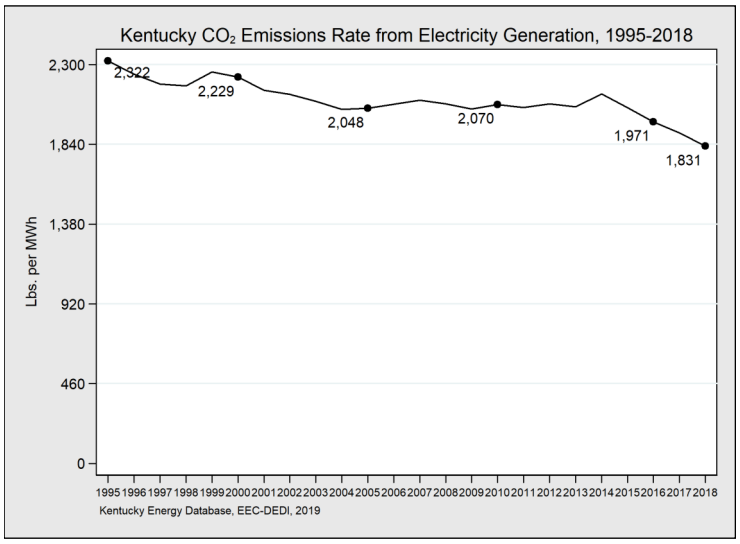


Utilities in Kentucky sold 76 TWh to 2.2 million consumers in 2018. Households accounted for 87% of consumers, but were 36% of consumption. The 6,749 industrial firms are less than 1% of total customers, but used 38% of all electricity consumed in Kentucky in 2018. LG&E and KU sell to 41.2% of consumers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

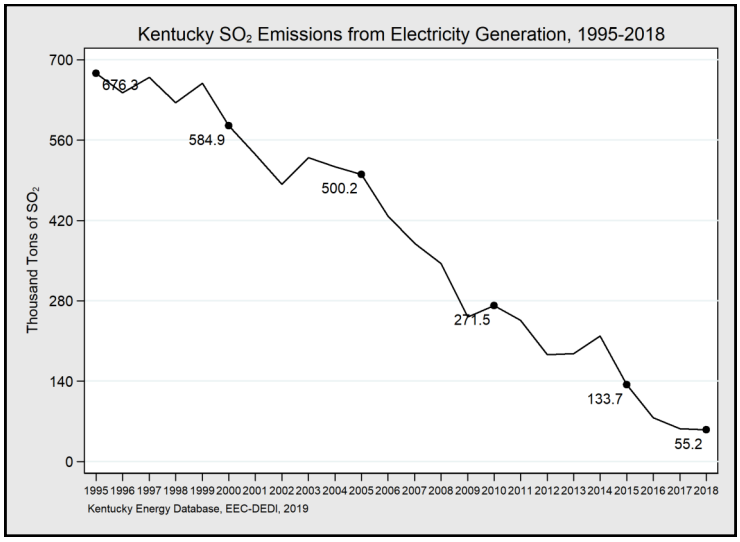
Kentucky Electric Power Emissions



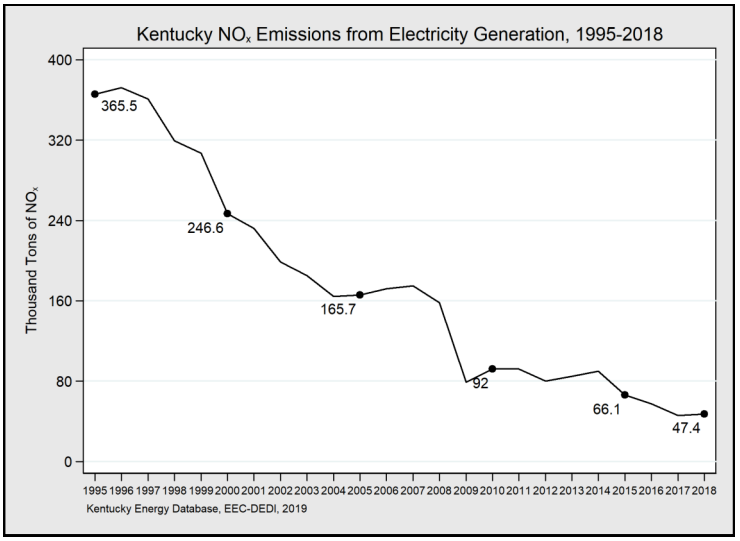


Emission	Tons	Since 1995
Carbon Dioxide	72,481,578	-27.5%
Sulfur Dioxide	55,159	-91.8%
Nitrogen Oxides	47,380	-87.0%

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.

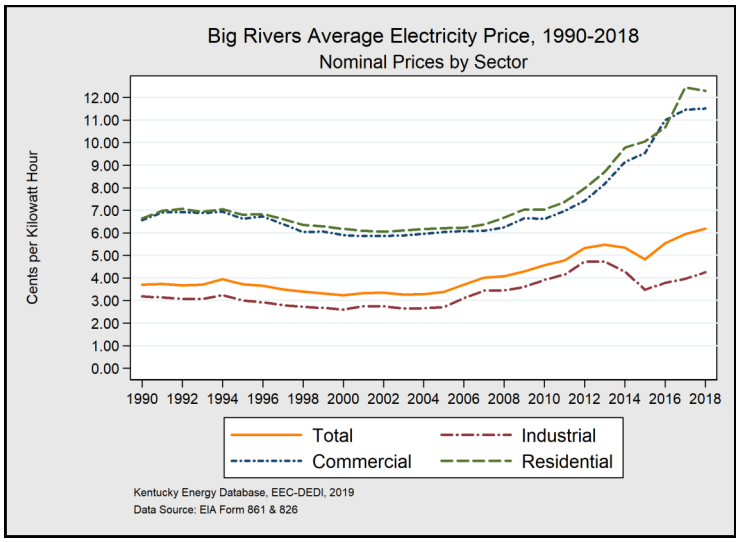


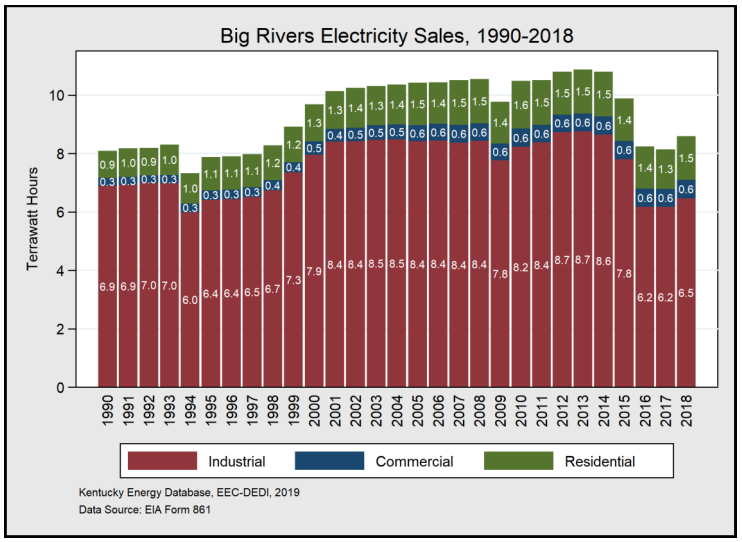
Sulfur dioxide (SO_2) is a highly reactive gas and major pollutant that is monitored and regulated by the state and federal government due to its connection to acid rain, incidence of asthma, and other respiratory problems. In 2018, the electric power sector of Kentucky emitted 55,159 tons of sulfur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



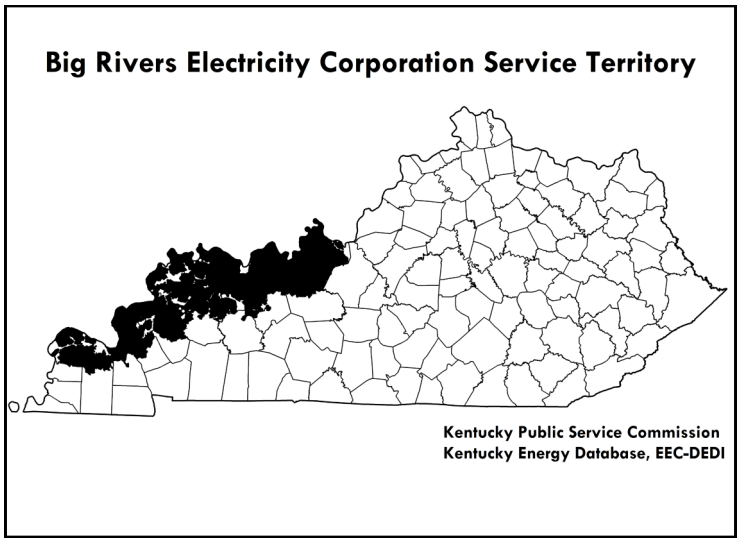


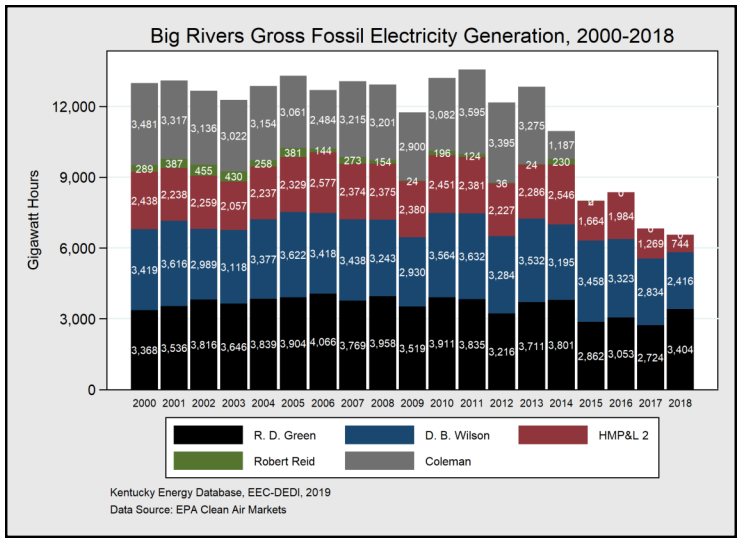
Sector	Price (Cents/kWh)	Since 2010*
Total†	6.19	+24.6%
Residential	12.30	+51.2%
Commercial	11.51	+50.1%
Industrial	4.26	-5.87%

*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



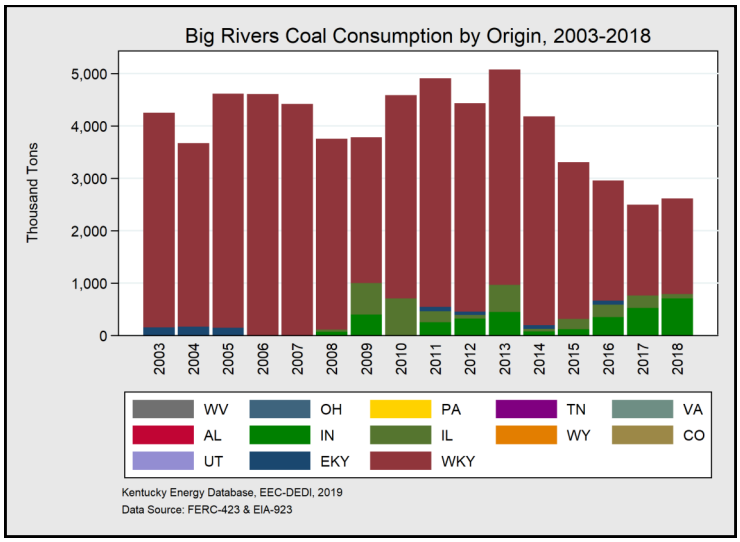


Big Rivers Electric Corporation generates and sells electricity in northwestern Kentucky. Total electricity prices in 2018 were 6.19 cents per kWh and have increased by 11% since 2015 in inflation-adjusted dollars. Big Rivers serves three RECCs: Kenergy Corporation, Meade County RECC, and Jackson Purchase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

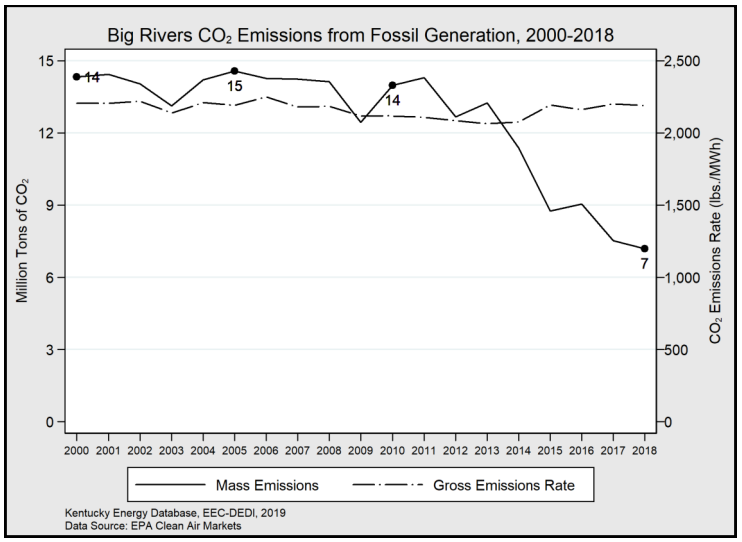
Electricity Generation	2018	Since 2010
Gigawatt Hours	6,564	-50.3%

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

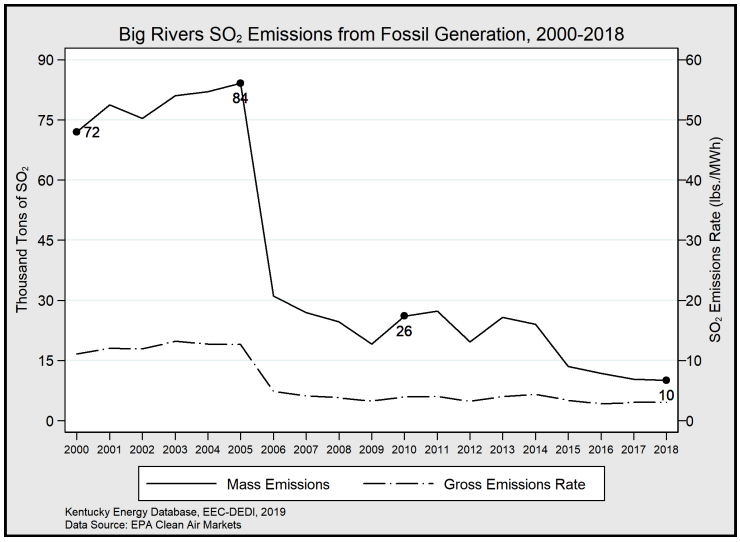


State	2018 Tons	Percentage
Total	2,613,921	100%
Western Kentucky	1,823,740	69.8%
Indiana	709,324	27.1%
Illinois	80,857	3.1%



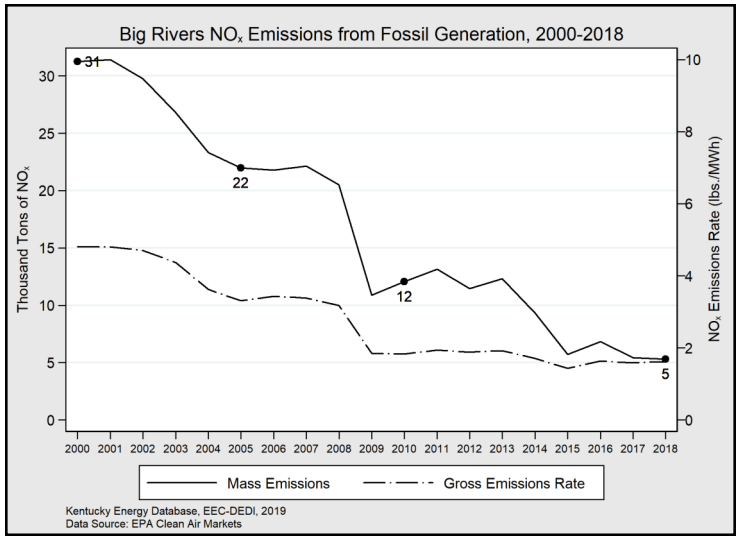
Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	7,185,669	-48.6%
Rate (lbs./MWh)	2,189	+3.4%

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%

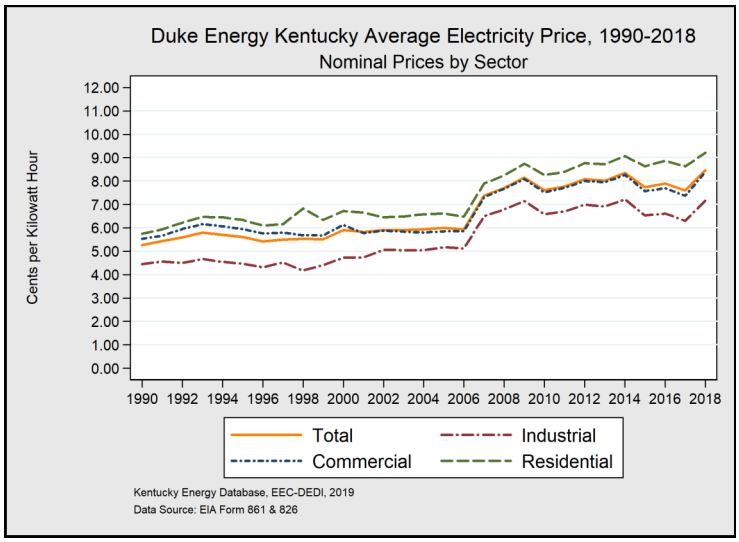
Big Rivers Electric Corporation emitted 10,000 tons of SO_2 in 2018, a decrease of 61.5% since 2010. The rate of SO_2 emissions decreased by 23% during that period.

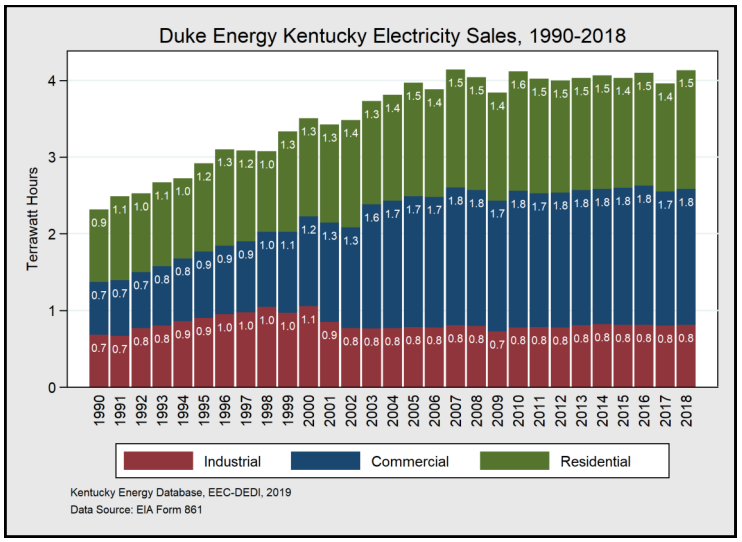


Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	5,311	-56%
Rate (lbs./MWh)	1.62	-16.6%

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

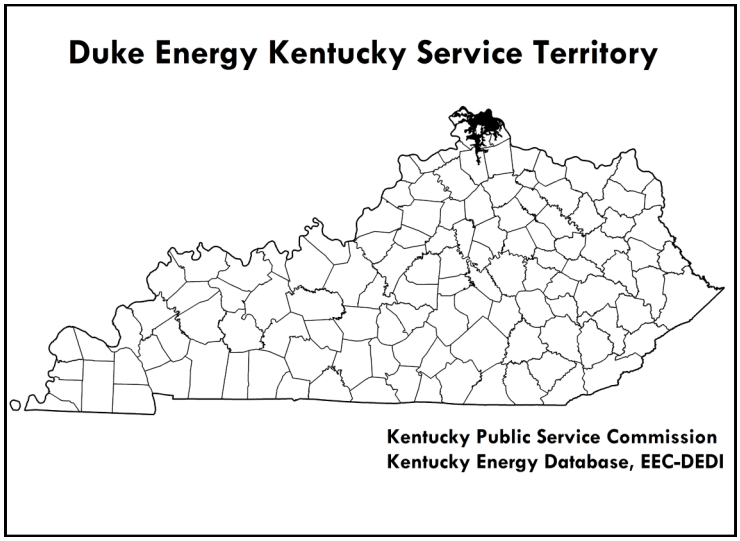


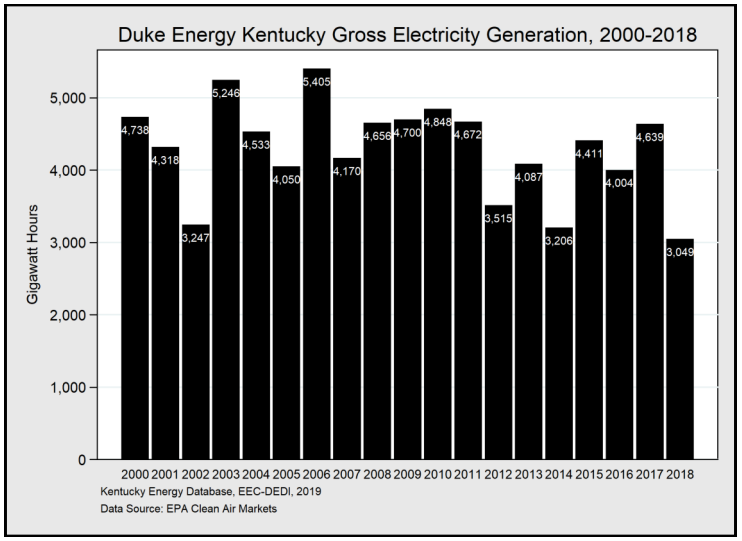


Sector	Price (Cents/kWh)	Since 2010*
Total†	8.46	-3.6%
Residential	9.21	-3.2%
Commercial	8.39	-3.1%
Industrial	7.17	-5.4%

*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%



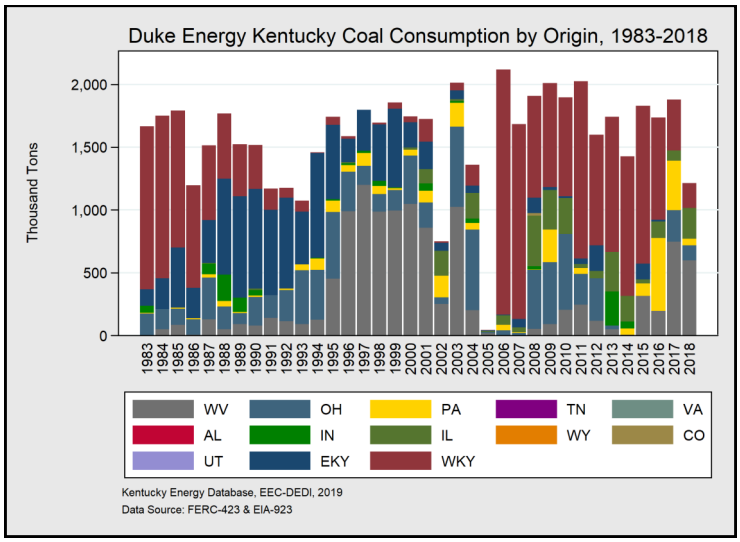


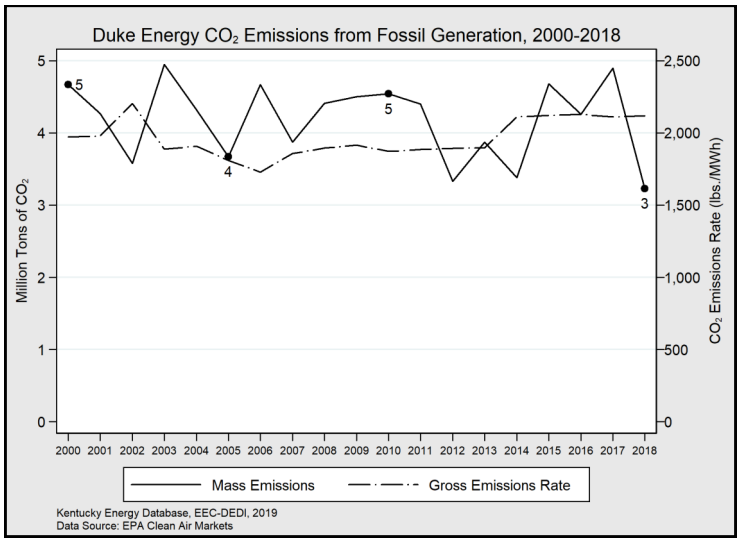
Duke Energy Kentucky generates and sells electricity in northern Kentucky and is owned and operated by Duke Energy. Total electricity prices in 2018 were 8.46 cents per kWh and have decreased by 3.6% since 2010 in inflation-adjusted dollars. Duke Energy owns and operates the East Bend coal-fired power 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

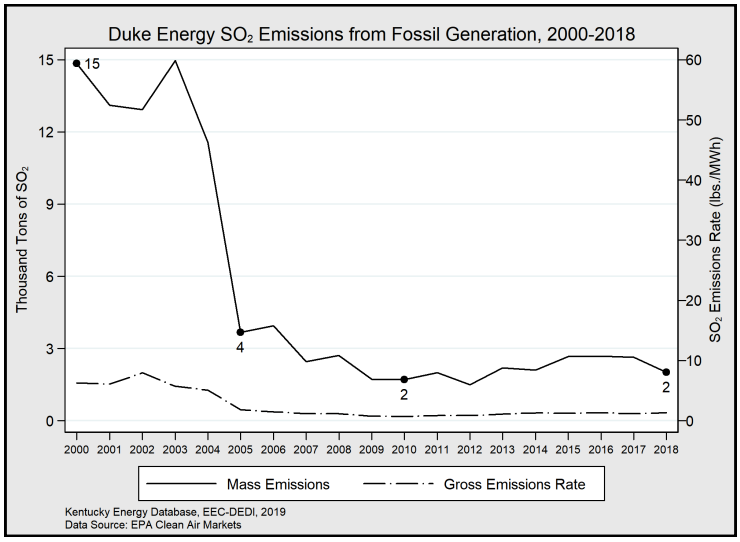


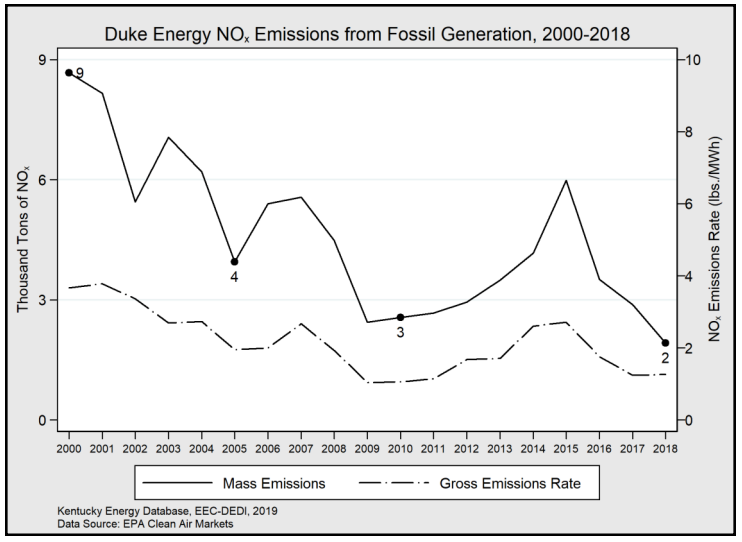


State	2018 Tons	Percentage
Total	1,094,483	100%
Western Kentucky	198,686	18.2%
Illinois	246,668	22.5%
Pennsylvania	50,642	4.6%
West Virginia	598,487	54.7%

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.





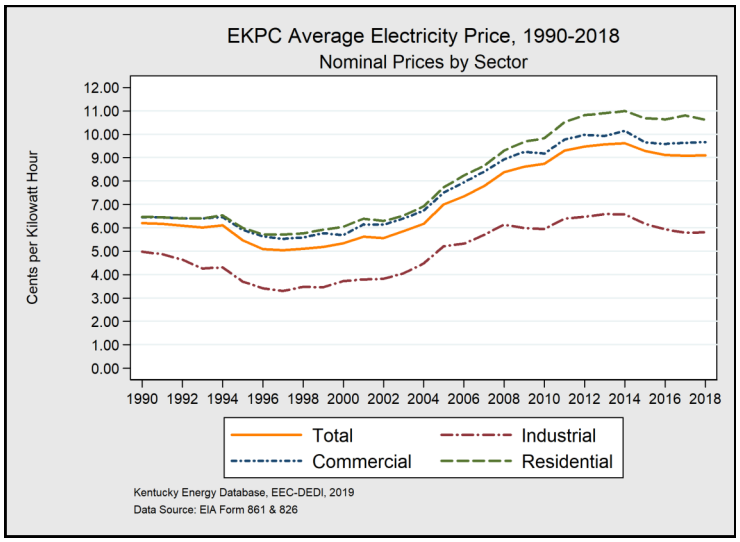
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	2,012	+17.6%
Rate (lbs./MWh)	1.32	+88%

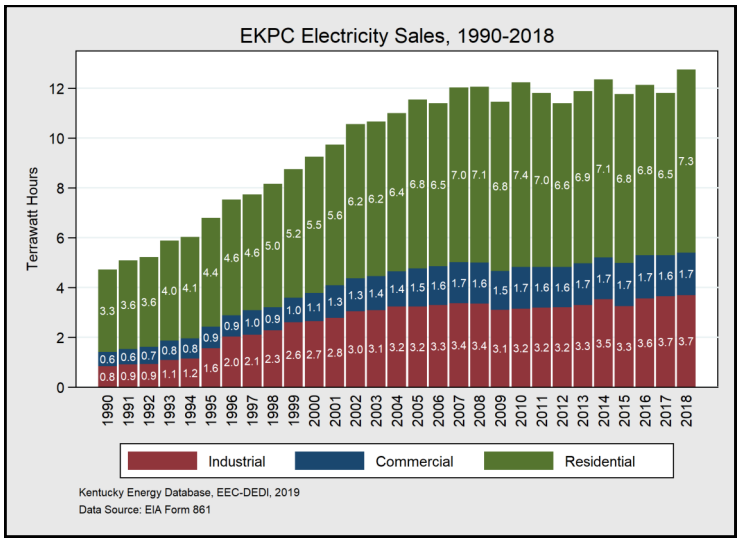
Duke Energy Kentucky emitted 2,012 tons of SO_2 in 2018, an increase of 17.6% since 2010. The rate of SO_2 emissions increased by 88% during that period while still remaining within the range of rates emitted by other utilities.

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



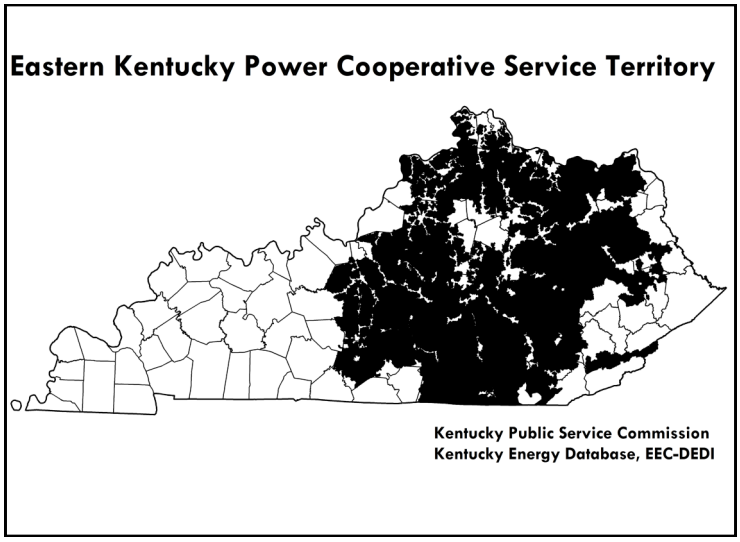


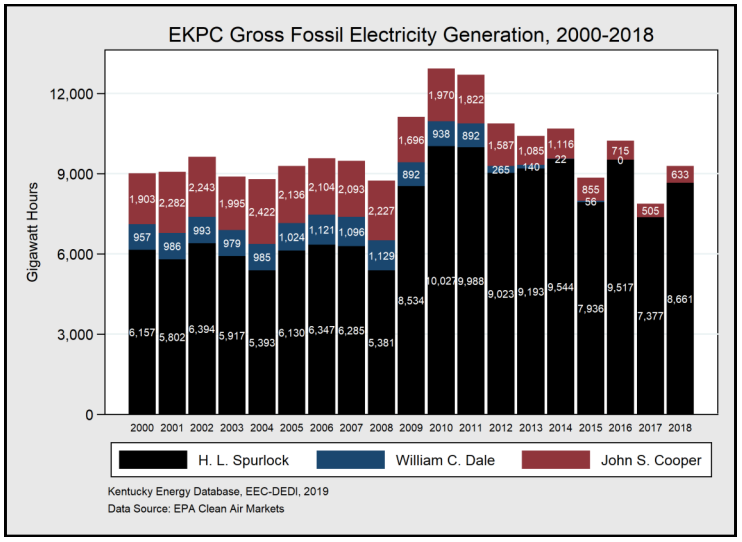
Sector	Price (Cents/kWh)	Since 2010*
Total	9.10	-9.6%
Residential	10.62	-6.2%
Commercial	9.67	-8.5%
Industrial	5.81	-15.3%

*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



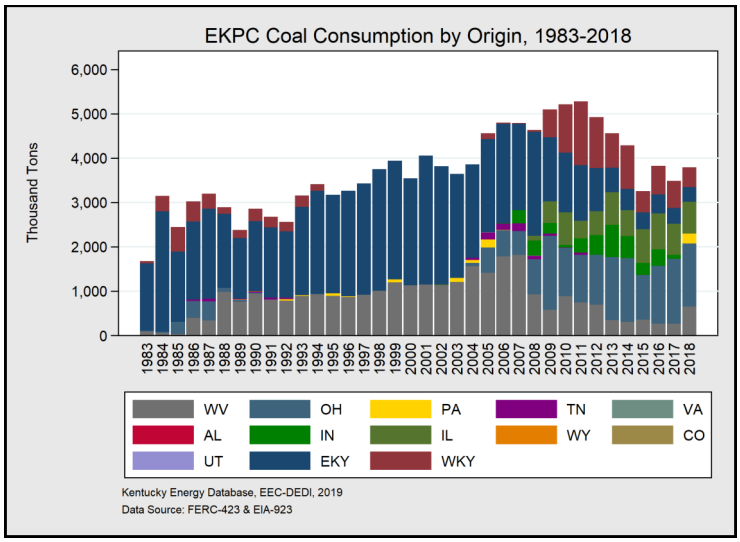


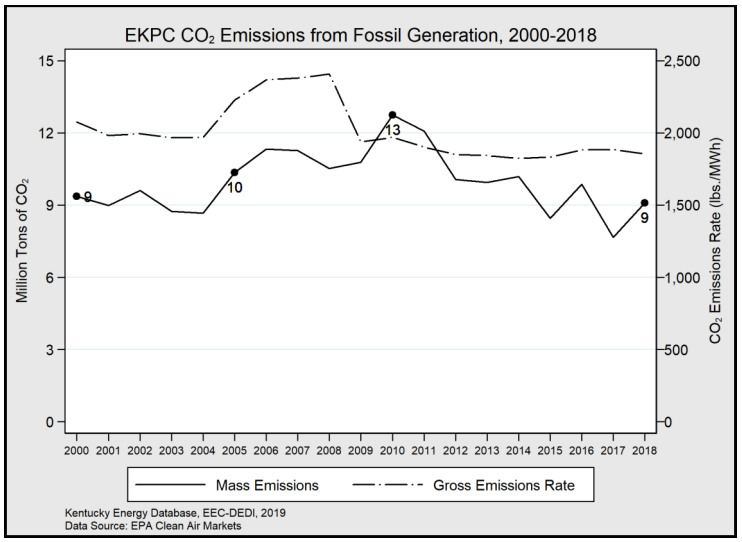
East Kentucky Power Cooperative serves central and eastern Kentucky where 16 RECCs jointly own and purchase electricity from EKPC. Total electricity prices in 2016 were 9.46 cents per kWh and have decreased by 1% since 2010 in inflation-adjusted dollars. EKPC owns and operates two coal-fired power plants,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

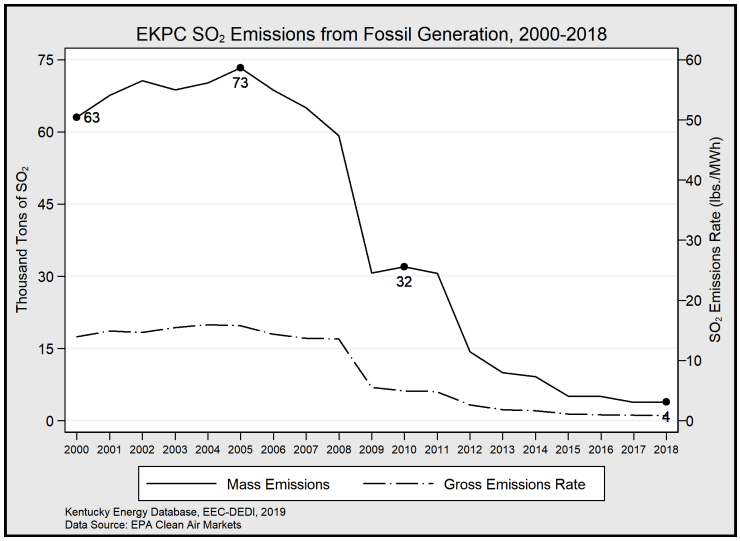


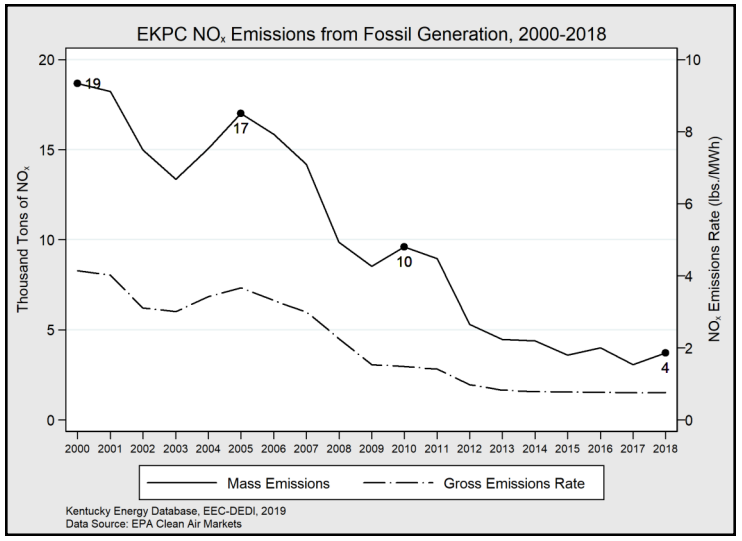


State	2018 Tons	Percentage
Total	3,795,927	100%
Ohio	1,425,414	37.6%
Western Kentucky	451,553	11.9%
Illinois	720,115	19.0%
Eastern Kentucky	325,744	8.6%
West Virginia	650,795	17.1%
Pennsylvania	222,306	5.9%

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.





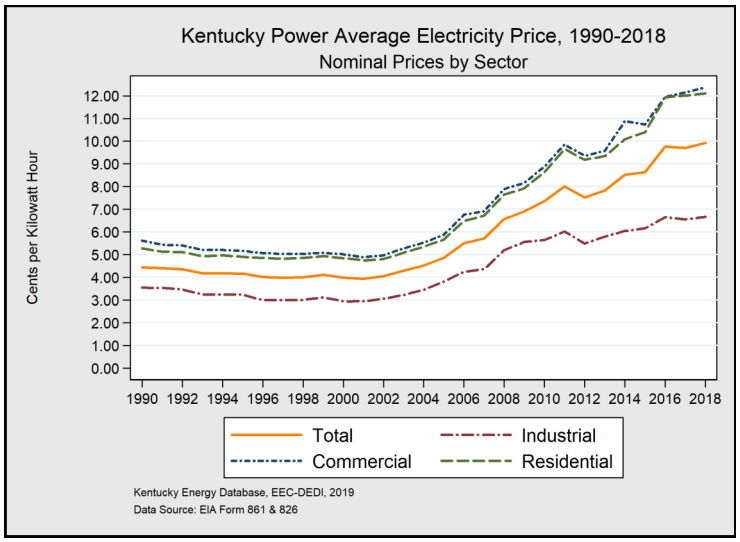
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	3,887	-87.8%
Rate (lbs./MWh)	0.79	-84%

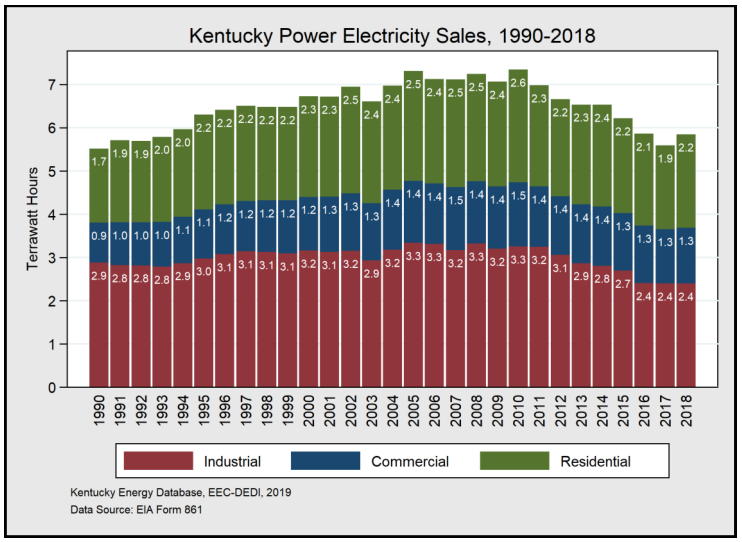
East Kentucky Power Cooperative emitted 3,887 tons of SO_2 in 2018, a decrease of 87.8% since 2010. The rate of SO_2 emissions decreased by 84% during that period.

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

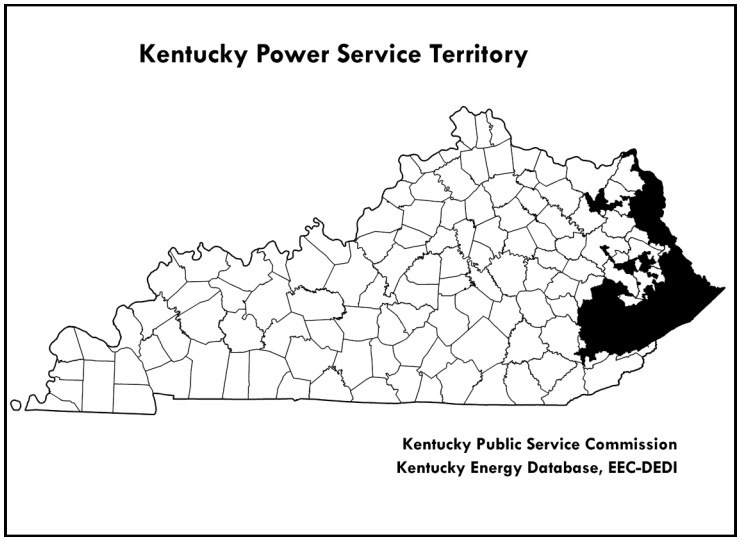


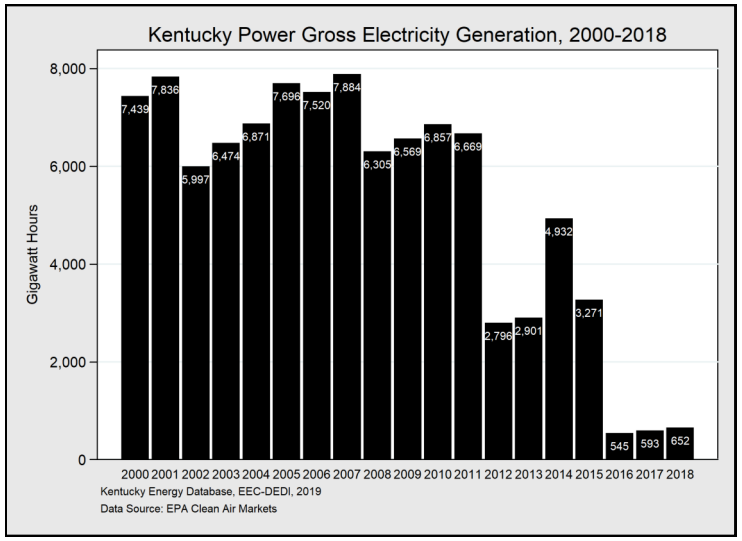


Sector	Price (Cents/kWh)	Since 2010*
Total	9.93	+17.1%
Residential	12.10	+2.6%
Commercial	12.37	+21.5%
Industrial	6.67	+20.9%

*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%



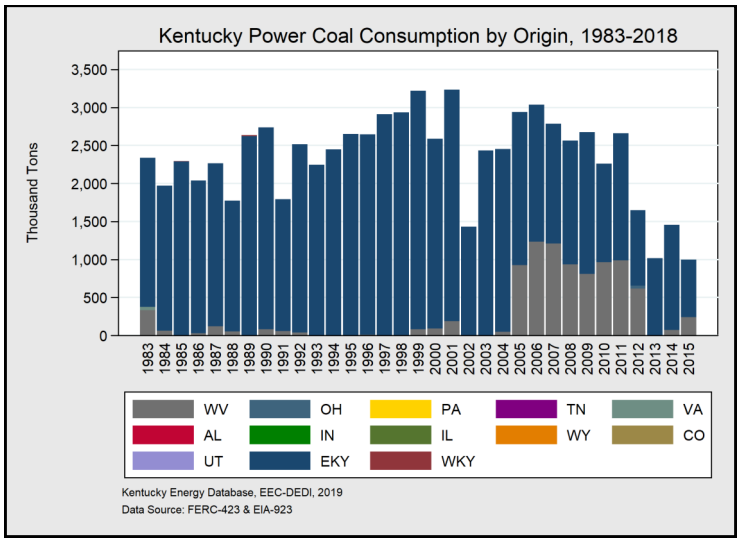


Kentucky Power, a subsidiary of American Electric Power, generates and distributes electricity in eastern Kentucky. Total electricity prices in 2016 were 9.7 cents per kWh and have increased by 33% since 2010 in inflation-adjusted dollars. Kentucky Power operates the Big Sandy power plant in Louisa Kentucky.

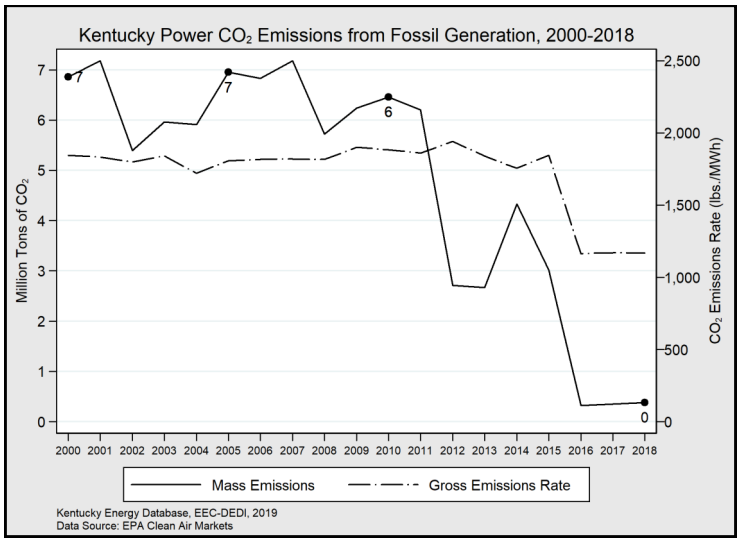
Electricity Generation	2018	Since 2010
Gigawatt Hours	652	-90.5%

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

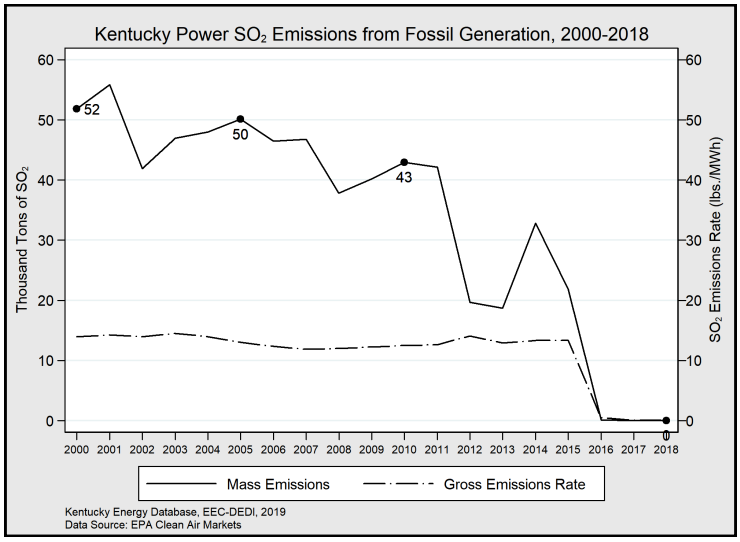


All units for the Big Sandy were retired in May of 2015 except unit 1, which was converted to natural gas.



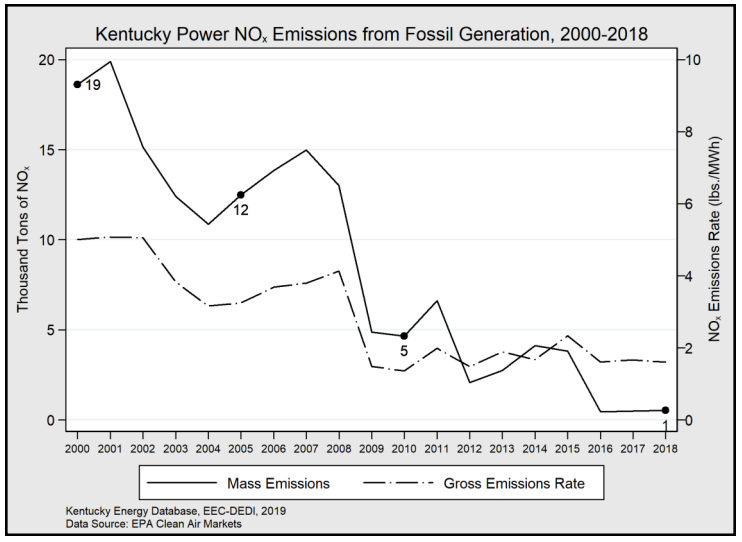
Carbon Dioxide	2018	Since 2010
Emissions (Tonnage)	380,764	-94.1%
Rate (lbs./MWh)	1,168	-37.8%

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%

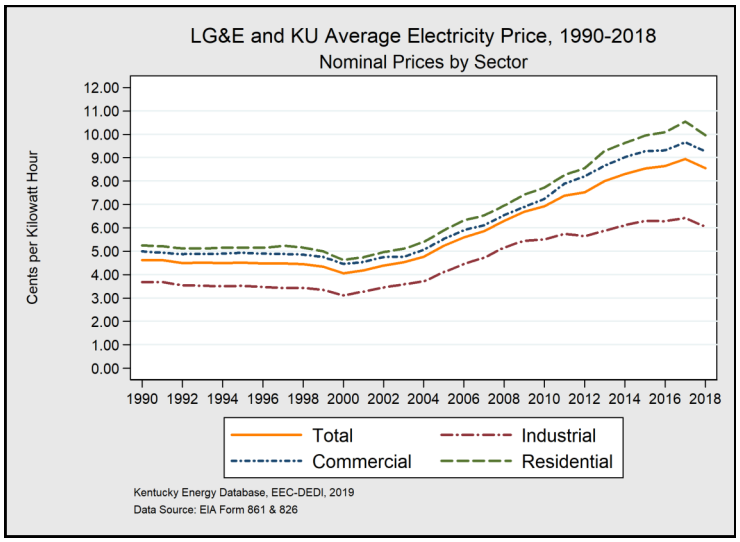
Kentucky Power emitted 16.5 tons of SO_2 in 2018, a decrease of 99.9% since 2010. The rate of SO_2 emissions reduced by 99% during that period.

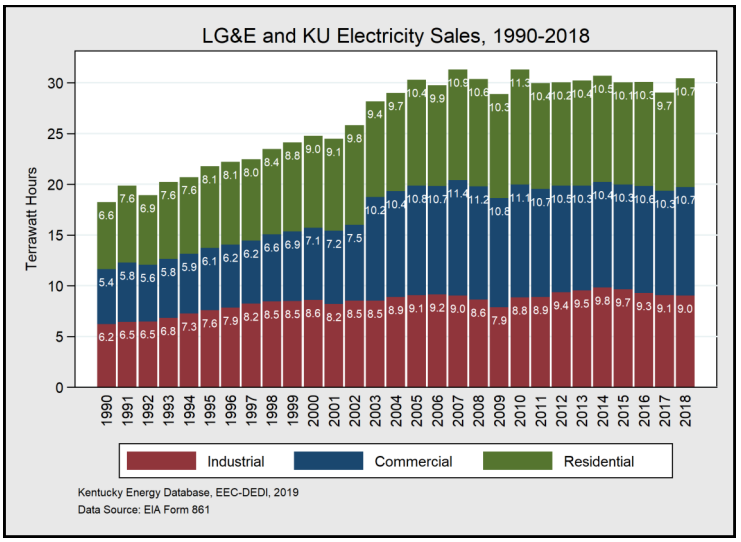


Nitrogen Dioxide	2018	Since 2010
Emissions (Tonnage)	521	-88.8%
Rate (lbs./MWh)	1.6	+17.7%

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

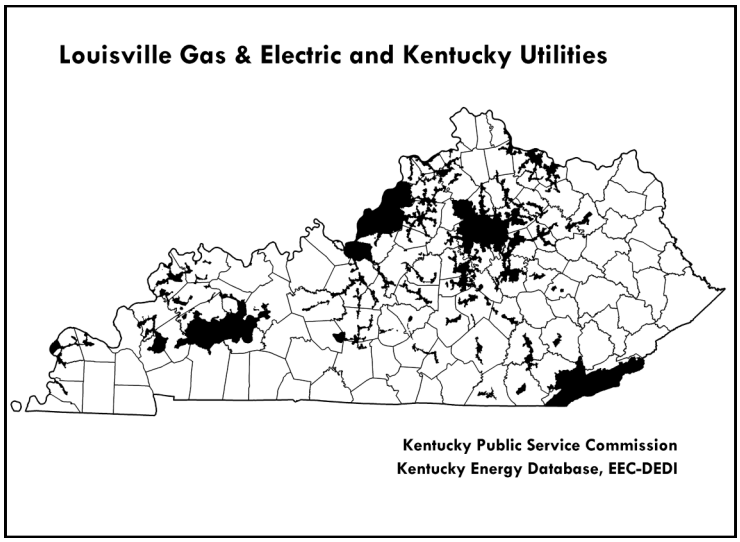


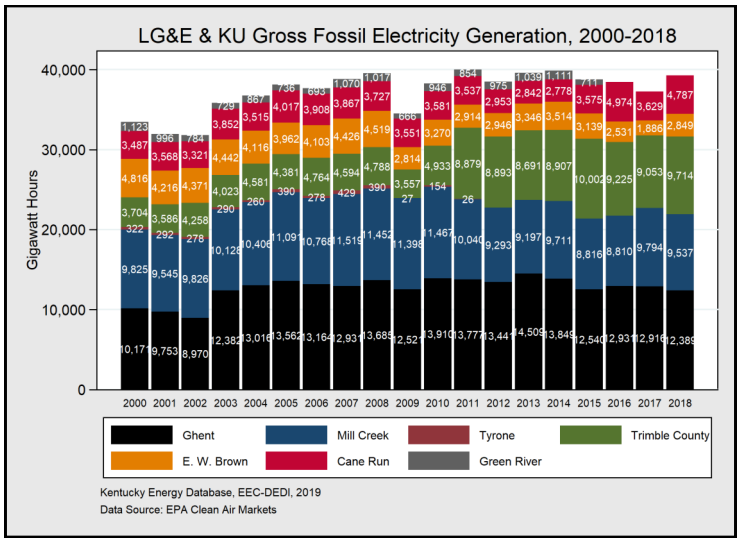


Sector	Price (Cents/kWh)	Since 2010*
Total	8.55	+7.2%
Residential	9.95	+12.0%
Commercial	9.26	+11.1%
Industrial	6.04	-4.8%

*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%



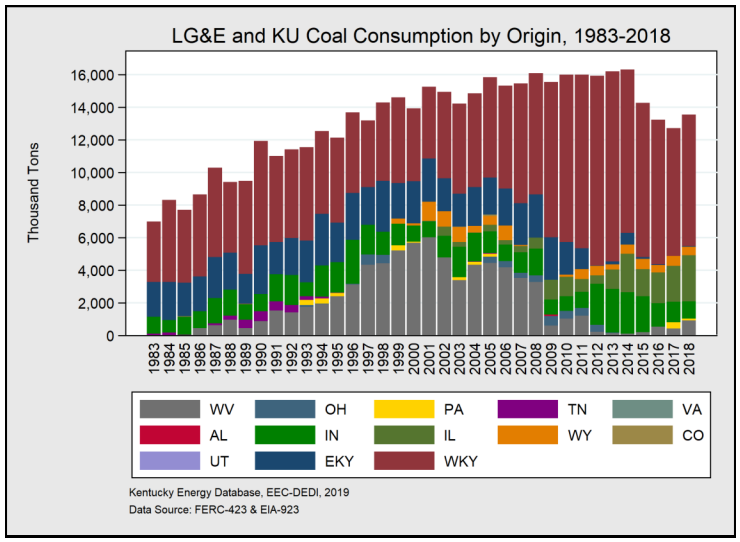


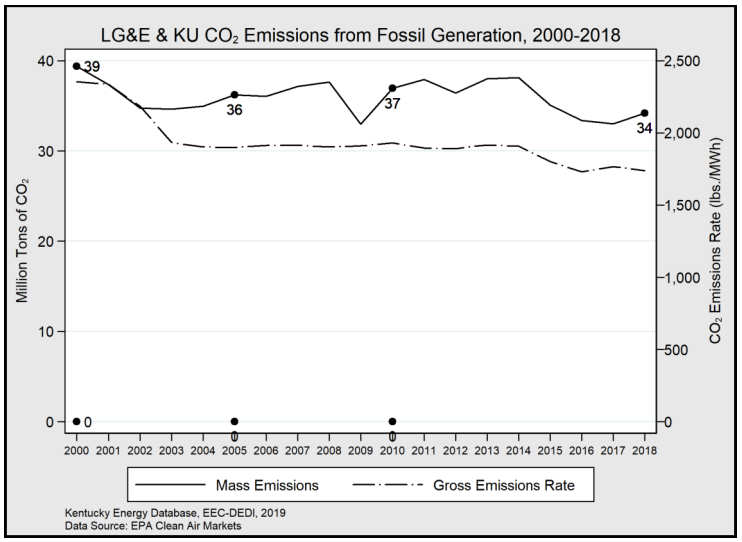
LG&E and KU is the single largest utility by sales in Kentucky and sells electricity throughout the state, primarily in densely populated areas. Total electricity prices in 2018 were 8.55 cents per kWh and have increased by 14% since 2010 in inflation-adjusted dollars. LG&E and KU operate numerous electricity 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

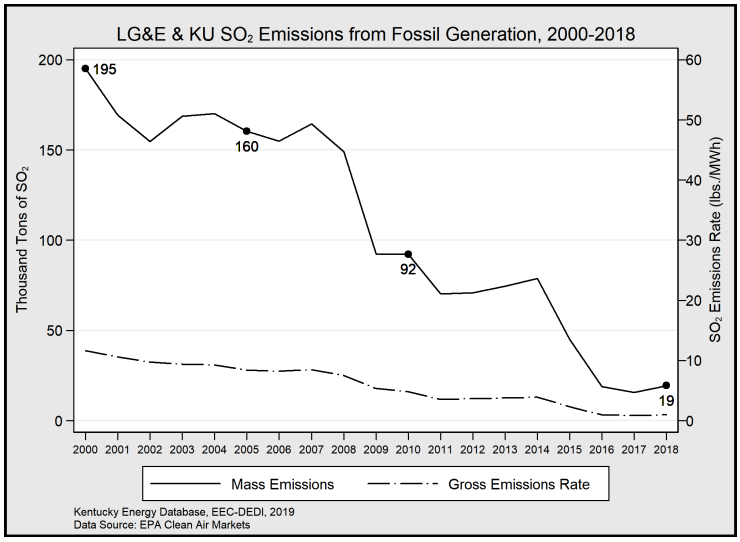


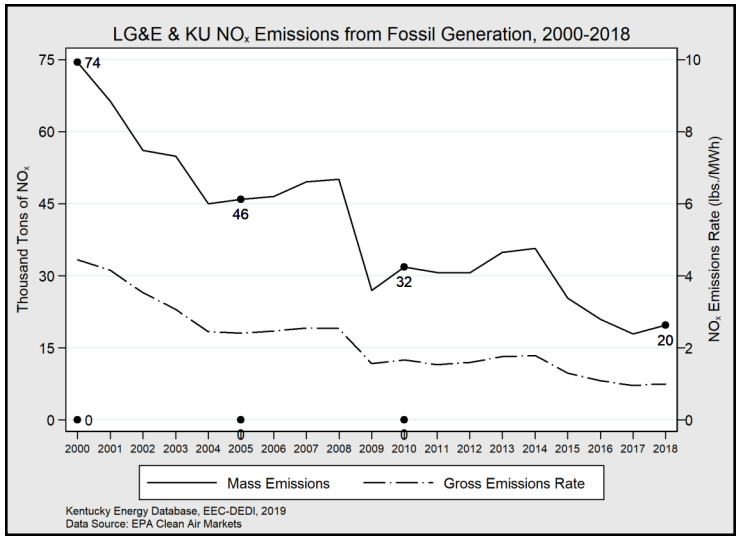


State	2018 Tons	Percentage
Total	13,461,043	100%
Western Kentucky	8,082,948	60.0%
Indiana	1,066,363	7.9%
Illinois	2,834,058	21.1%
Wyoming	514,561	3.8%
Eastern Kentucky	32,975	0.2%
West Virginia	930,138	6.9%

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.





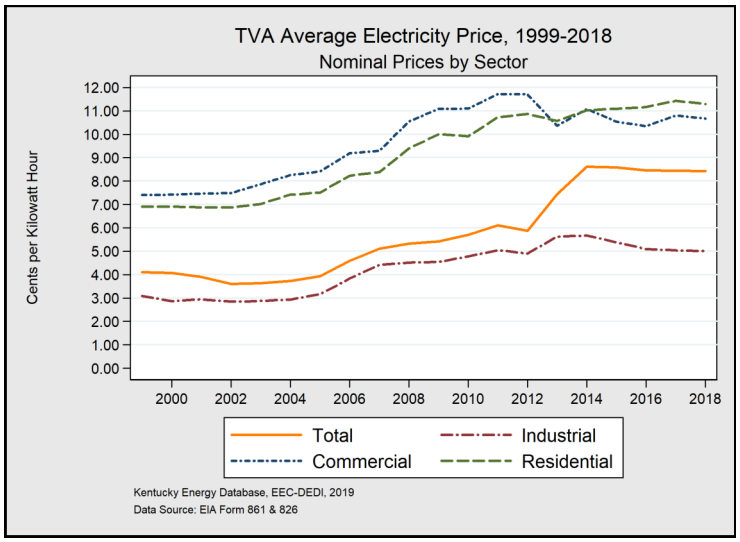
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	19,406	-78.9%
Rate (lbs./MWh)	0.99	-79.5%

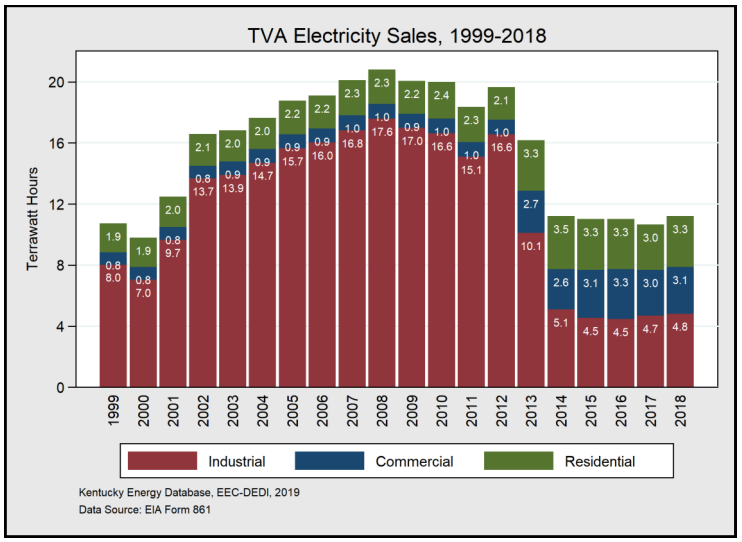
LG&E and KU emitted 19,000 tons of SO_2 in 2018, a decrease of 78.9% since 2010. The rate of SO_2 emissions reduced by 79.5% during that period.

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



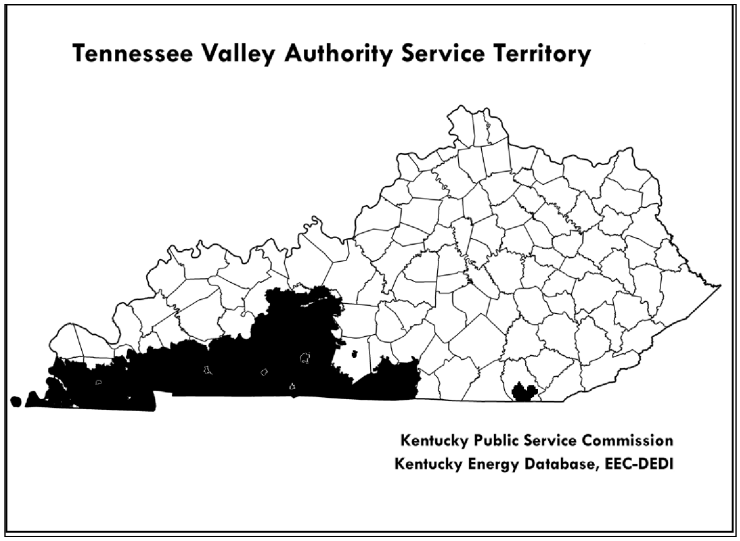


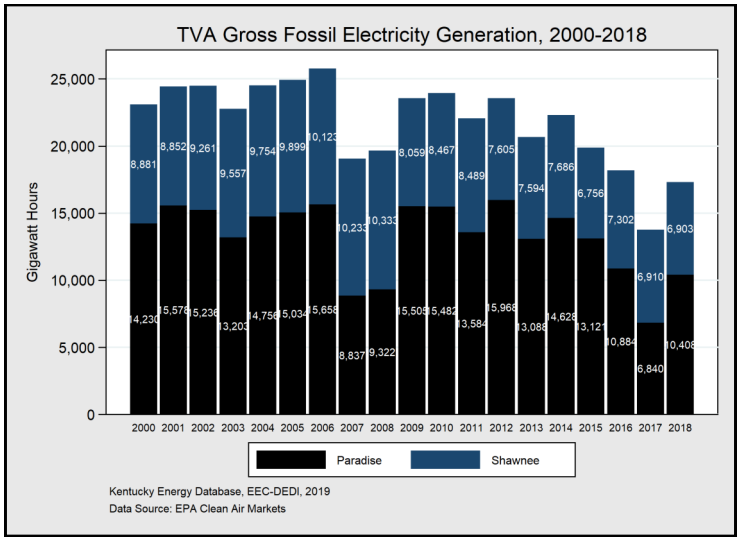
Sector	Price (Cents/kWh)	Since 2010*
Total†	8.42	+28.3%
Residential	11.29	-1.1%
Commercial	10.67	-16.5%
Industrial	5.01	-9.0%

*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



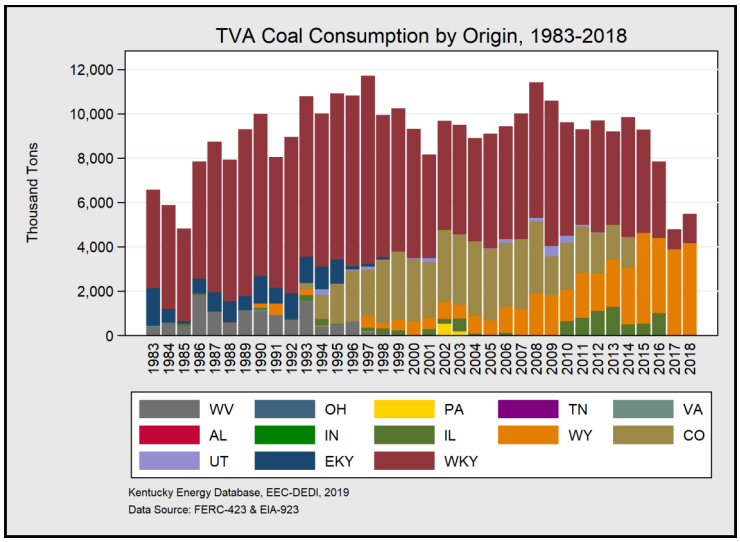


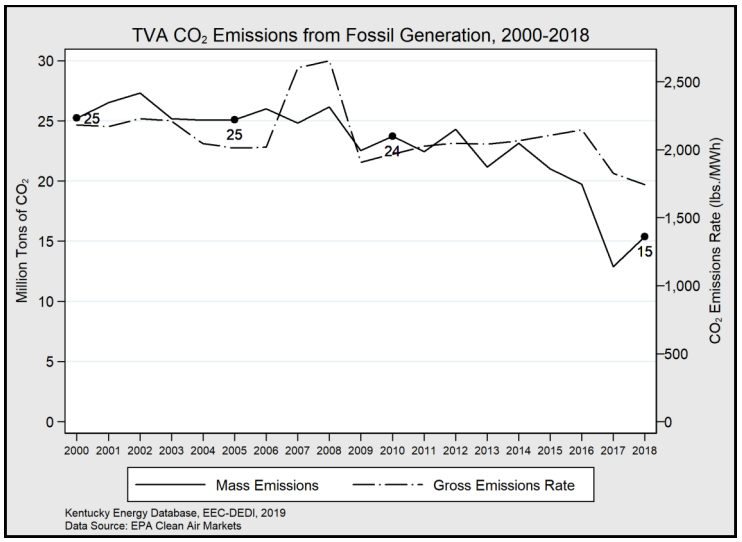
The Tennessee Valley Authority generates and sells electricity to five RECCs, 10 municipalities, and several industrial consumers in southwest Kentucky. Total electricity prices in 2018 were 8.42 cents per kWh and have increased by 28.3% since 2010 in inflation-adjusted dollars. In Kentucky, TVA operates 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

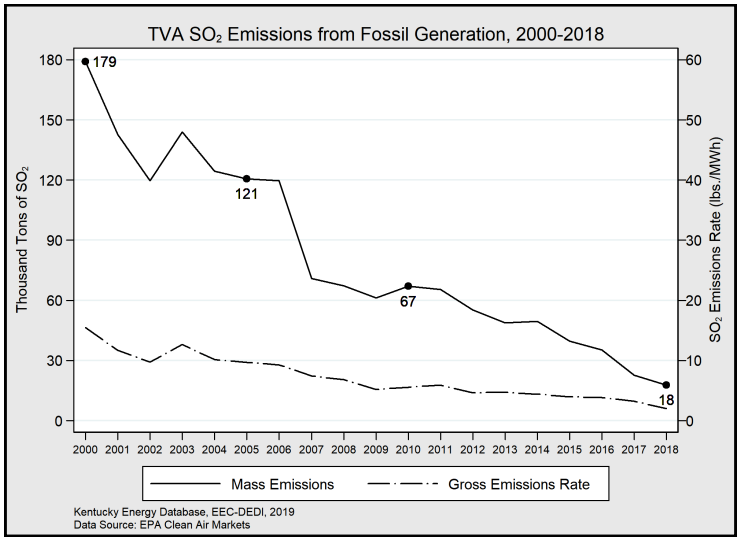


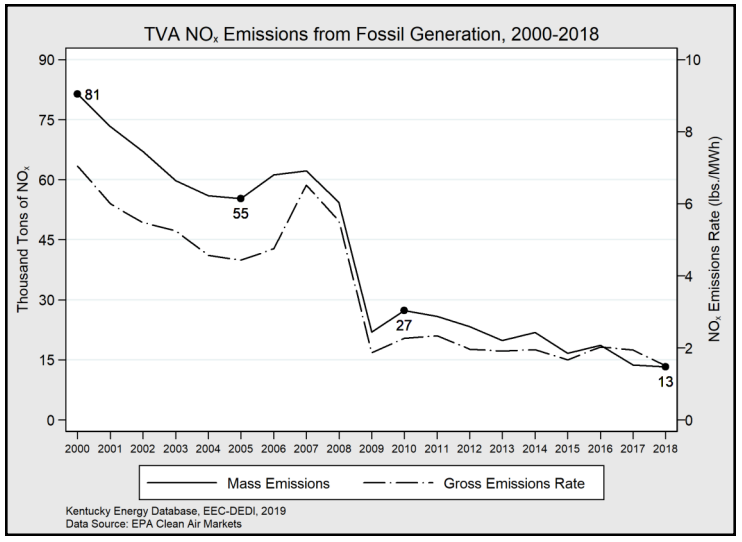


State	2018 Tons	Percentage
Total	5,482,270	100%
Western Kentucky	1,321,965	24.1%
Wyoming	4,121,752	75.2%
Illinois	38,553	0.7%

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.





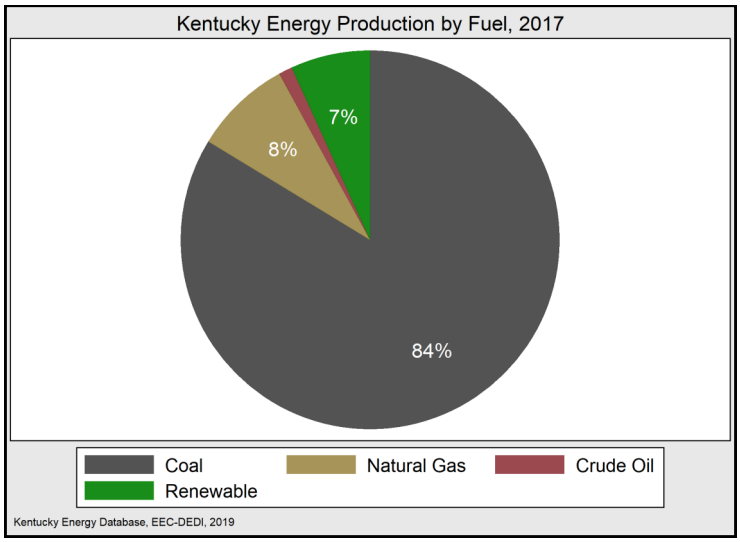
Sulfur Dioxide	2018	Since 2010
Emissions (Tonnage)	17,701	-73.6%
Rate (lbs./MWh)	2.00	-64.0%

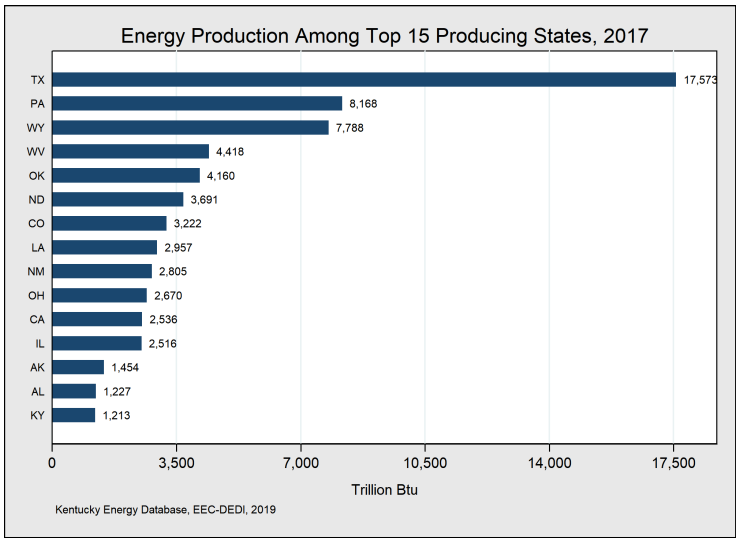
The Tennessee Valley Authority emitted 17,000 tons of SO_2 in 2018, a decrease of 73% since 2010. The rate of SO_2 emissions reduced by 64% during that period.

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

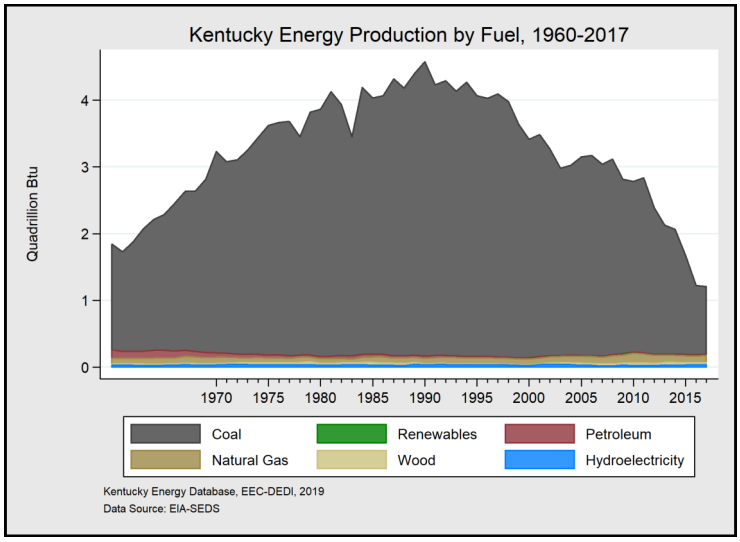


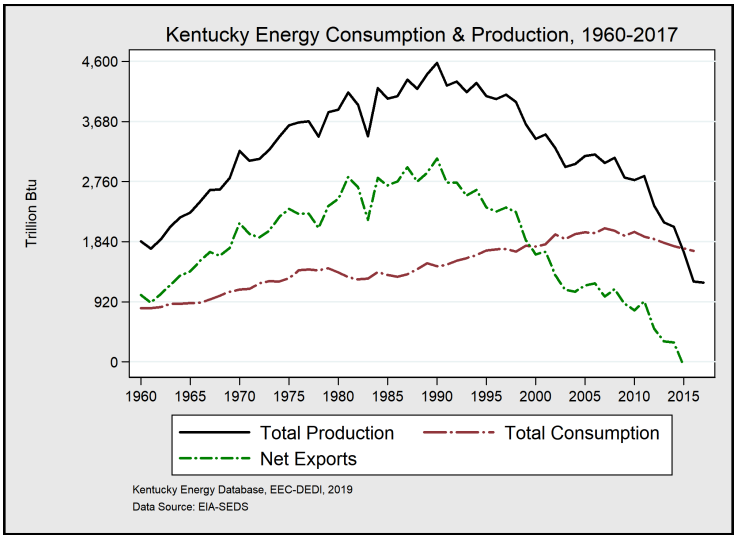


Fuel Type	Billion Btu	1 Year Change
Total	1,212,860	-1.5%
Coal	1,015,108	-2.5%
Natural Gas	101,231	-1.3%
Renewable	82,345	+13.9%
Crude Oil	14,176	-4.5%

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.

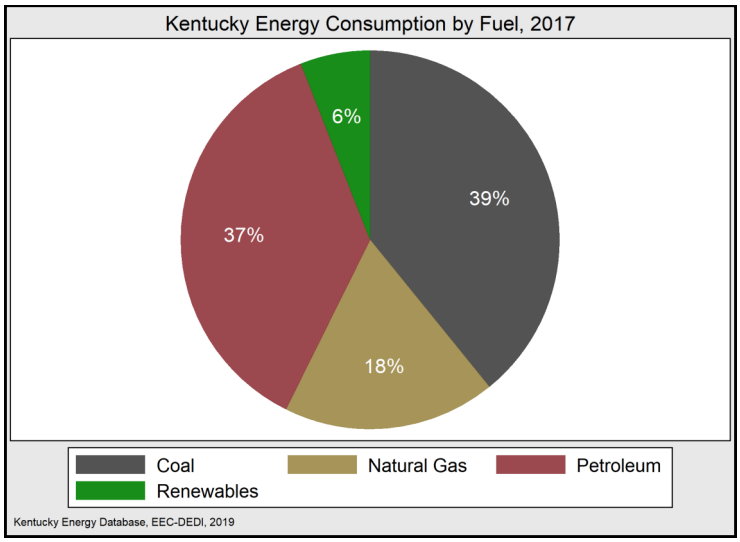


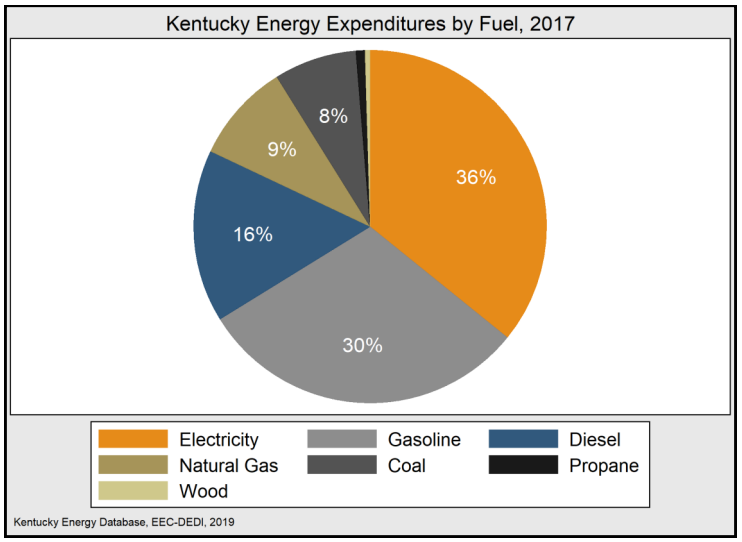


Kentucky produced 1.21 quadrillion Btu of energy in 2017. Despite declining production since 1990, coal supplies the vast majority of energy production in Kentucky at 1.01 quadrillion Btu, or 84% of all energy produced. Natural gas, renewable resources, and crude oil—despite significant growth in recent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

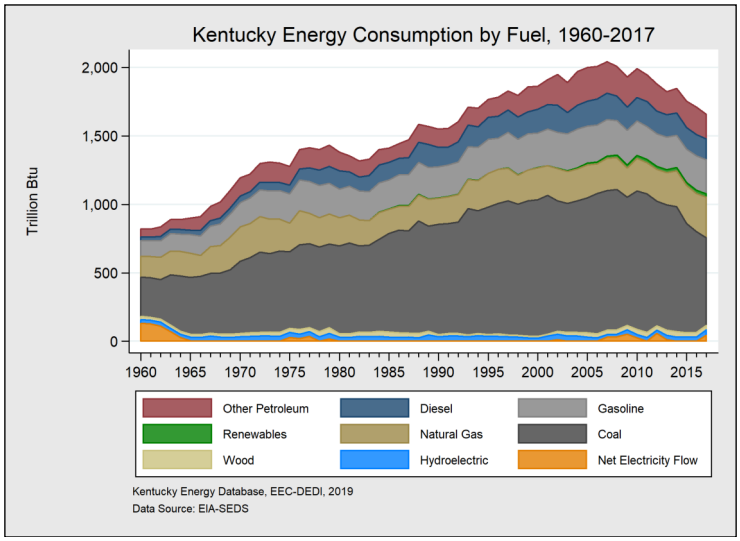


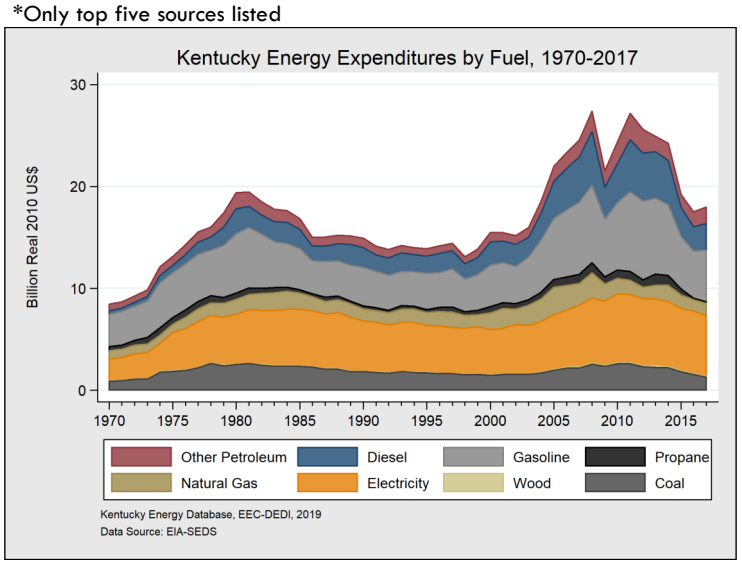


Fuel Type	Billion Btu	1 Year Change
Total	1,632,847	-5.5%
Coal	639,356	-13.2%
Petroleum	296,965	+6.1%
Natural Gas	599,225	-4.1%
Renewables	97,301	+11.8%

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

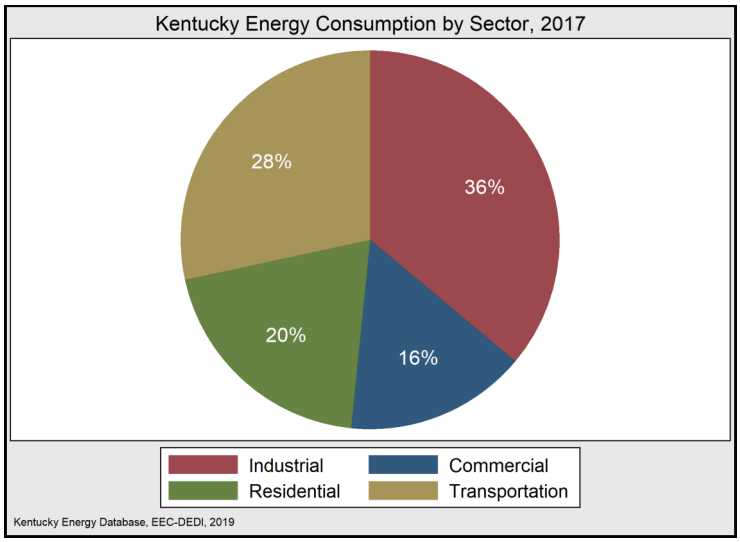


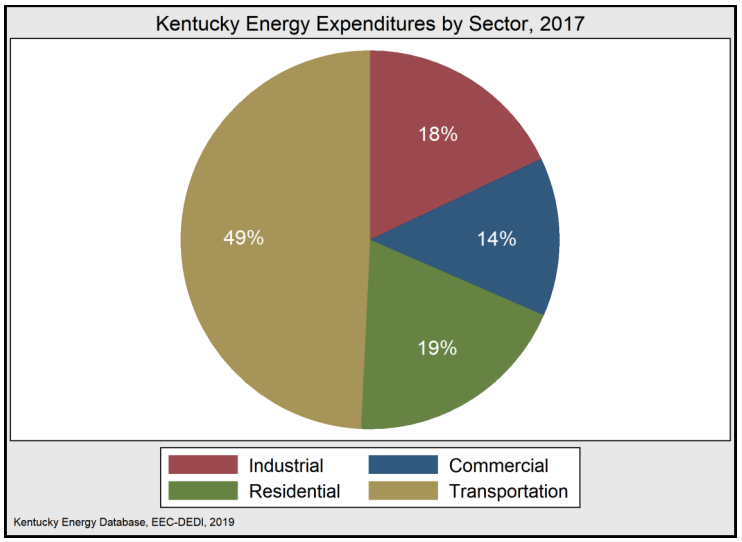


During 2017, Kentucky consumed 1.63 quadrillion Btu of energy, a decrease of 5.5% compared with 2016. The combustion of coal for electricity remained Kentucky's primary energy source, providing 39% of the state's energy requirements. Petroleum products were the second largest source of energy at 37%. 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.

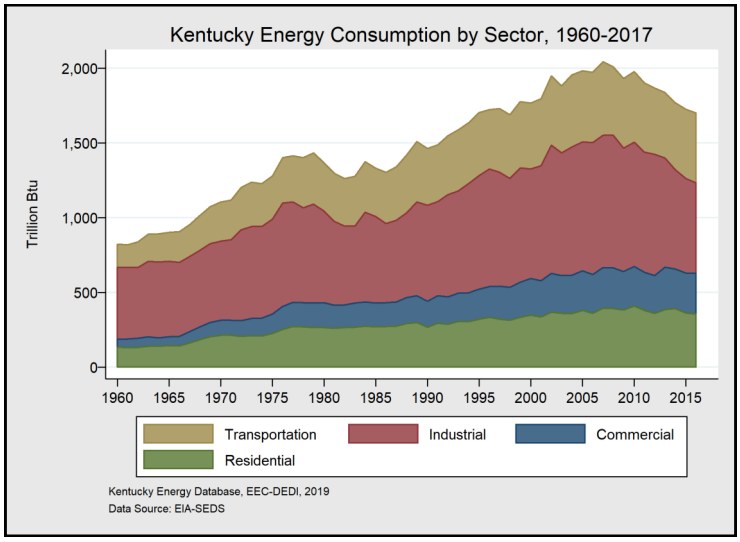
Kentucky Energy Consumption

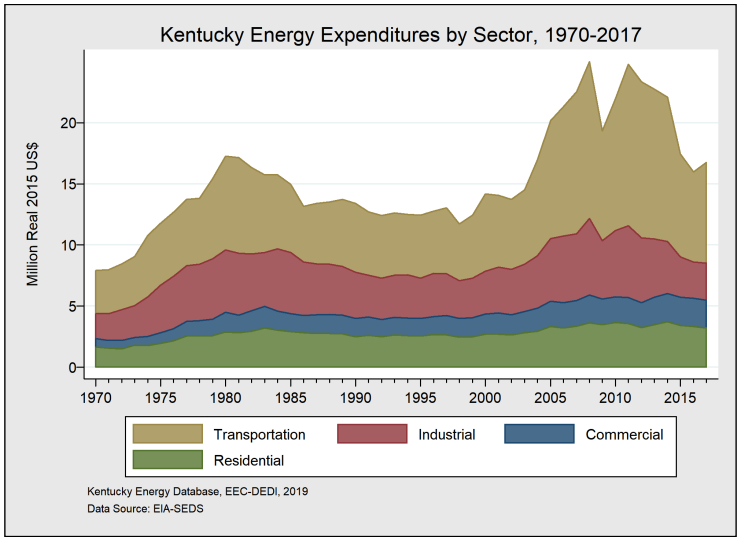




Sector	Billion Btu	1 Year Change
Total	1,658,207	-2.7%
Industrial	598,457	-2.4%
Transportation	470,715	+1.0%
Residential	331,991	-6.3%
Commercial	257,046	-4.9%

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%

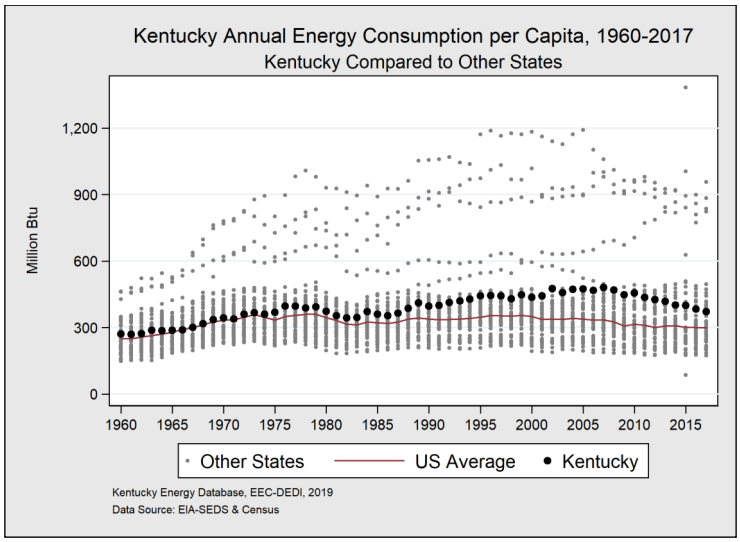


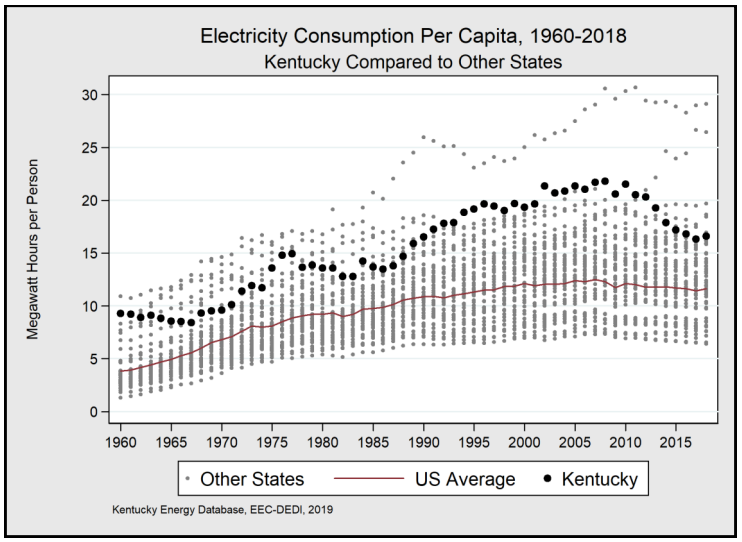


During 2017, manufacturing operations in Kentucky consumed 36% of all energy consumed within the Commonwealth. Kentucky's industrial energy use was proportionally larger than the national average of 33% in 2017. After manufacturing, transportation was the second largest use of energy, with 28% of total 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



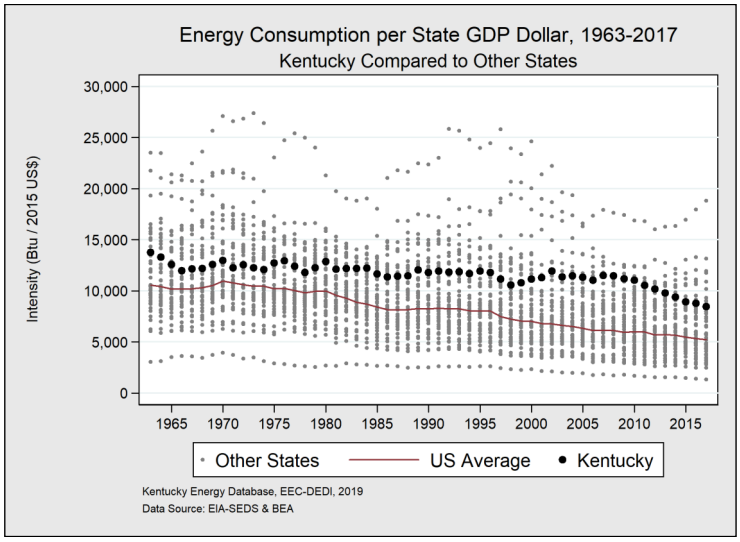


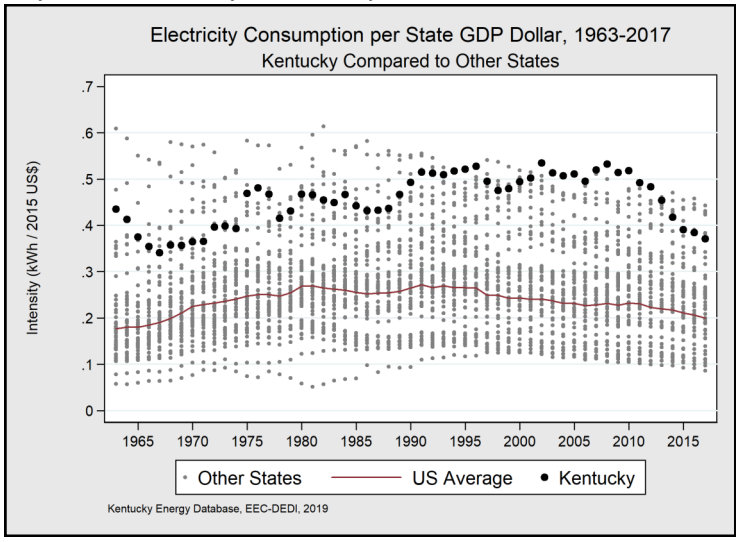
State	MMBtu per Capita	Rank
Louisiana	884.21	1st
Kentucky	372.28	15th
U.S. Average	299.71	-
California	199.34	49th

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.





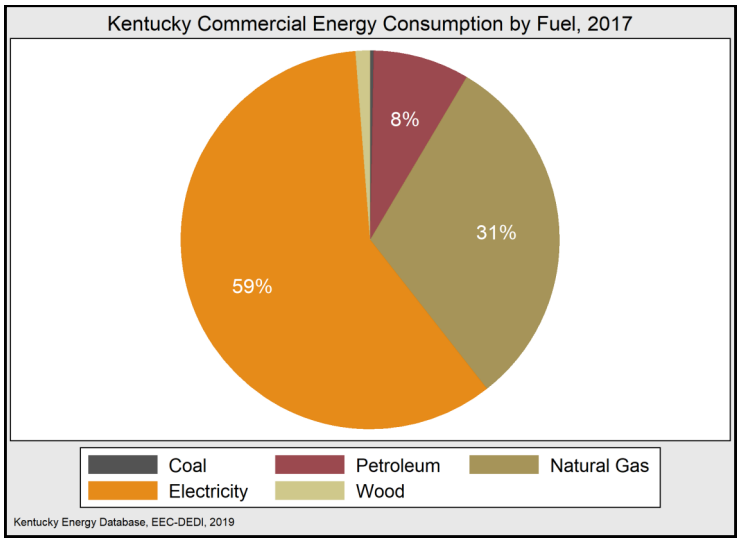
State	Btu/$U.S. GDP	Rank
Louisiana	18,821	1st
Kentucky	8,468	11th
U.S. Average	5,421	-
Maine	2,792	50th

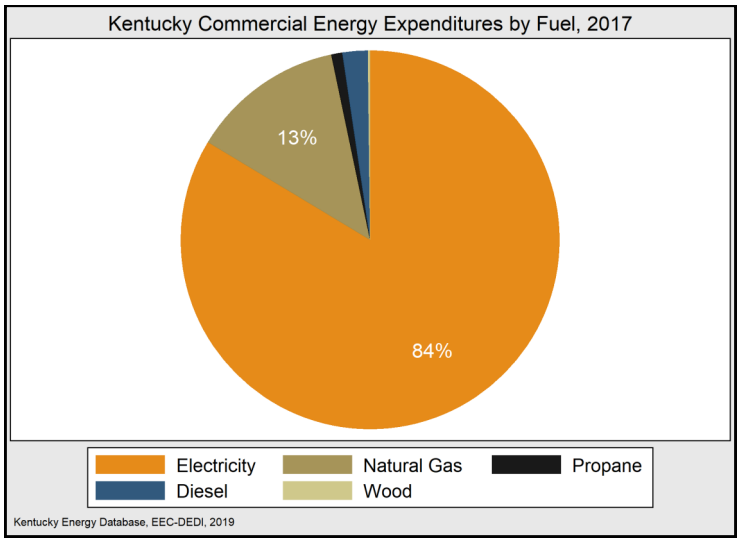
Kentucky ranked 11th in terms of total energy consumption per dollar of state GDP in 2017. Total energy intensity decreased by 3.4% compared with 2016.

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.

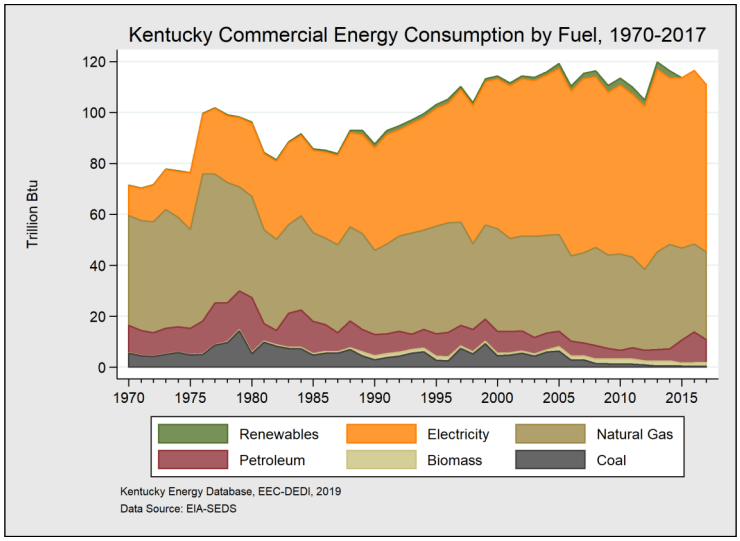
Commercial Energy Consumption

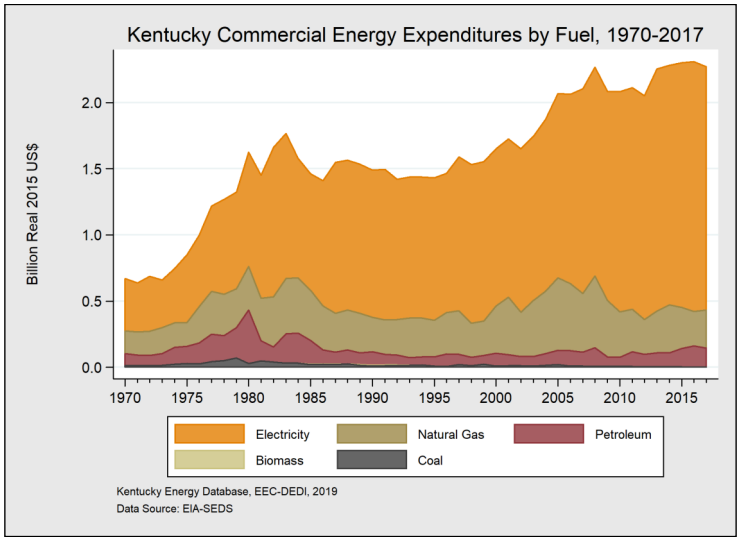




Fuel Type	Billion Btu	1 Year Change
Total Net	110,965	-4.7%
Electricity	65,826	-3.4%
Natural Gas	34,306	-0.6%
Petroleum	9,091	-24.9%
Wood	1,384	+4.1%
Coal	358	-1.4%

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%

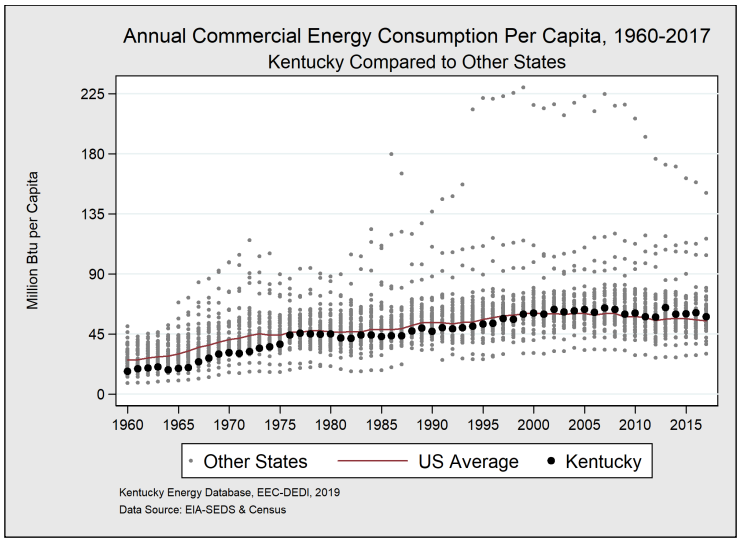




In 2017, non-manufacturing businesses in Kentucky consumed 110,965 billion Btu of energy, a 4.7% increase in net commercial energy consumption compared with 2016. Electricity constituted 59% of commercial energy consumption, followed by natural gas at 31%. Other commodities such as petroleum products, 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.

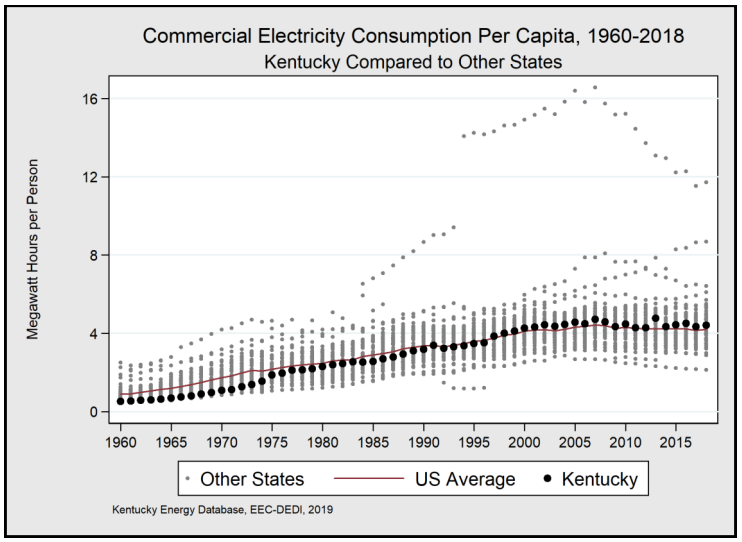
In 2017, non-manufacturing businesses in Kentucky spent more than $2.2 billion on energy consumption—a 0.04% increase in commercial energy expenditures compared with 2016. Electricity was the largest energy expenditure, at 84%. Natural gas was 13% of commercial energy expenditures.

Commercial Energy Intensity



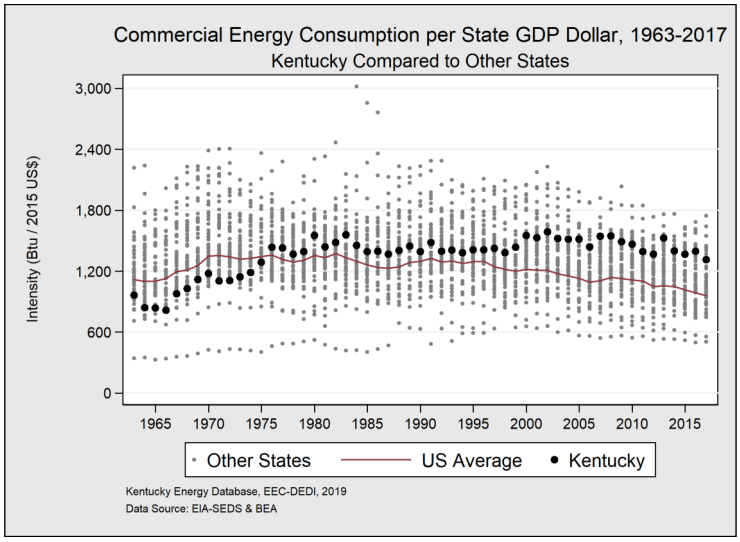
State	MMBtu per Capita	Rank
North Dakota	116.4	1st
Kentucky	57.7	25th
U.S. Average	54.8	-
Hawaii	30.1	52nd

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



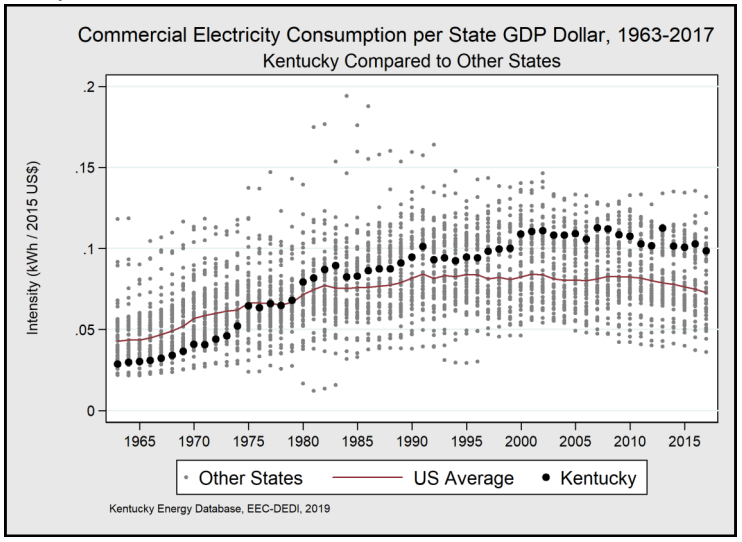
State	MWh per Capita	Rank
North Dakota	8.64	1st
Kentucky	4.33	21st
U.S. Average	4.15	-
Hawaii	2.16	52nd

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

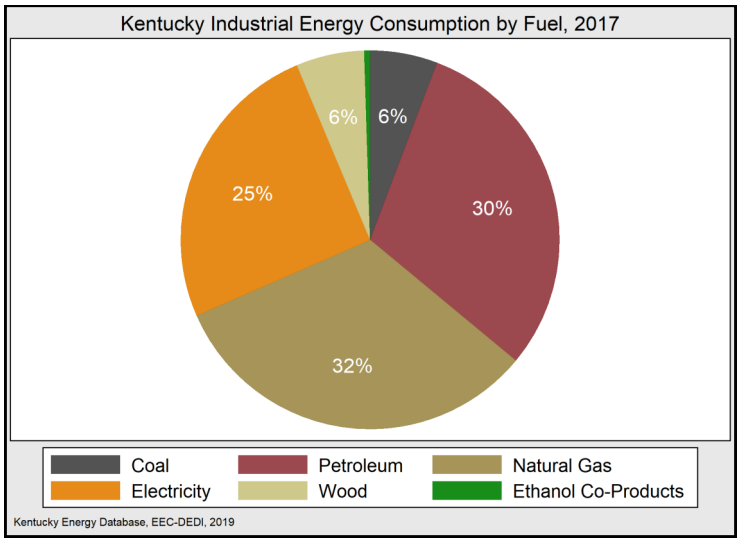
Kentucky ranked 11th highest in terms of commercial energy consumption per dollar of state GDP in 2017. Commercial energy intensity decreased by 5.9% compared with 2016.

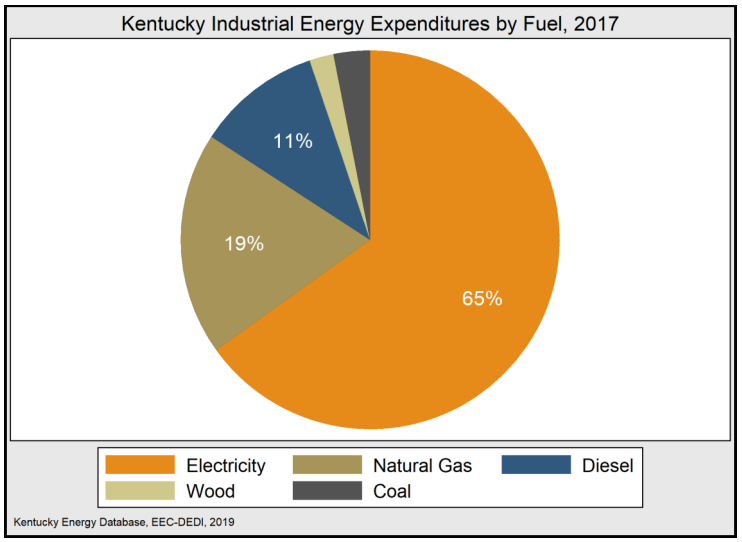


State	kWh/$U.S. GDP	Rank
Mississippi	0.13	1st
Kentucky	0.10	15th
U.S. Average	0.07	-
Hawaii	0.04	52nd

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.

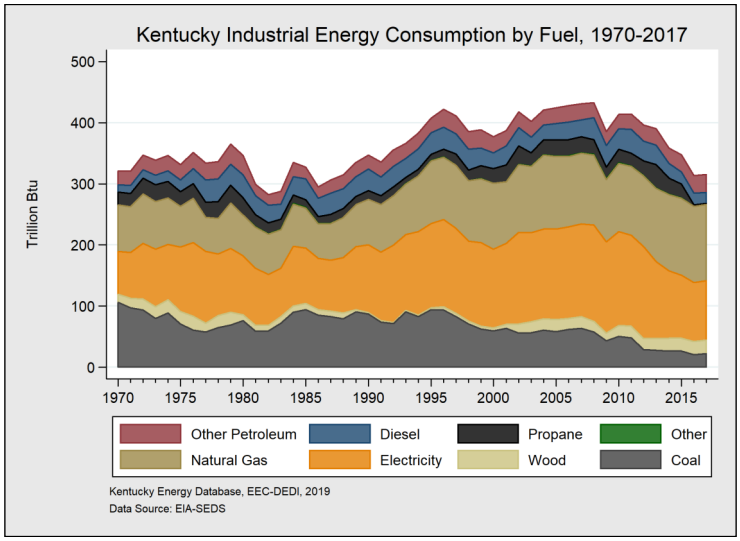
Industrial Energy Consumption

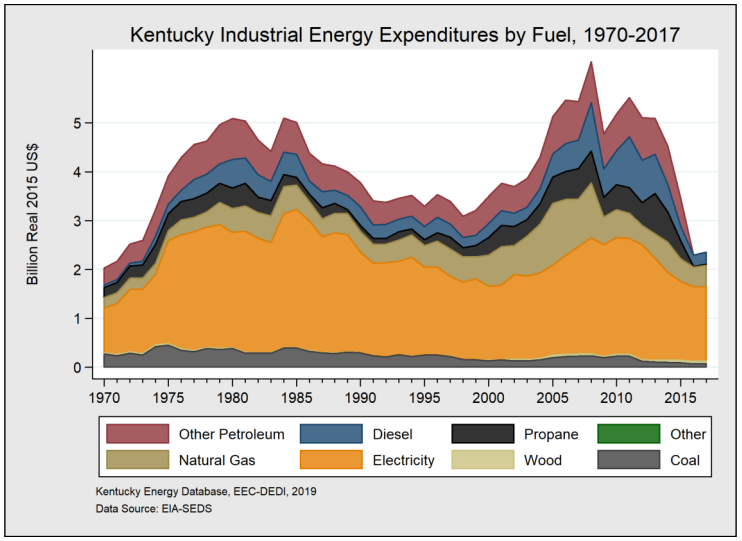




Fuel Type	Billion Btu	1 Year Change
Total Net	382,287	-3.2%
Petroleum	116,357	-11.9%
Electricity	97,103	+0.8%
Natural Gas	124,603	+0.2%
Coal	22,110	+8.1%
Wood	22,114	+1.7%

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%

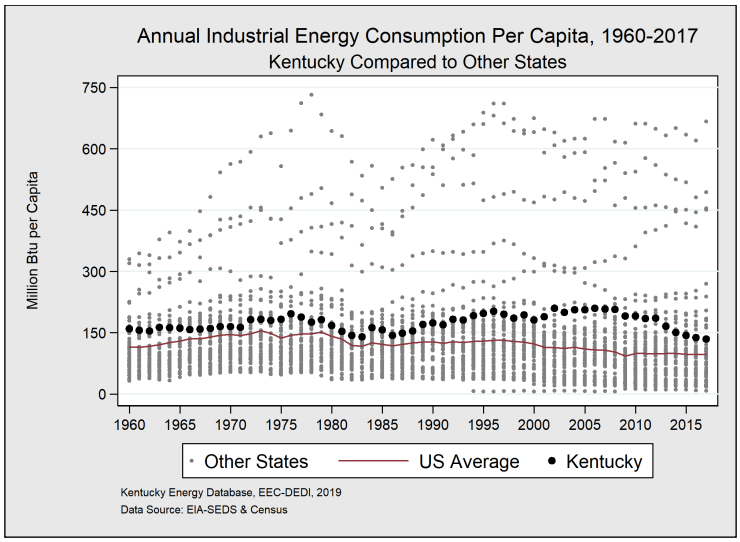




Kentucky-based manufacturing operations and farms consumed 382 trillion Btu of energy in 2017, a decrease of 3.2% from 2016. Natural gas was the largest component of industrial energy use in 2017, or 32% of total industrial energy consumption. Electricity and petroleum accounted for 25% and 30% of industrial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

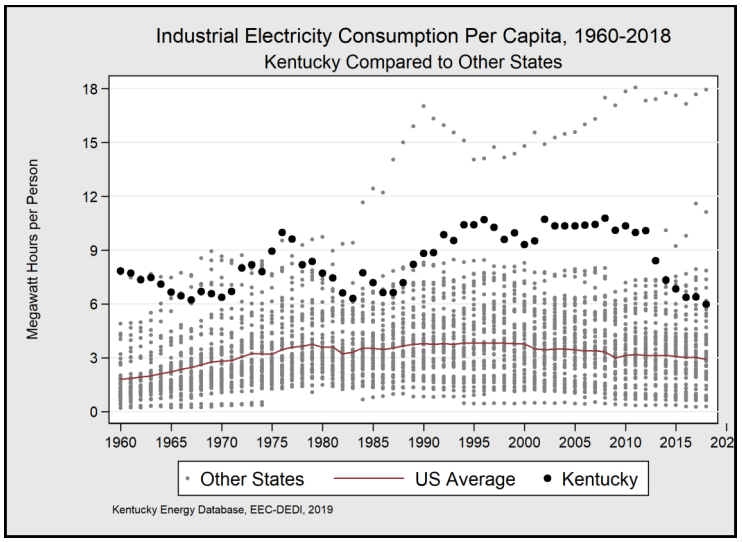
Kentucky spent more than $2.3 billion to fuel factories and farms within the Commonwealth, which was a 4.7% increase in industrial energy spending compared with 2016. Electricity was the largest expenditure—65% of industrial energy spending. Diesel and natural gas accounted for 11% and 19% of industrial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

Industrial Energy Intensity



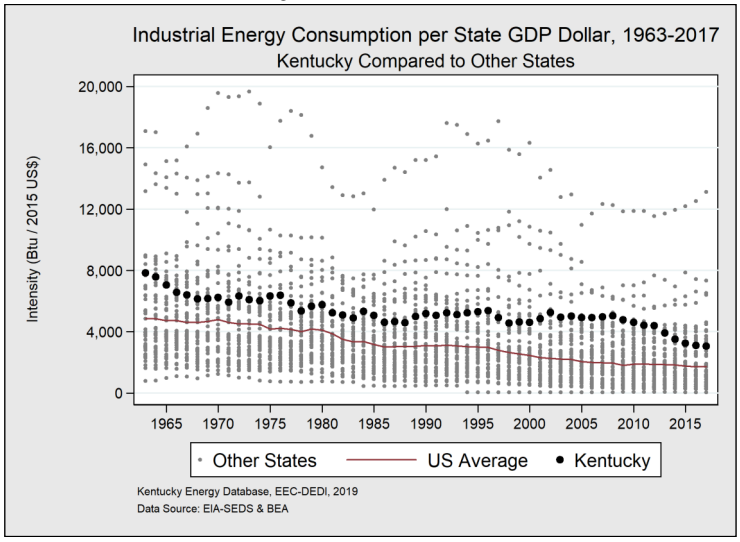
State	MMBtu per Capita	Rank
Louisiana	666.7	1st
Kentucky	134.4	14th
U.S. Average	97.9	-
Maryland	17.9	51st

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



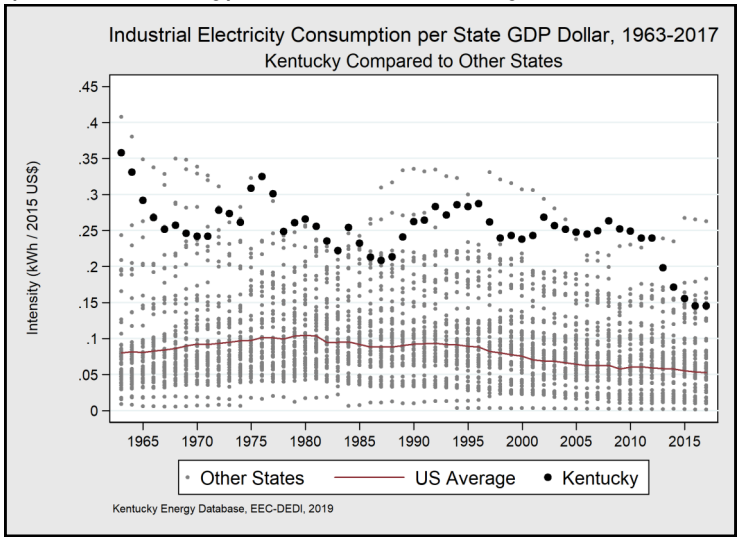
State	MWh per Capita	Rank
Wyoming	17.7	1st
Kentucky	6.4	8th
U.S. Average	3.0	-
Maryland	0.6	51st

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

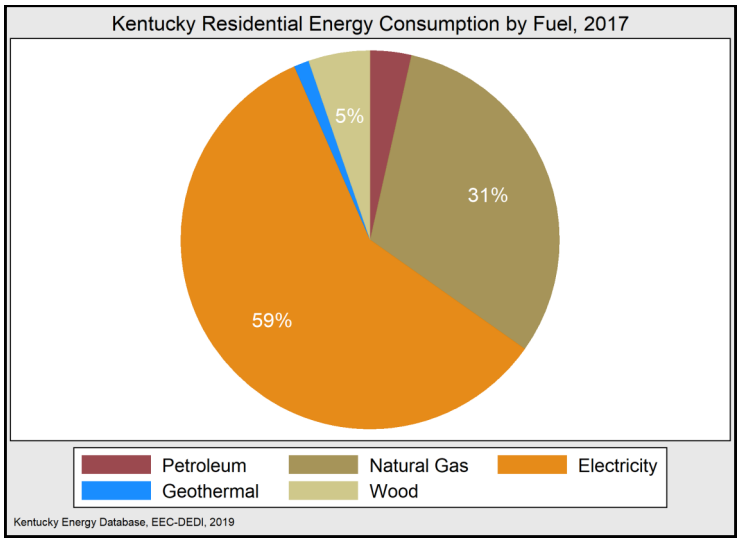
Kentucky industrial energy intensity decreased by 33% compared with 2010, and is decreasing significantly faster than the national average.

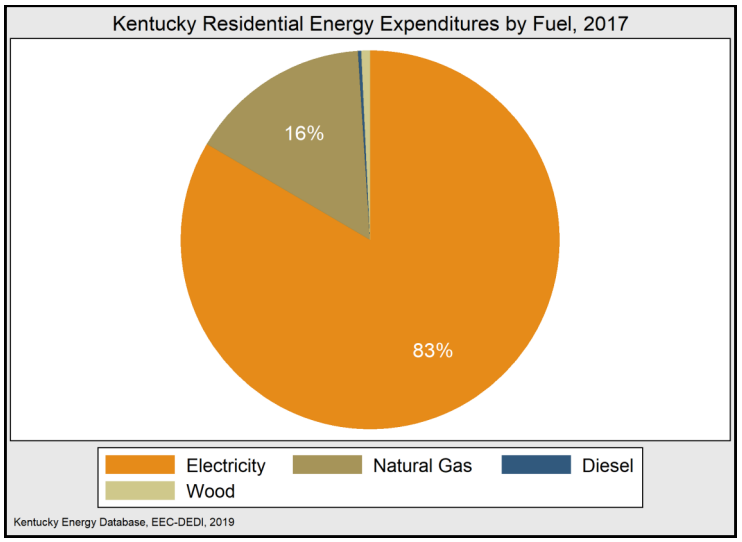


State	kWh/$U.S. GDP	Rank
Wyoming	0.26	1st
Kentucky	0.14	7th
U.S. Average	0.05	-
Maryland	0.009	50th

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

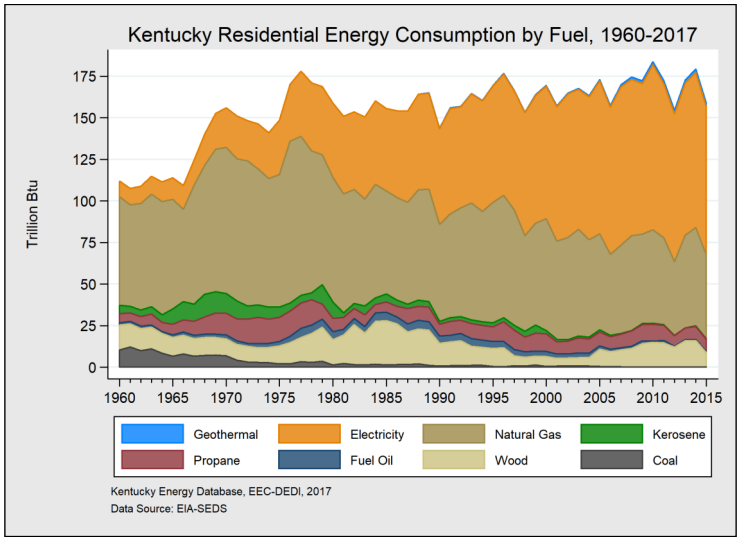
Residential Energy Consumption

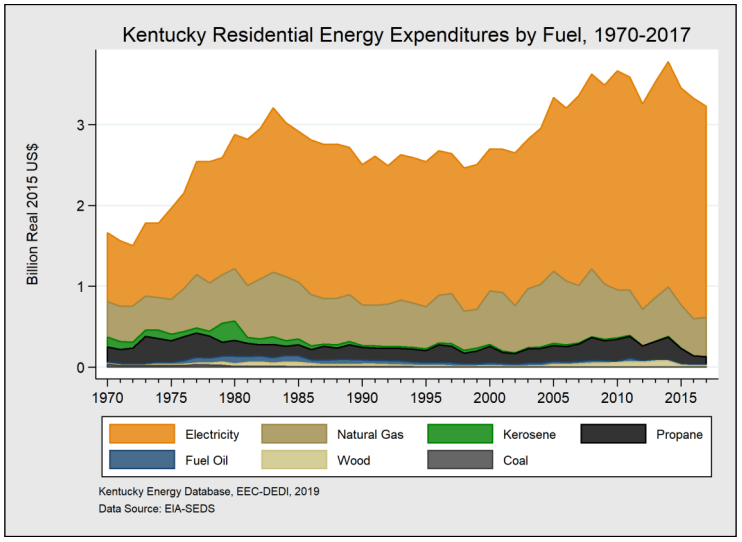




Fuel Type	Billion Btu	1 Year Change
Total Net	144,696	-5.2%
Electricity	84,899	-5.5%
Natural Gas	45,244	-3.4%
Wood	7,608	+0.7%
Petroleum	5,085	-22.1%
Geothermal	1,860	+0.0%

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%

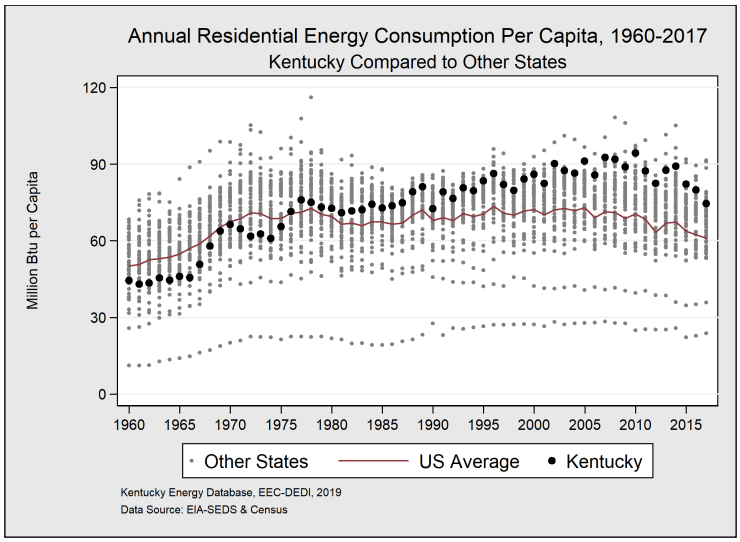


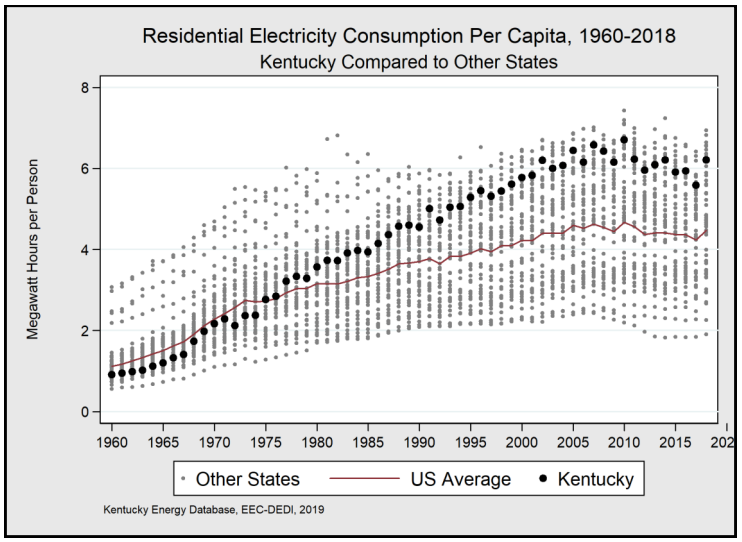


Households in Kentucky consumed 144 trillion Btu of energy in 2017, a 5.2% decrease in net residential energy consumption compared with 2016. The largest portion of energy used in the residential sector—59%—was through electricity and the second largest was natural gas. Over time, electricity has increased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



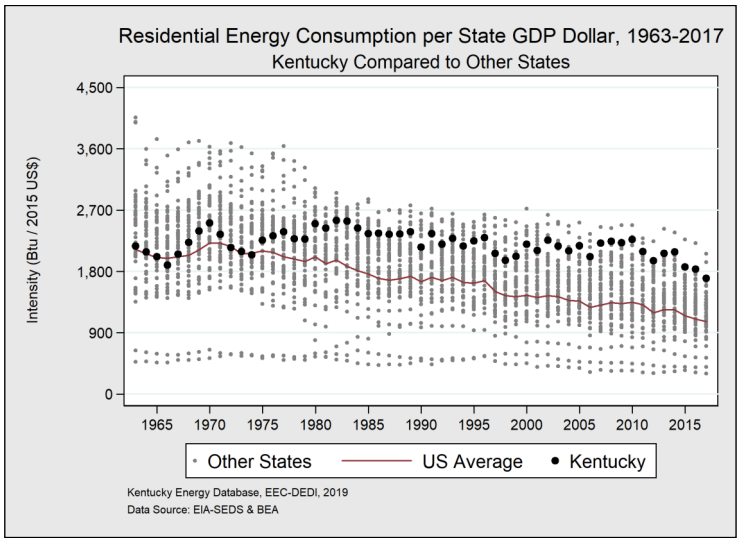


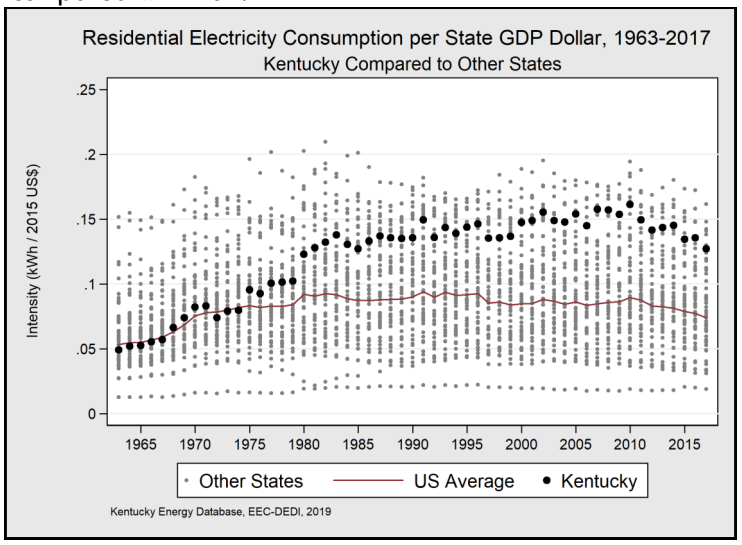
State	MMBtu per Capita	Rank
North Dakota	91.5	1st
Kentucky	74.5	10th
U.S. Average	61.0	-
Hawaii	23.8	52nd

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.





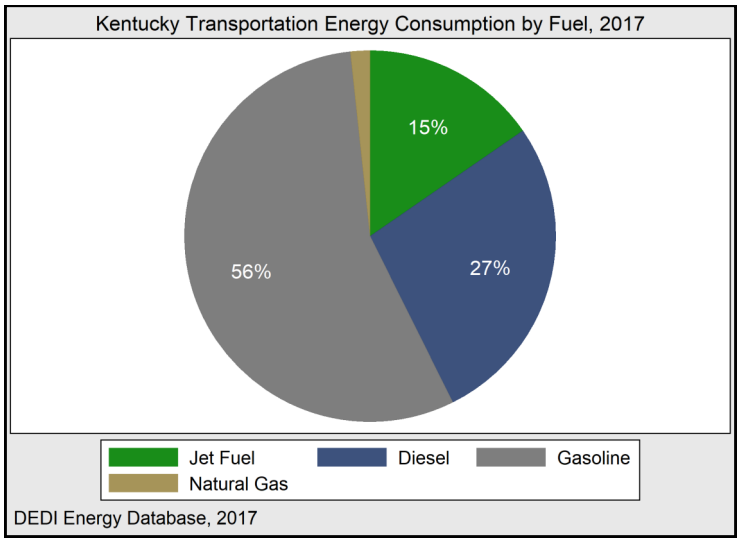
State	Btu/$U.S. GDP	Rank
Montana	2,056	1st
Kentucky	1,696	4th
U.S. Average	1,066	-
Hawaii	399	51st

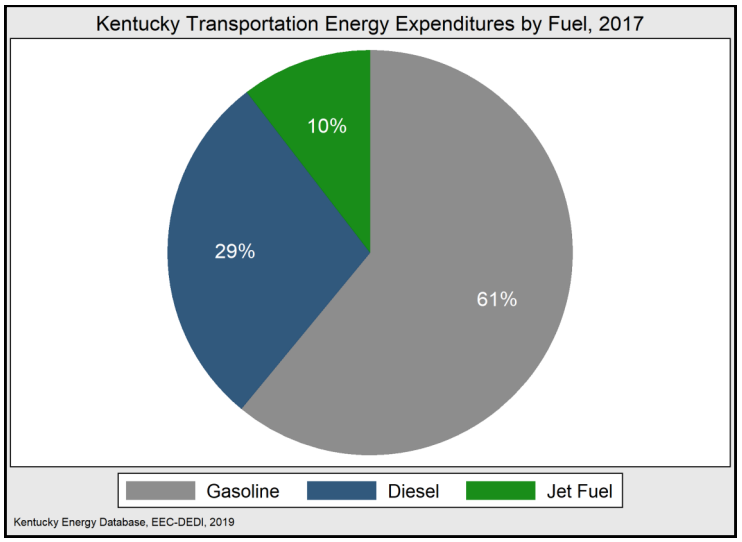
Kentucky ranked 4th in terms of residential energy consumption relative to one dollar of state GDP. Residential energy intensity decreased by 7.6% compared with 2016.

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%.

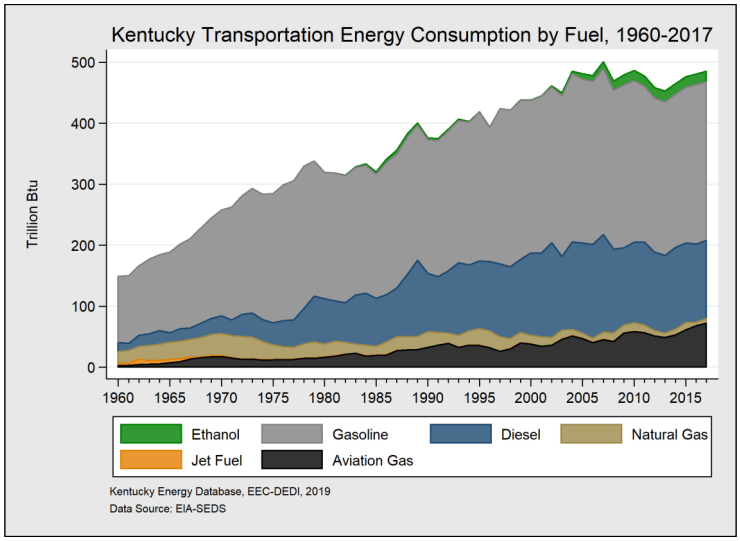
Transportation Energy Consumption

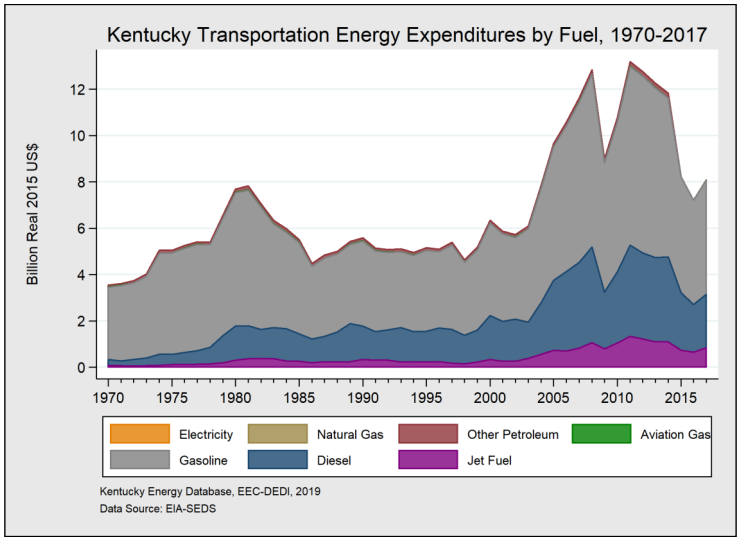




Fuel Type	Billion Btu	1 Year Change
Total	470,715	+1.0%
Gasoline	260,507	-0.4%
Diesel	127,680	-0.1%
Jet Fuel	71,976	+5.8%
Natural Gas	7,876	+36.4%
Propane	37	-52.6%

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%

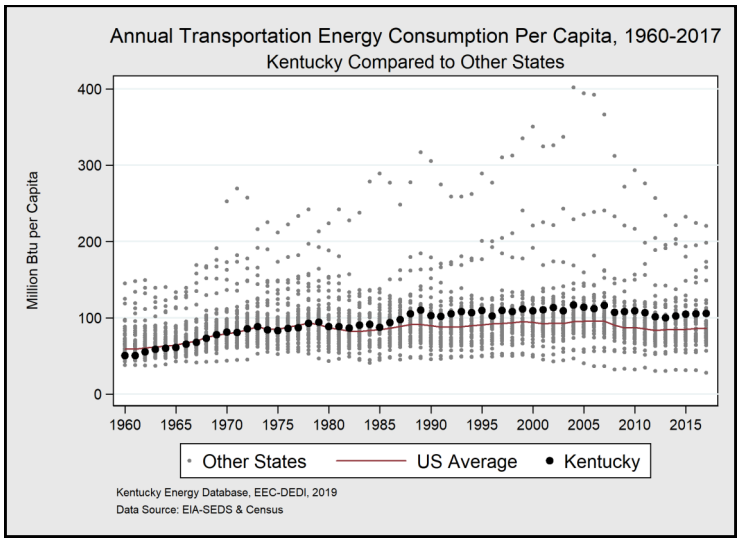


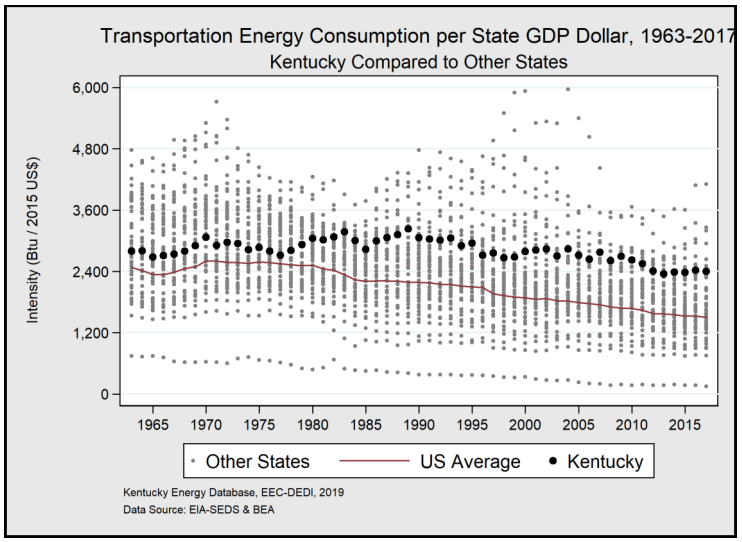


Transportation sector energy consumption in Kentucky was 470 trillion Btu in 2017, a 1% increase compared with 2016. Gasoline was 56% of transportation energy consumption in 2017, followed by diesel at 27%. The other 16% of transportation energy consumption came from jet fuel, natural gas and propane.

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

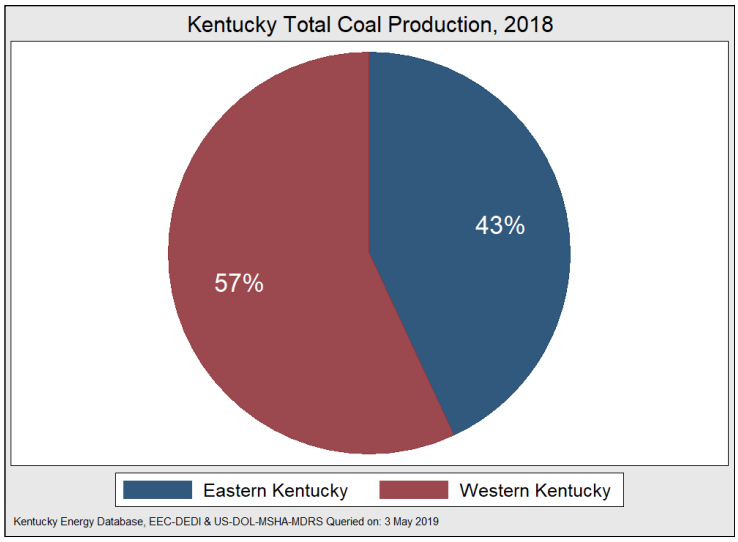
County	Tons	1 Year Change	Percentage
Total	39,798,896	-4.9%	100%
Union	9,753,472	+8.8%	24.5%
Pike	4,328,175	-5.4%	10.9%
Perry	3,638,302	-3.6%	9.1%
Hopkins	3,528,289	-1.3%	8.9%
Harlan	3,097,648	-11.5%	7.8%
Ohio	2,738,362	-33.6%	6.9%
Muhlenberg	2,628,986	-5.3%	6.6%
Webster	2,475,504	-5.8%	6.2%
Mclean	1,270,993	-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%

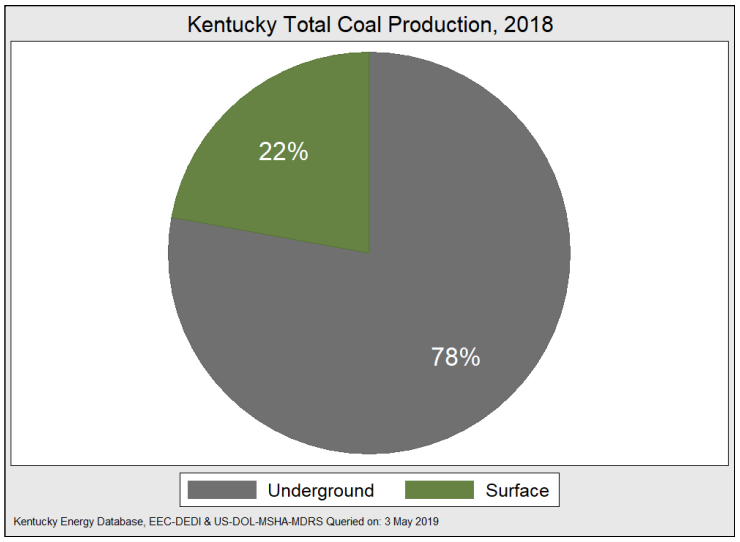
County	Tons	1 Year Change	Percentage
Letcher	587,638	+57.8%	1.5%
Magoffin	503,227	+331.7%	1.3%
Whitley	453,720	-10.8%	1.1%
Johnson	359,287	-49.8%	0.9%
Daviess	263,518	+18.1%	0.7%
Knox	183,857	+54.1%	0.5%
Martin	151,837	-54.5%	0.4%
Morgan	107,649	+128.0%	0.3%
Lawrence	89,884	+50.5%	0.2%
Breathitt	39,236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



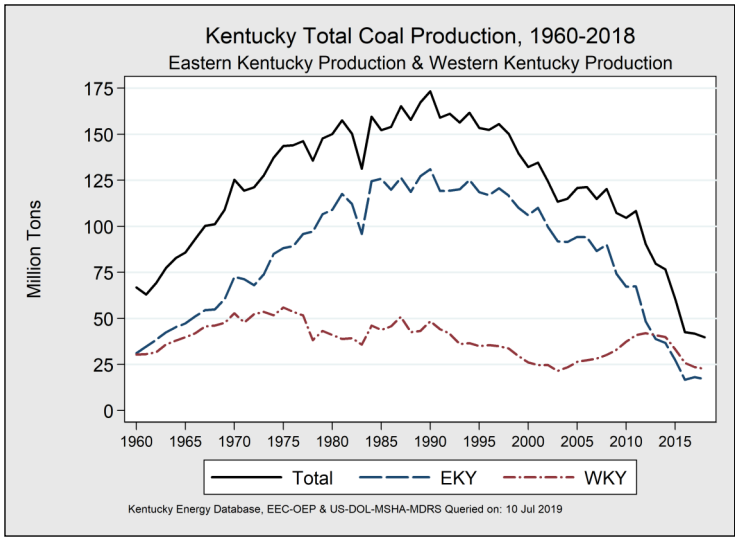


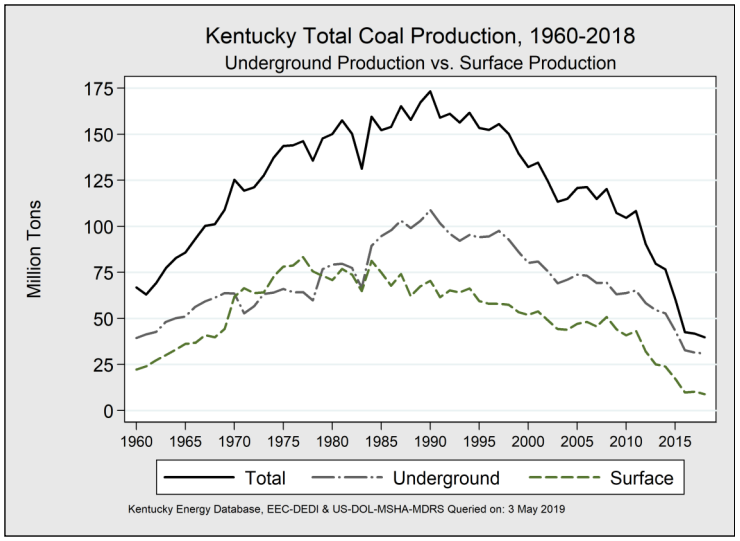
Region	2018 Tonnage	Annual Change
Total	39,798,896	-4.9%
Western Kentucky	22,659,124	-4.0%
Eastern Kentucky	17,139,772	-5.9%

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.

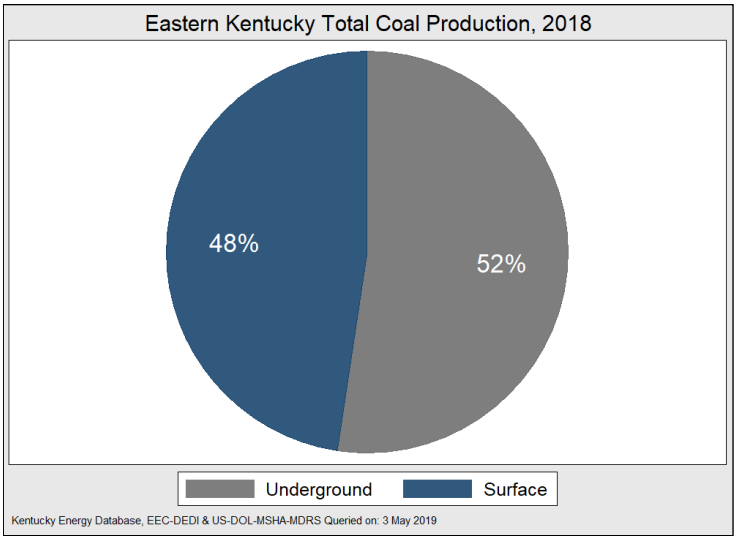


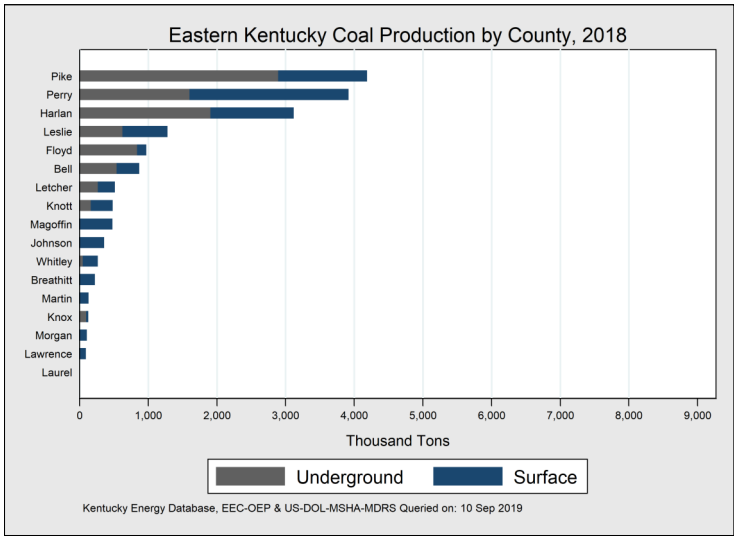


Eastern Kentucky has been the top-producing region in Kentucky since 1912, when eastern Kentucky overtook western Kentucky. Western Kentucky coal mines have produced the majority of coal in the Commonwealth since the third quarter of 2013 and were the main source of Kentucky coal from 1886 to 1911.

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.

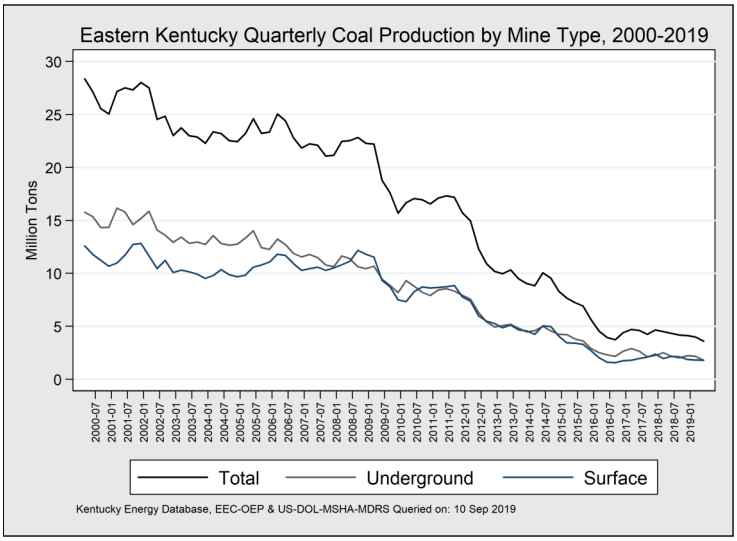
Eastern Kentucky Coal Production





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.



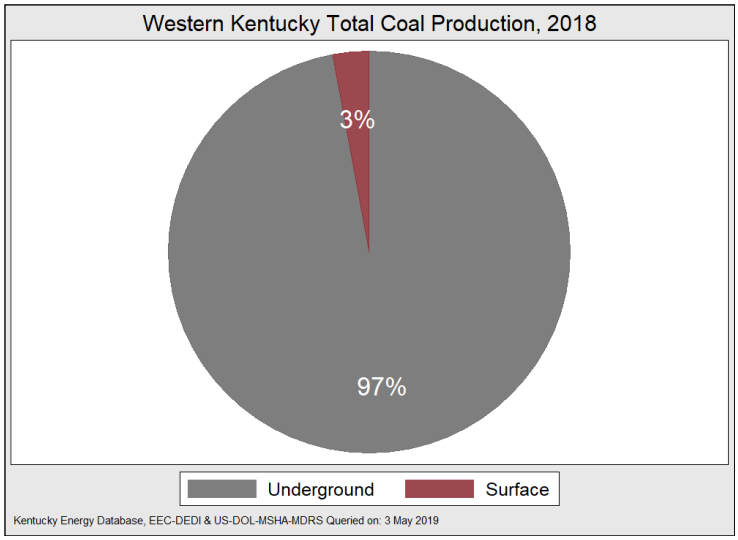
Eastern County	2018 Tonnage	Annual Change
Pike	4,328,175	-5.4%
Perry	3,638,302	-3.6%
Harlan	3,097,648	-11.5%
Leslie	1,264,272	+20.7%
Floyd	918,122	-32.7%
Bell	795,063	-27.5%
Knott	621,055	+10.8%
Letcher	587,638	+57.8%
Magoffin	503,227	+331.7%
Whitley	453,720	-10.8%
Johnson	359,287	-49.8%
Knox	183,857	+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%

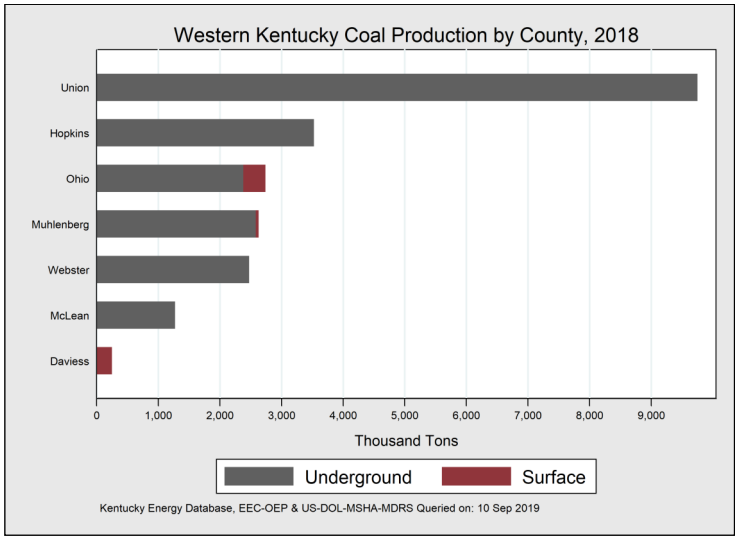
Annual production slowed at both underground and surface mining operations in eastern Kentucky in 2018, by 9.9% and 1.2% respectively.

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.

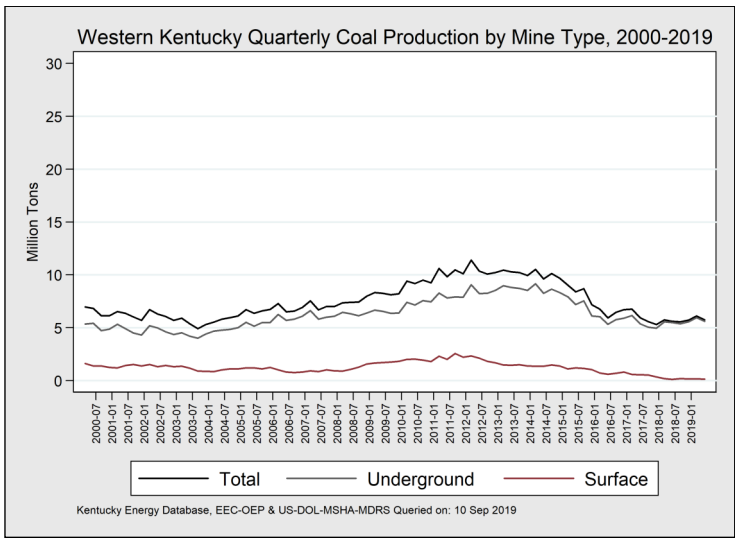
Western Kentucky Coal Production





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.



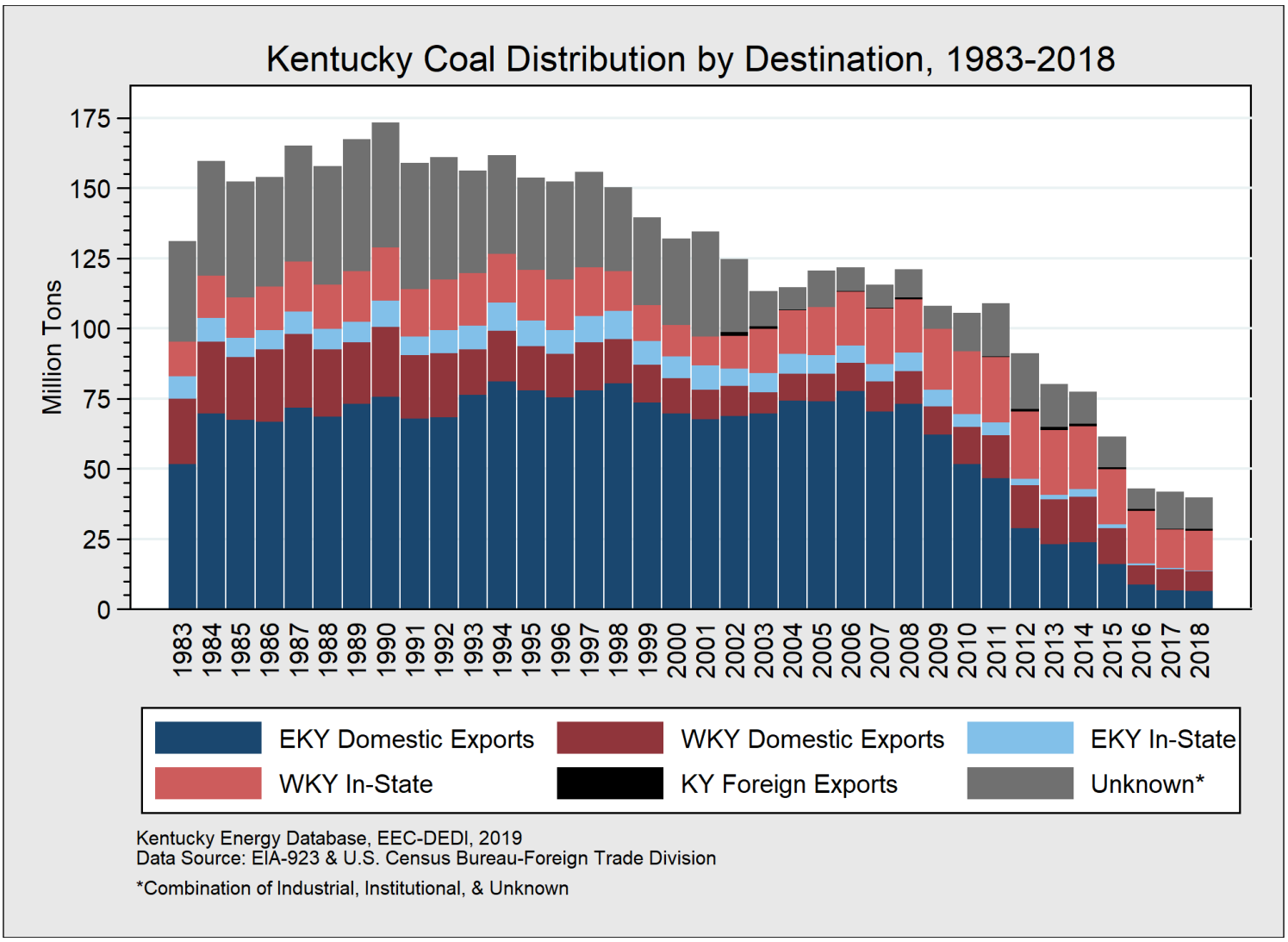
Surface mining made up 3% of coal production in western Kentucky. The majority of western Kentucky coal production was excavated by surface mining until 1985. In fact, Muhlenberg County was the Commonwealth's leading coal producer from 1961 to 1978, predominantly through the utilization of surface mining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



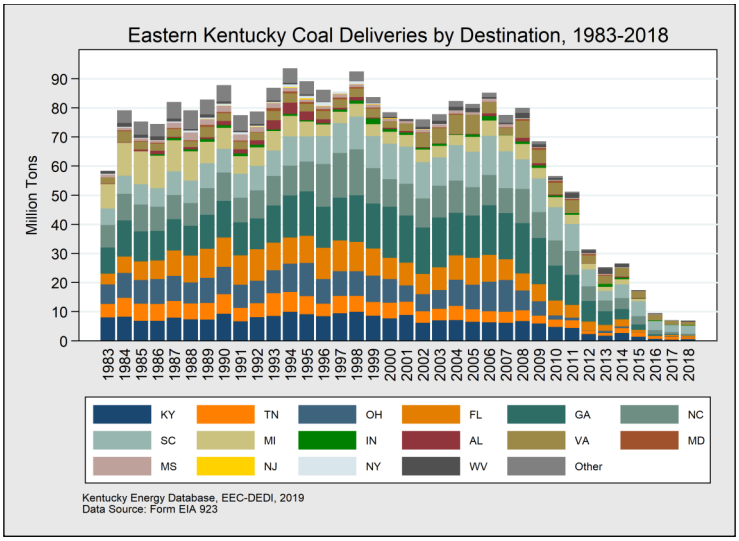
Coal Distribution by Destination, 2018		
Coal and Destination	Thousand Tons	Percentage
Total Production	39,799	100%
WKY In-State	14,166	35.6%
Industrial/Unknown	11,293	28.3%
WKY Out-of-State	6,998	17.6%
EKY Out-of-State	6,465	16.2%
Foreign Exports	487	1.2%
EKY In-State	389	1.0%

†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.

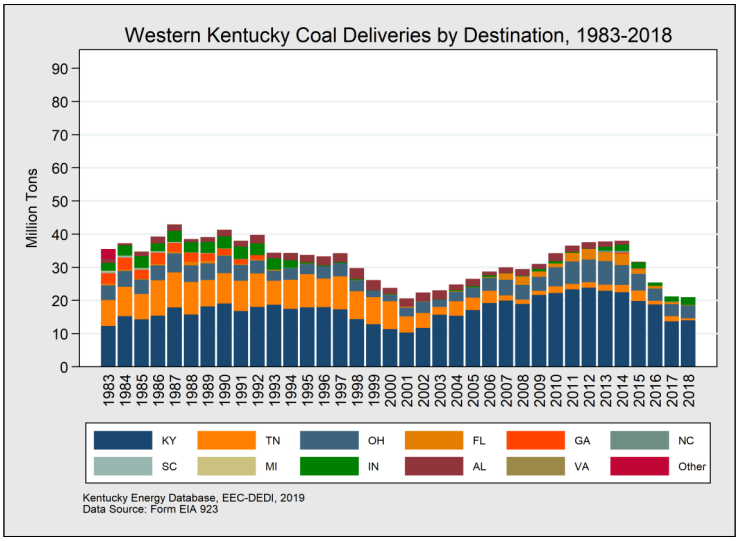
Eastern Kentucky coal has predominantly been sold to states in the southeastern United States. Conversely, western Kentucky coal has mostly been mined for in-state consumption. Kentucky remains the single-largest consumer of Kentucky coal, increasing its consumption as other states have decreased their 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.



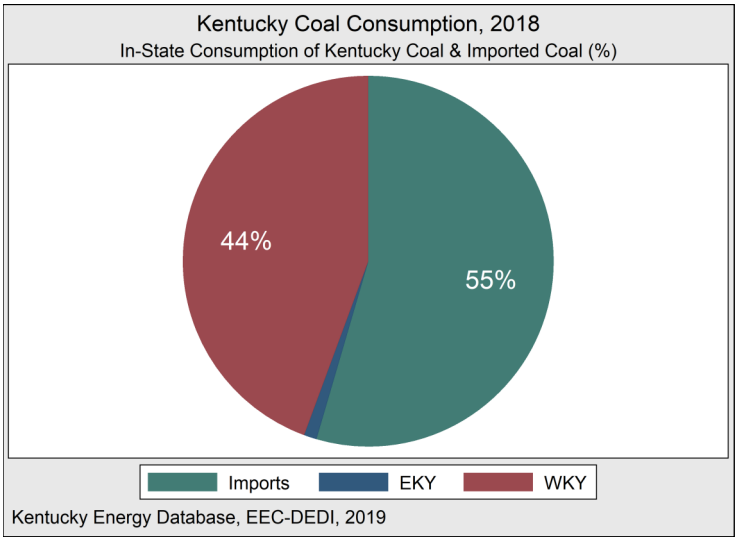
Western Kentucky Coal Deliveries, 2018		
Destination	Thousand Tons	Percentage
Total	21,164	100%
Kentucky	14,166	66.9%
Florida	3,947	18.6%
Indiana	2,350	11.1%
Tennessee	537	2.5%
Ohio	92	0.4%
Mississippi	67	0.3%
Pennsylvania	6	0.03%

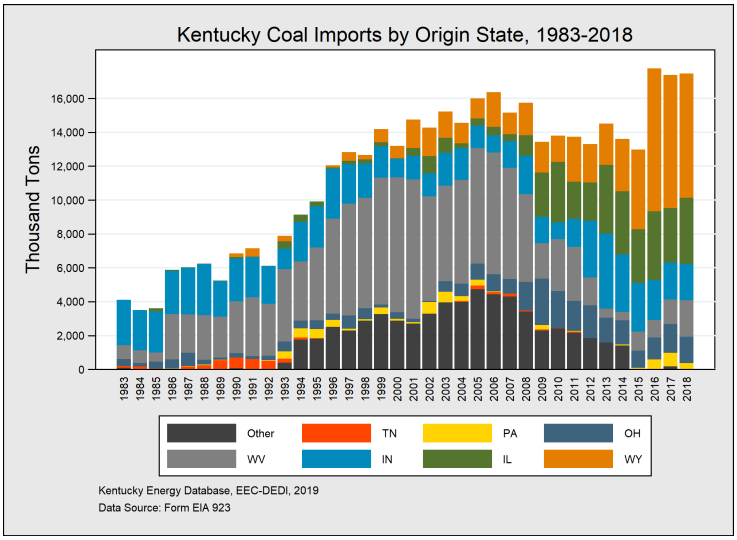
Known shipments of steam coal from western Kentucky to power plants within the United States decreased by 0.1 % in 2018 to 21.1 million tons. The largest market for western Kentucky coal is consistently Kentucky, which represented 66.9% of western Kentucky coal deliveries during the year. Overall, coal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

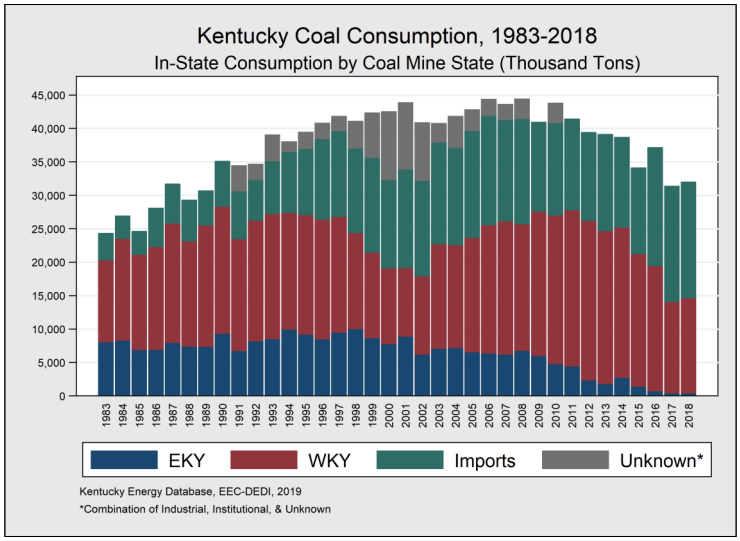




Origin of Coal	Thousand Tons	1 Year Change
Total	32,037,588	+1.9%
Western Kentucky	14,166,247	+0.4%
Imports	17,467,006	+12.6%
Eastern Kentucky	404,335	+3.4%

All values have been rounded to the nearest thousand tons.

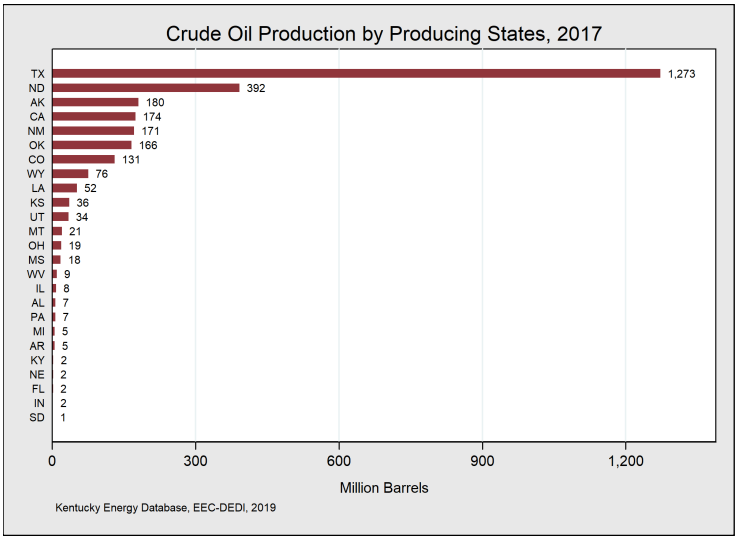
Imported Coal	Thousand Tons	1 Year Change
Total Imports	17,467	+1.5%
Wyoming	7,333	-6.7%
Illinois	3,920	+21.5%
Indiana	2,179	+51.5%
Ohio	2,119	-2.5%
West Virginia	1,546	-9.4%
Pennsylvania	369	-53.5%

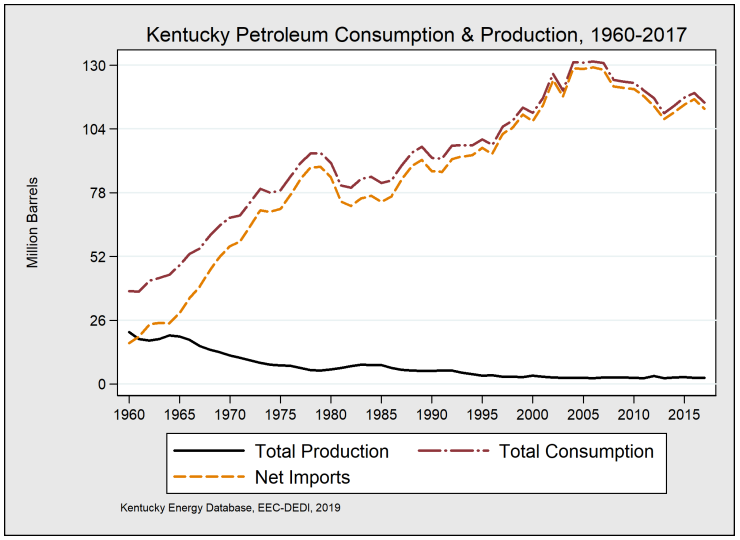


Coal consumption in Kentucky increased by 1.9% in 2018 to 32 million tons. Coal imports were the largest source of coal used within the Commonwealth, representing 55% of coal consumption. Conversely, coal from eastern Kentucky accounted for 1% of the coal consumed in Kentucky in 2018.

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





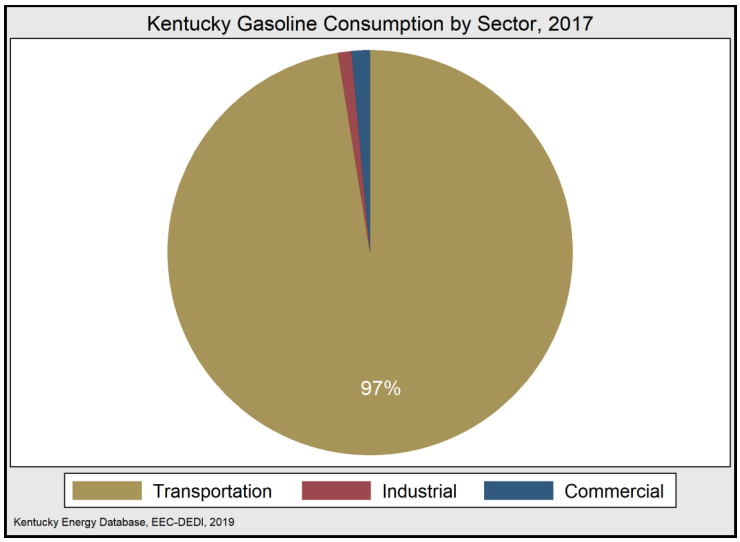
Production	2017 Million Barrels	Rank
Texas	1,273	1st
Kentucky	2	21st

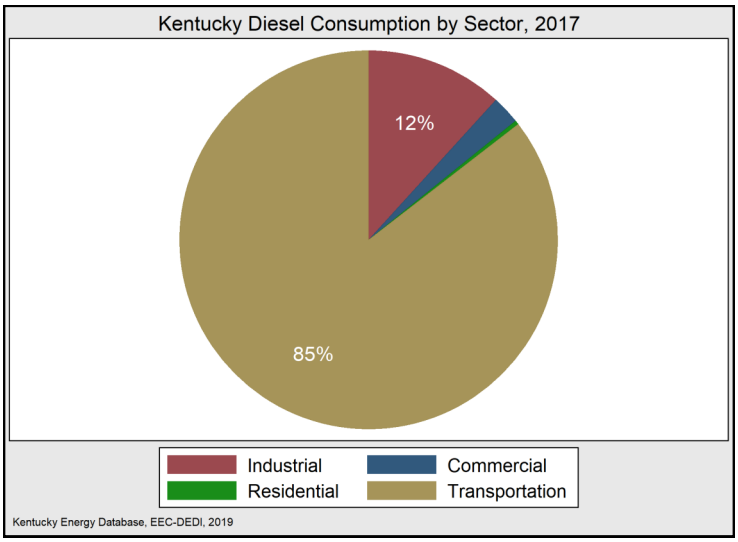
Crude oil production in Kentucky decreased by 4.5% in 2017 to produce 2.4 million barrels. Annual crude oil production in Kentucky had remained between 2.4 and 2.9 million barrels since the year 2000, but has recently increased with more widespread application of horizontal wells and nitrogen foam and 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

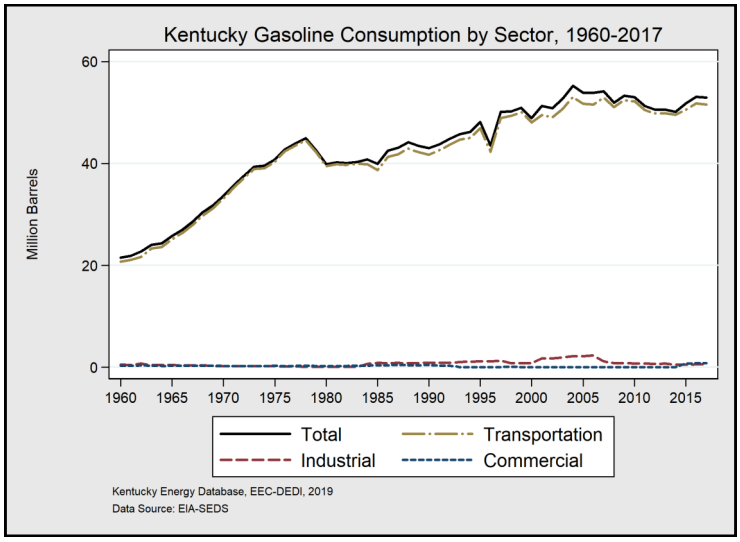
Kentucky Liquid Fuel Consumption

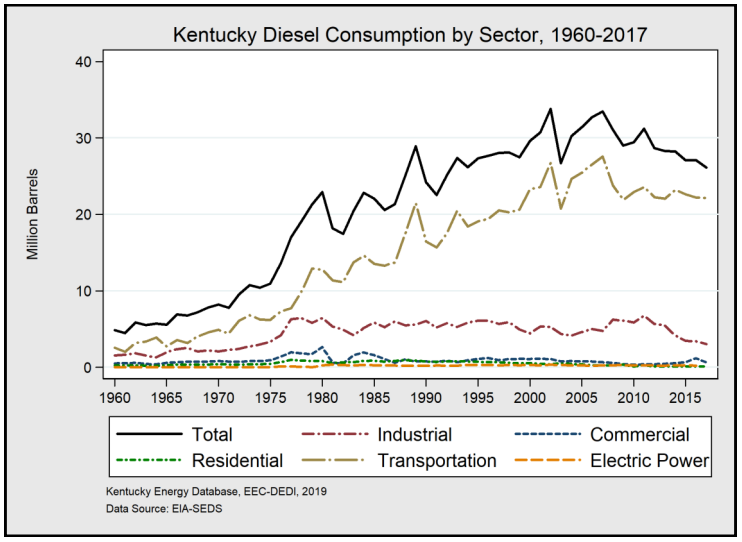




Sector	Thousand Barrels	Percentage
Total	52,908	-0.4%
Transportation	51,555	-0.4%
Industrial	568	+0.9%
Commercial	785	+1.3%

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%

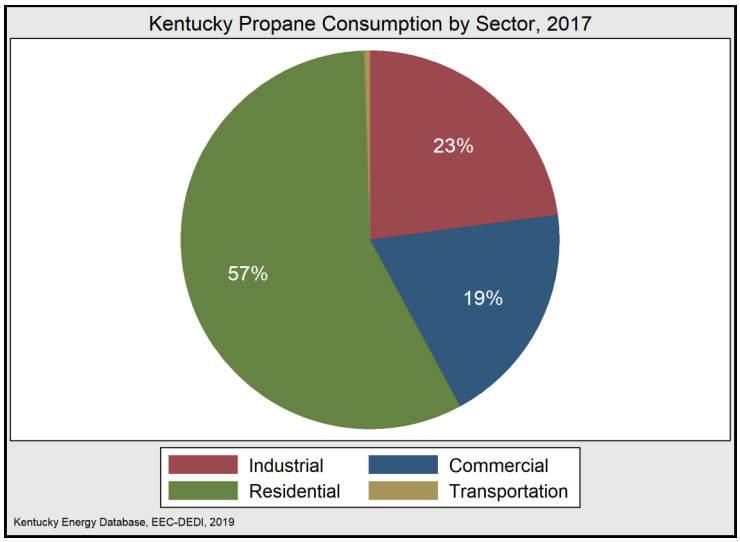


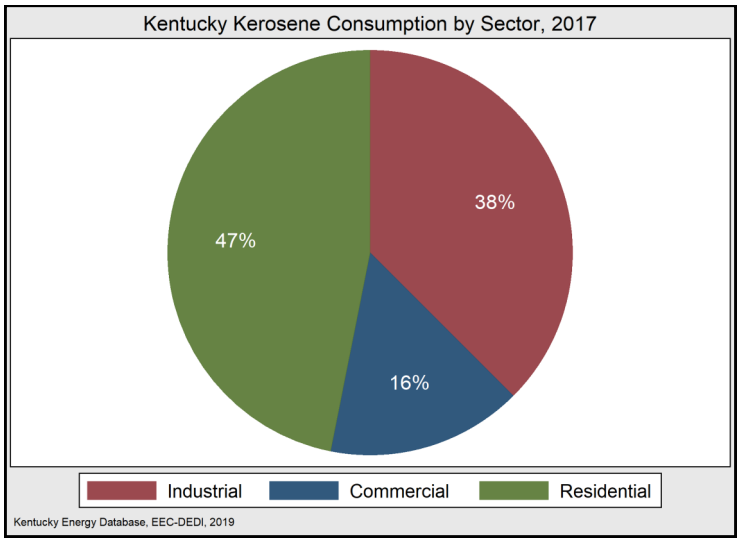


In 2017, Kentucky consumed 52.9 million barrels of gasoline, with 97% used for transportation. Compared with 2016, total gasoline consumption in Kentucky decreased by 0.4%.

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.

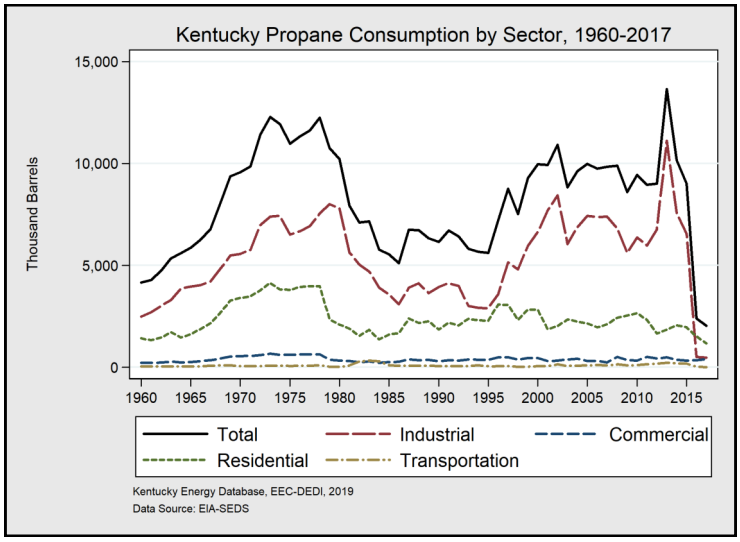
Kentucky Liquid Fuel Consumption

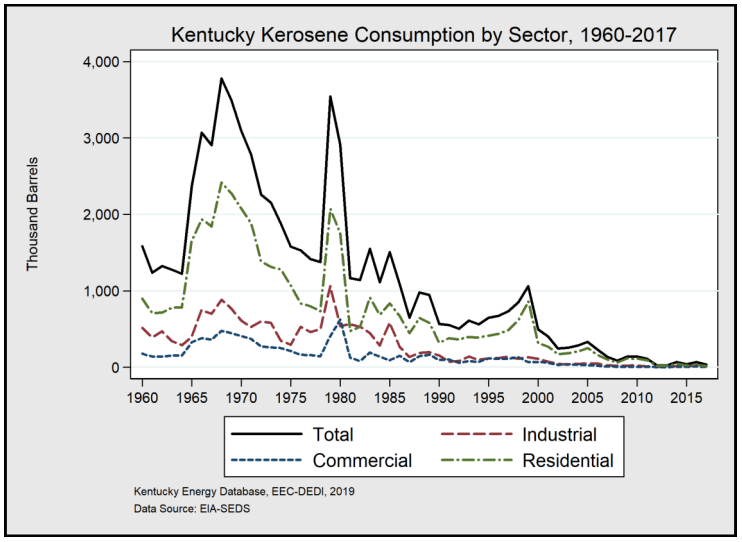




Sector	Thousand Barrels	Percentage
Total	2,030	-15.0%
Industrial	465	-7.4%
Residential	1,165	-23.1%
Commercial	390	11.1%
Transportation	10	-50.0%

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



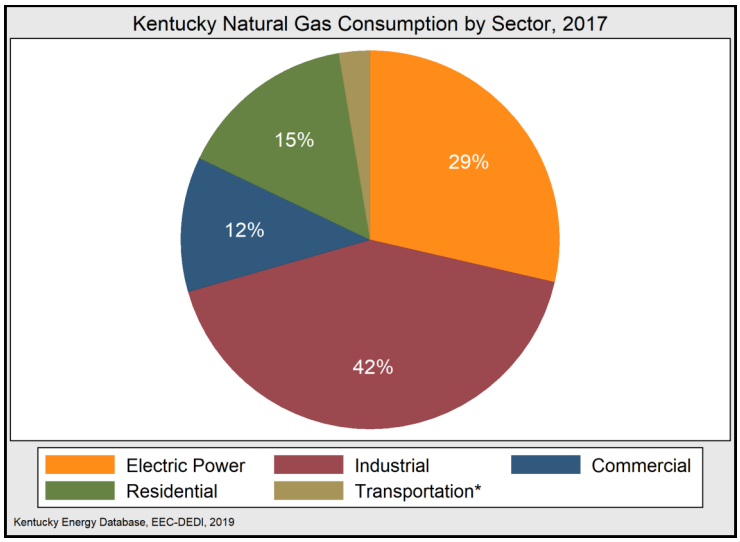


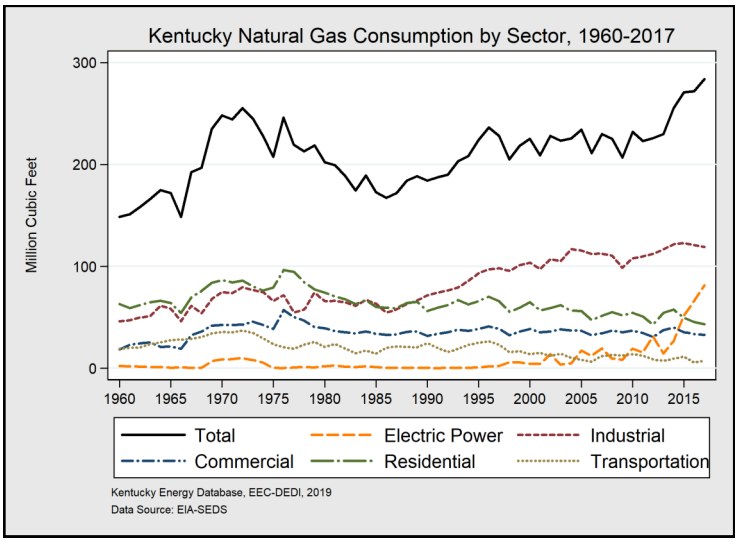
In 2017, more than 2 million barrels of liquid petroleum gas (LPG), which is mostly propane, but also includes ethane and butane, was consumed in Kentucky. Since 2016, consumption decreased by 15%. With 57% of total consumption, the residential sector was the largest end-user of LPG, followed by the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





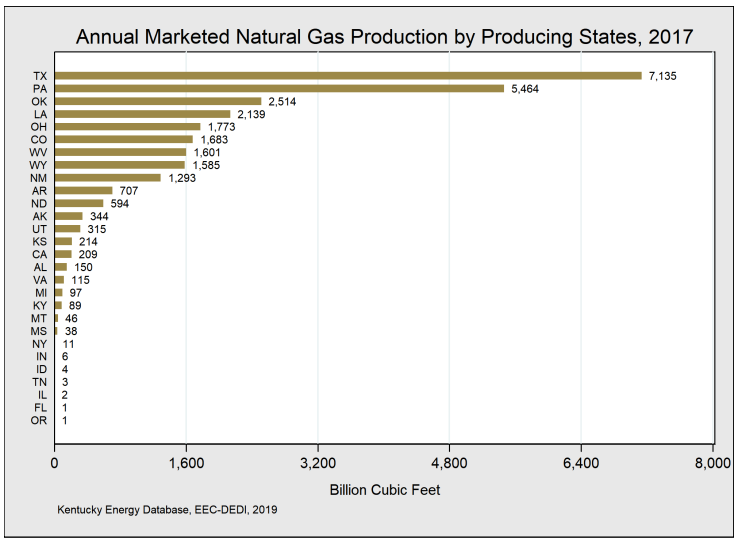
Sector	Million Cubic Feet	1 Year Change
Total	283,905	+4.4%
Industrial	119,119	-1.4%
Residential	43,253	-4.9%
Commercial	32,796	-2.2%
Electric Power	81,208	+22.4%
Transportation*	7,529	+34.2%

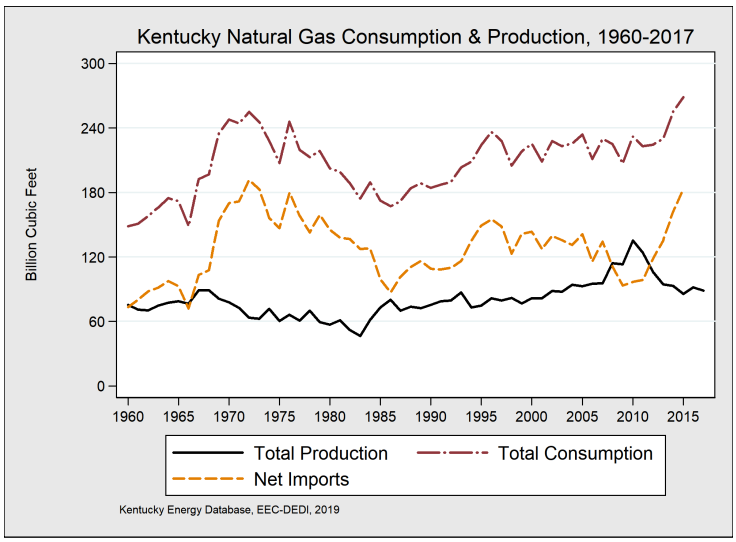
*Natural gas consumption by the transportation sector is the summation of vehicle fuel usage and natural gas used in the movement of natural gas resources through transmission and distribution pipelines. In Kentucky in 2017, direct vehicle fuel usage of natural gas was approximately 44 million cubic 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.

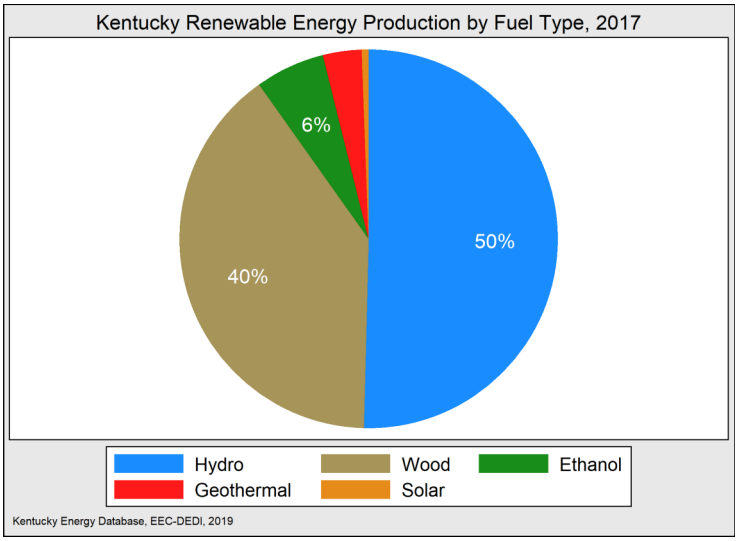
Additional information on the location of natural gas fields and wells is available from the Kentucky Geological Survey Geologic Map Information Service at:

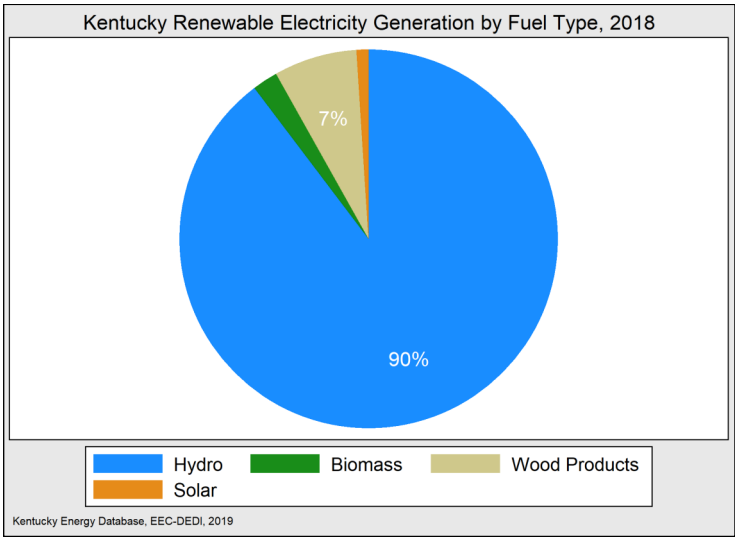
http://kgs.uky.edu/kgsmap/kgsgeoserver/viewer.asp

Kentucky Renewable Energy

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

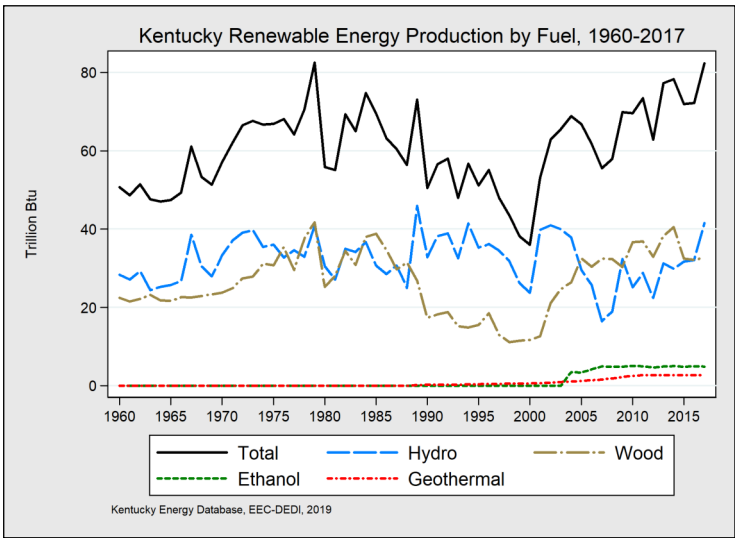
Kentucky Renewable Energy

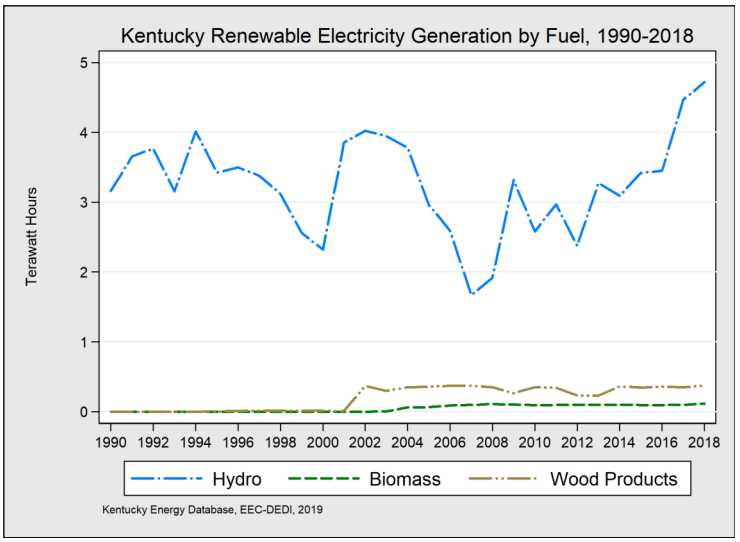




Fuel Type	Billion Btu	1 Year Change
Total	82,345	+13.9%
Wood & Biomass	32,734	+1.8%
Hydroelectric*	41,514	+29.3%
Ethanol†	4,904	-0.7%
Geothermal	2,712	+0.0%
Solar	481	+31.8%

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%





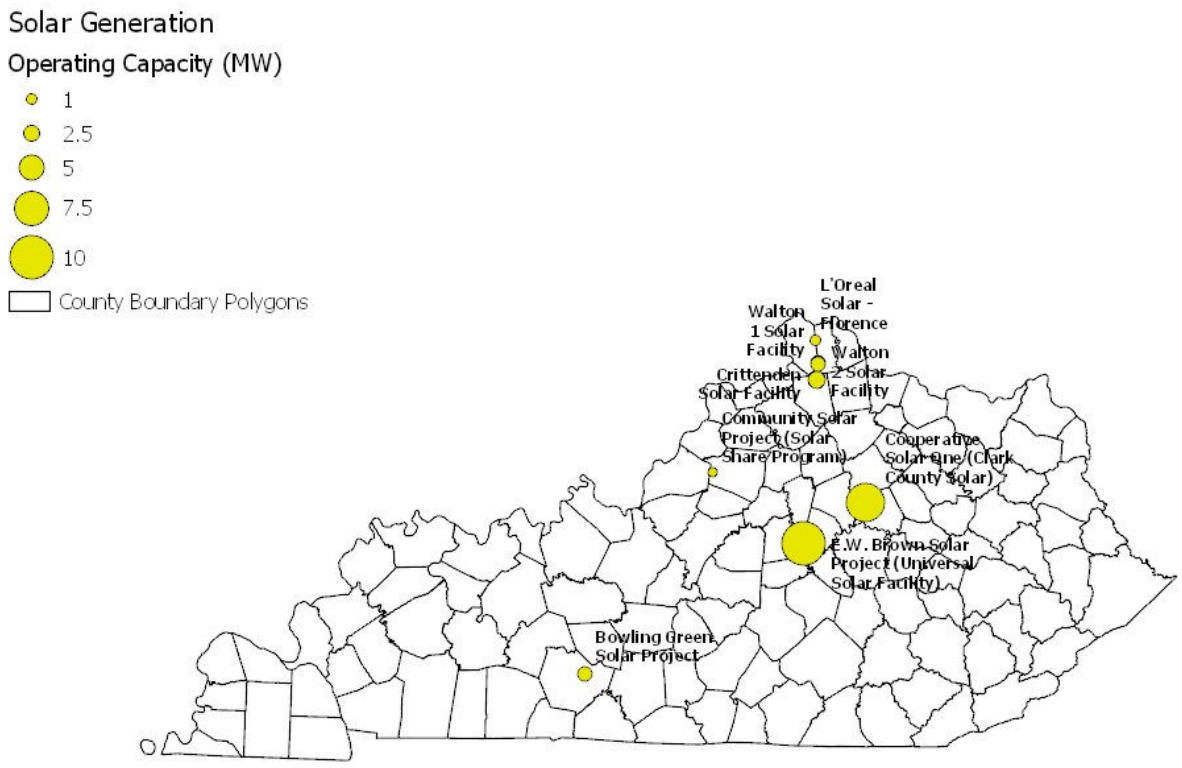
In 2017, Kentucky produced 82.3 trillion Btu of energy from renewable resources, a 13.9% increase compared with 2016. Year-to-year fluctuations are mostly due to variations in hydroelectric power, which itself is a reflection of rainfall. Hydroelectric, Wood and biomass waste was 96% of all renewable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

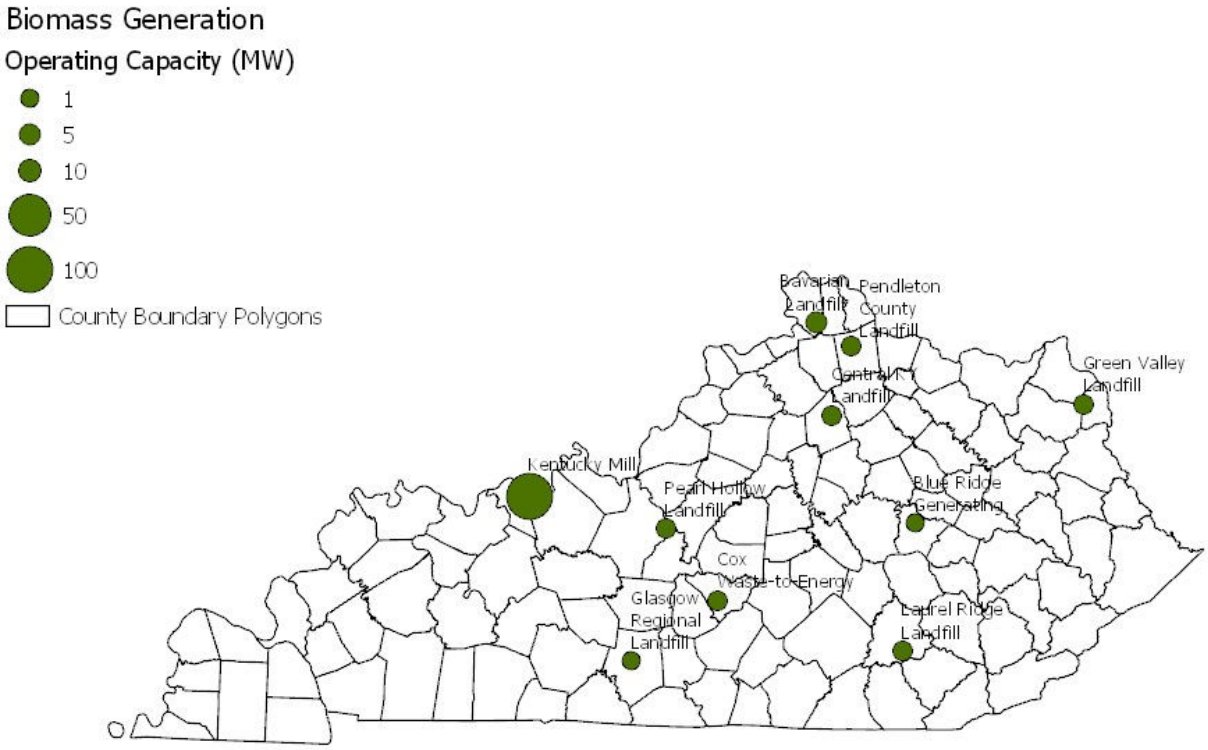
*Hydroelectric generation is directly accounted through gigawatt-hour consumption, whereas hydroelectric production (billion Btu) is a calculated fossil fuel displacement conversion, or the amount of fossil fuel energy required to generate an equal amount of electricity.

Kentucky Solar Generation



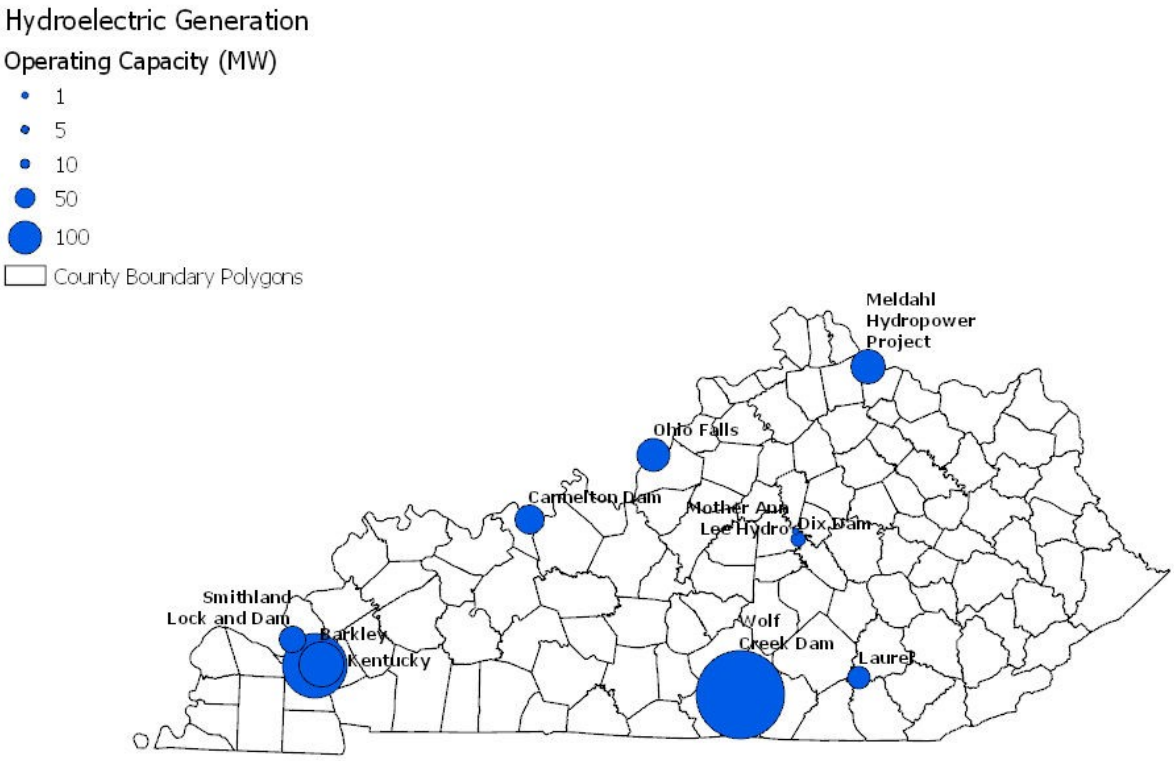
Name	Capacity (MW)
Bowling Green Solar Project	2.1
Community Solar Project (Solar Share Program)	0.5
Cooperative Solar One (Clark County Solar)	8.5
Crittenden Solar Facility	2.7
E.W. Brown Solar Project (Universal Solar Facility)	10
L'Oreal Solar - Florence	1.1
Walton 1 Solar Facility	2
Walton 2 Solar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

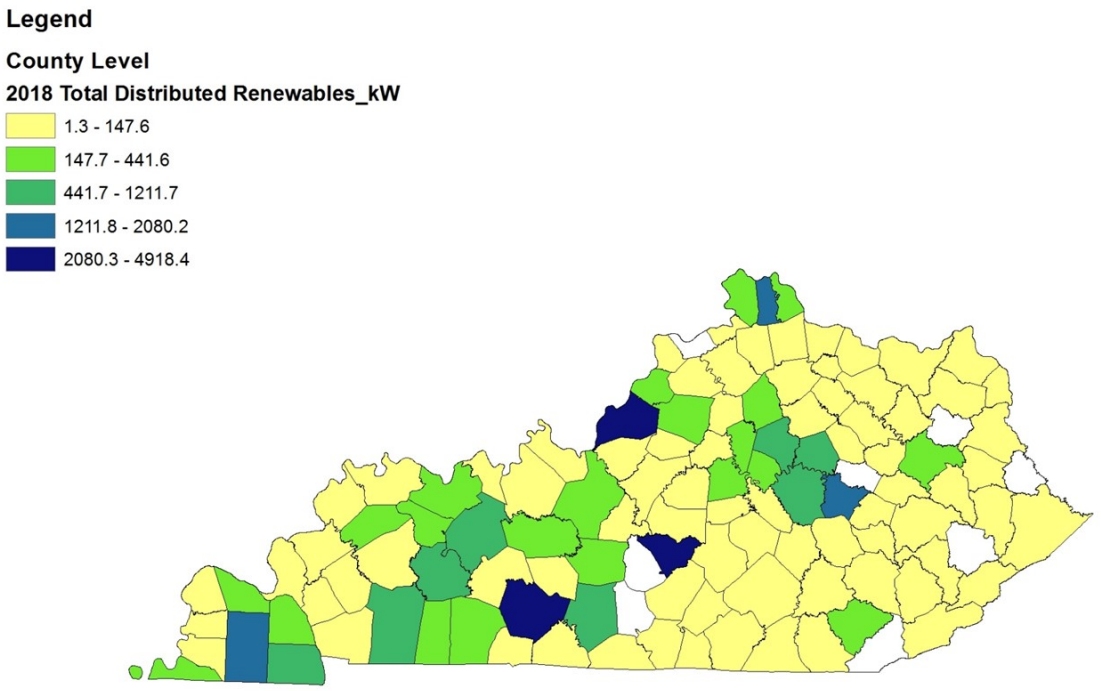
Net Energy Metering or Net Metering refers to a compensation mechanism established in KRS 278.465-468 which allows small renewable generation systems to interconnect to the electric distribution grid.

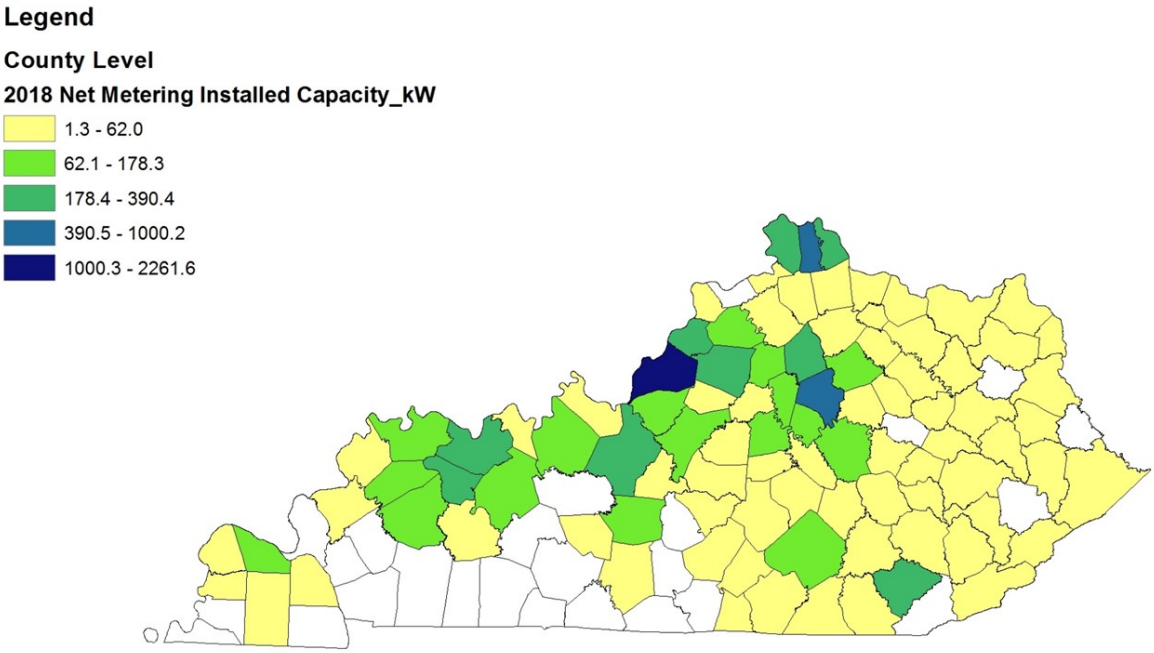
Distributed renewable generation systems located in areas of Kentucky served by TVA local power companies do not interconnect via net metering.

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.

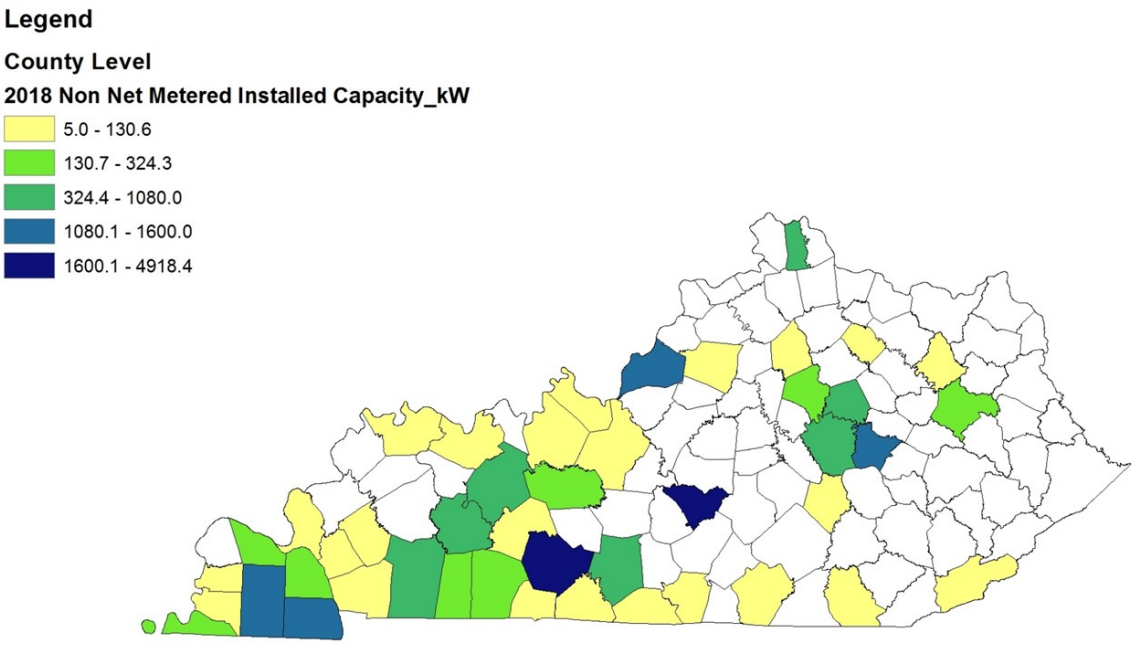
For more information on accessing alternative energy in Kentucky, visit the Consumer Energy Management and Access Guide located at eec.ky.gov/energy.

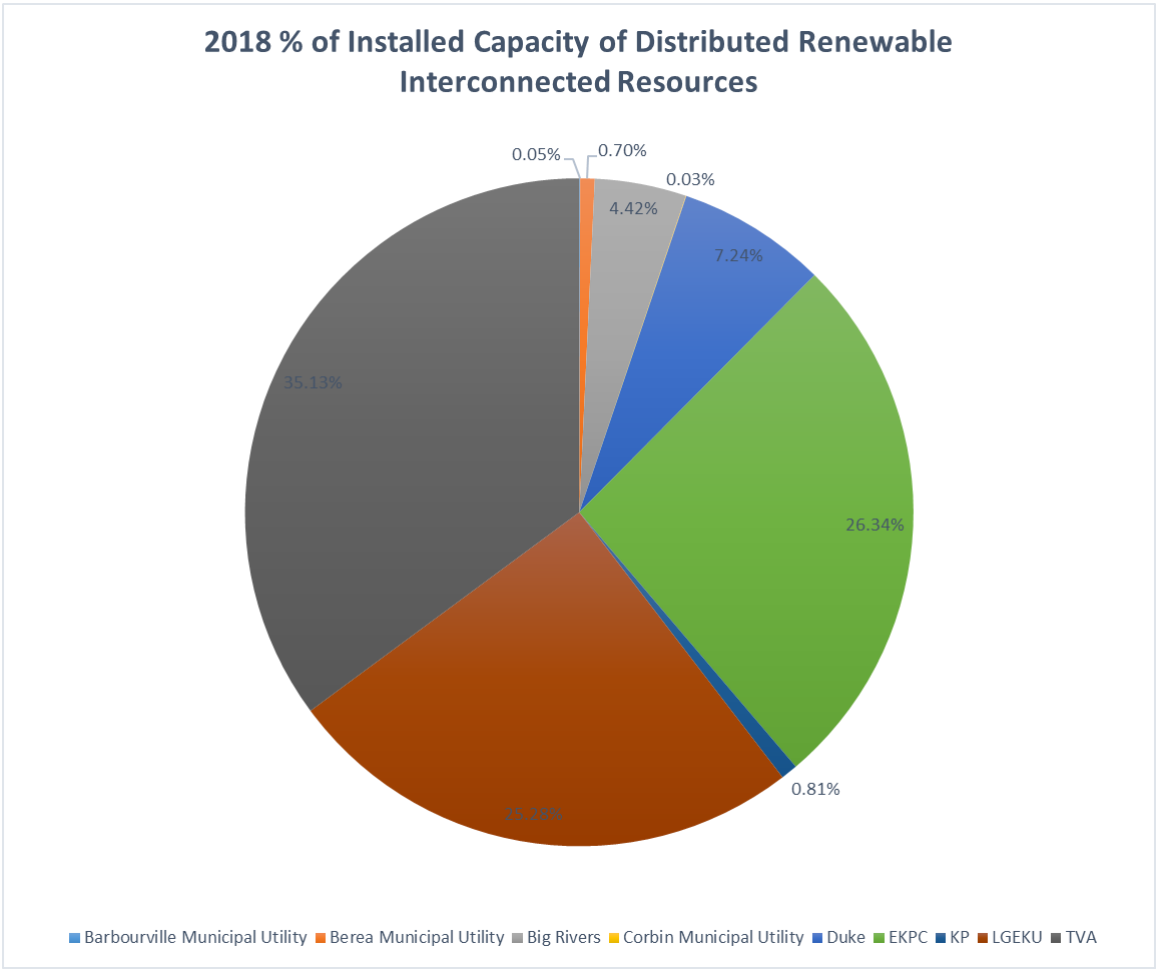
Distributed Renewable Generation





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

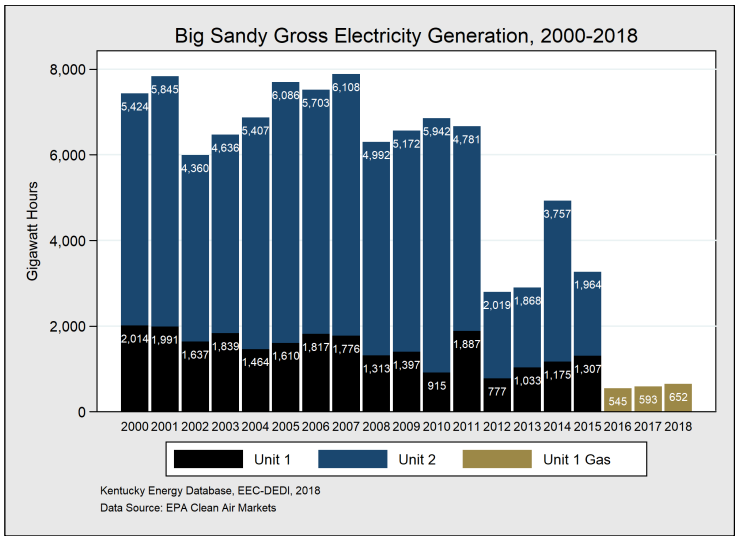
The following pages detail generation and emission statistics for Kentucky's coal fired generating plants. The plants that are profiled represent those that are currently coal fired or were once coal fired and have been converted to another source.

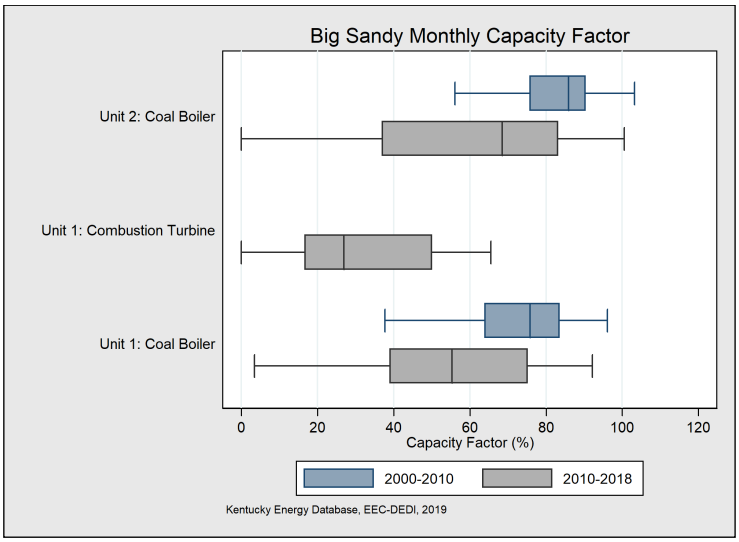
Edits from the previous edition:

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





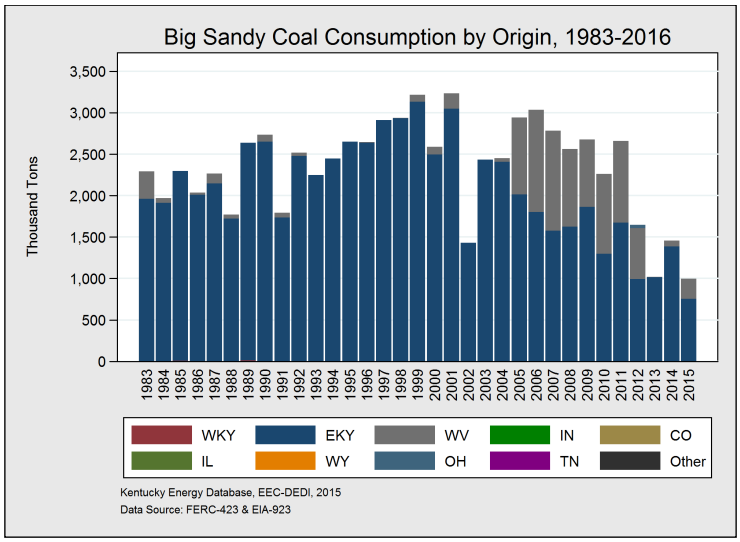
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1963**		**Natural Gas**	**268**	**27%**	**652**	**625**	**1,168**	**0.05**	**1.6**
1	1963		Natural Gas	268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

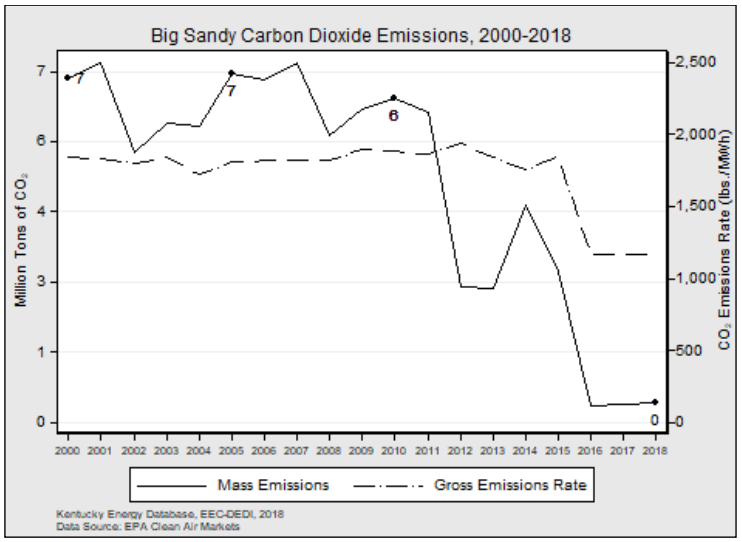
The Big Sandy Power Plant, near Louisa in Lawrence County, is 55 years old and consisted of two coal-fired electricity generating units, which came online in 1963 and 1969, respectively. The plant has a total nameplate capacity of 1,096 MW and is owned by Kentucky Power, a subsidiary of American Electric 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

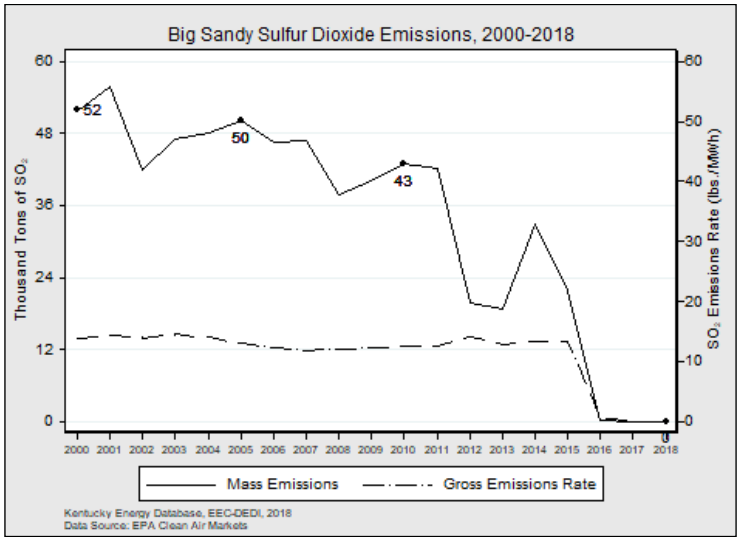


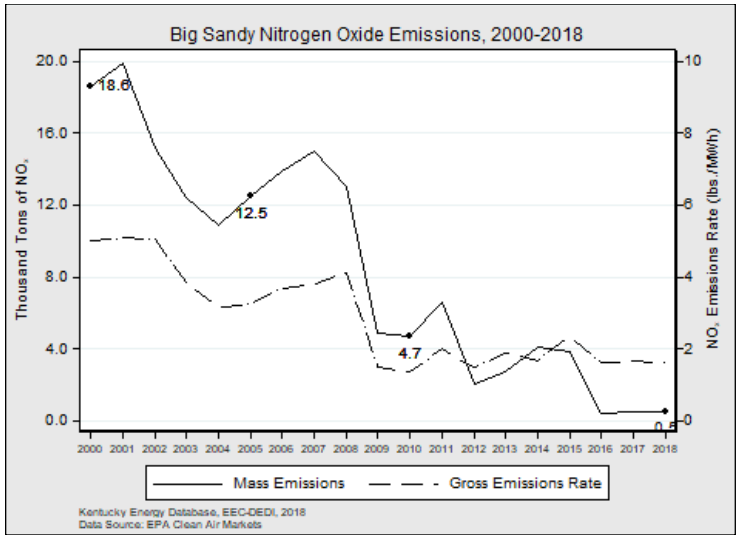


State	2015 Tons	Percentage
Total	1,457,580	100%
Eastern Kentucky	1,387,116	95%
West Virginia	70,464	5%

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.





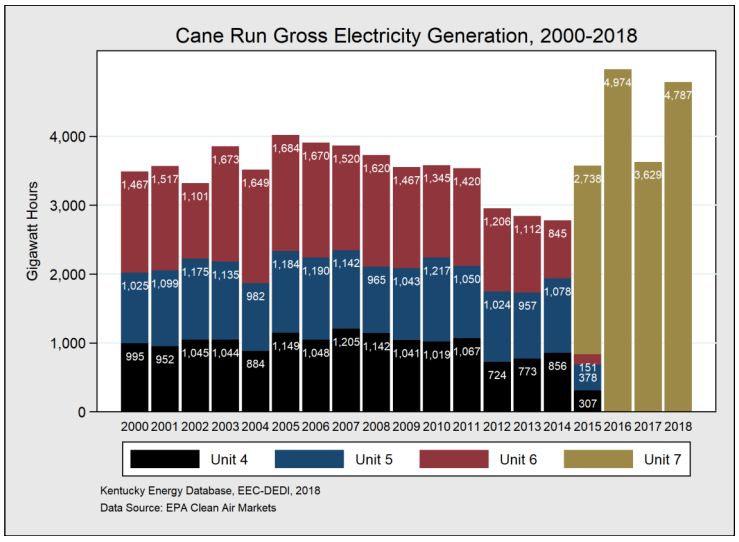
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	16.5	-99.99%
Rate (lbs./MWh)	0.05	-99.99%

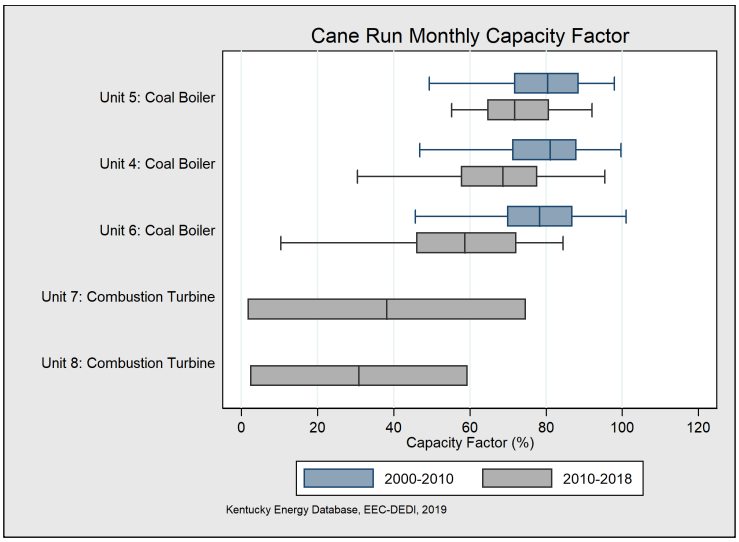
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	522	-89%
Rate (lbs./MWh)	1.6	-18%

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			

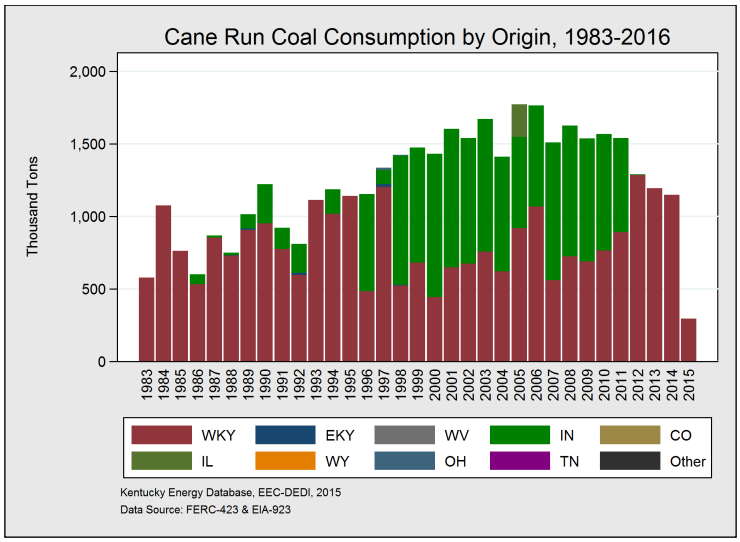
Cane Run Station, located southwest of Louisville in Jefferson County, began operation in 1954. The plant had six units at one time, but the three oldest coal units were retired by 1987. Units 4, 5, and 6 came online in 1962, 1966, and 1969, respectively. Units 4, 5, and 6 were retired in 2015 and replaced 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.

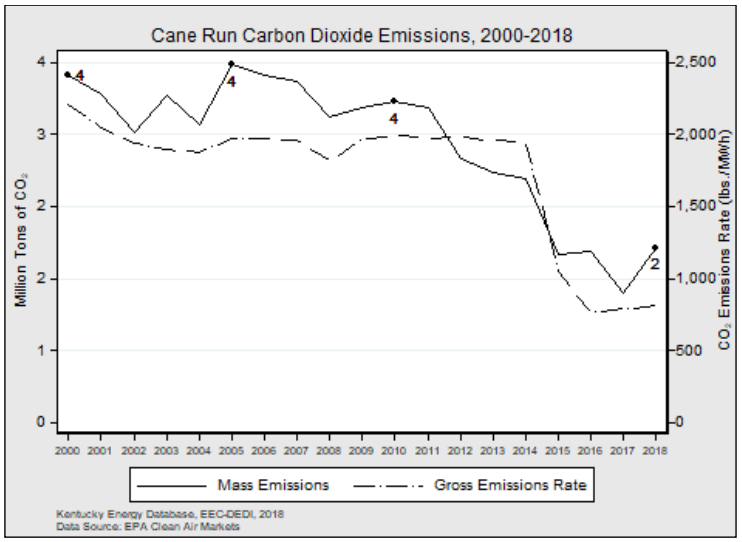
In their last full year of operation, Cane Run's coal units generated 2.7 GWh of electricity with an average capacity factor of 56%. Units 4, 5, and 6 generated 71.1 GWh for the Commonwealth over their lifetime with an average capacity factor of 59%. The coal units were demolished in June 2019.

*2018

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

Cane Run Station

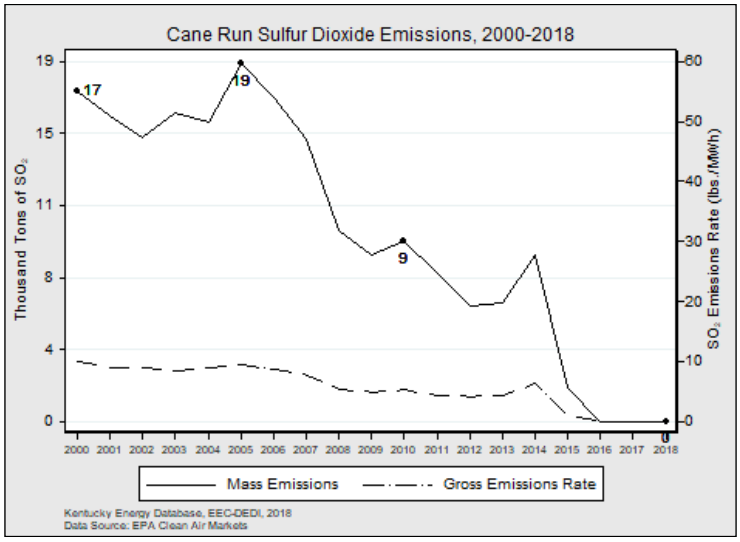


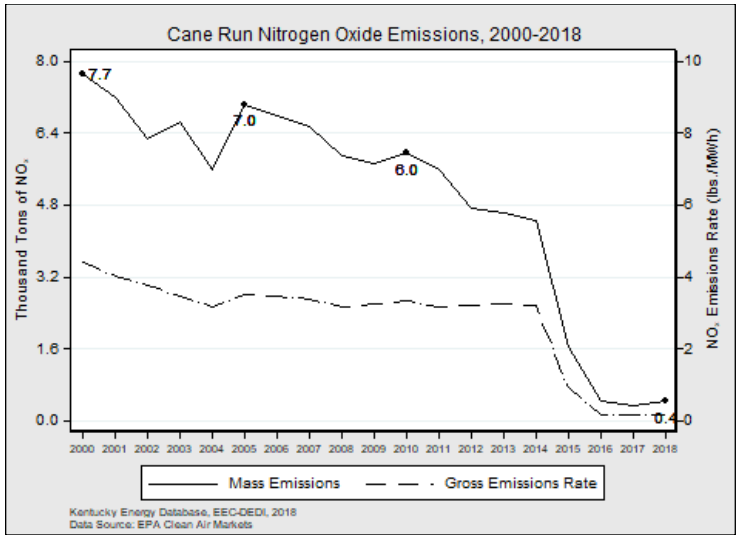


State	2016 Tons	Percentage
Total	1,147,537	100%
Western Kentucky	1,147,537	100%

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.





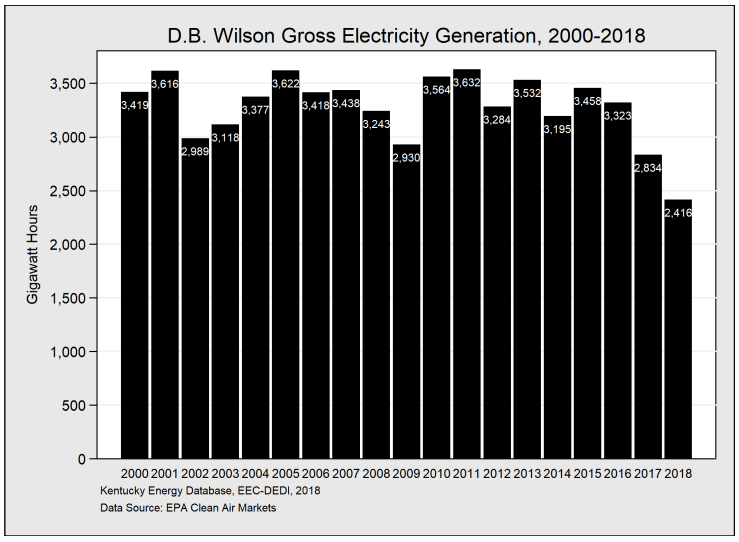
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	9.78	-99%
Rate (lbs./MWh)	0.004	-99%

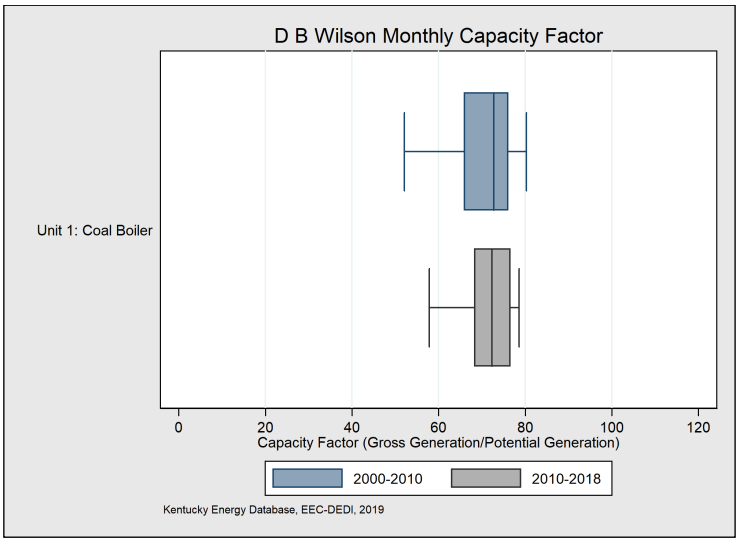
Nitrogen Dioxide	2015 Value	Since 2010
Emissions (Tonnage)	429	-93%
Rate (lbs./MWh)	0.17	-95%

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



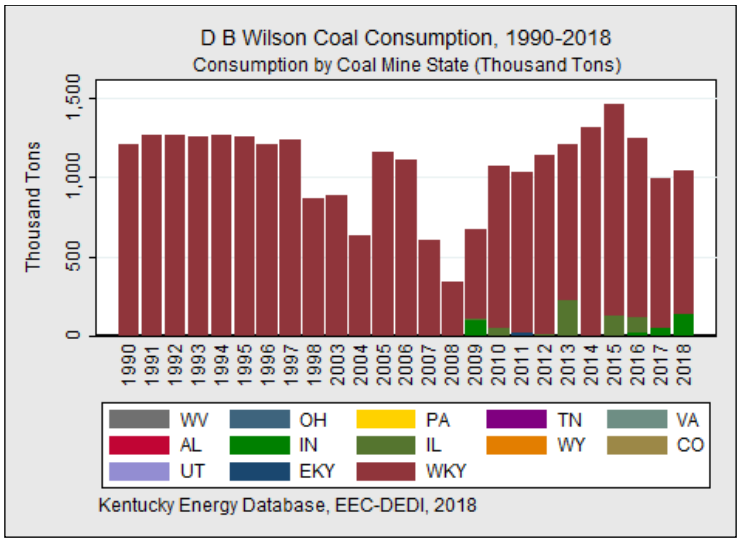


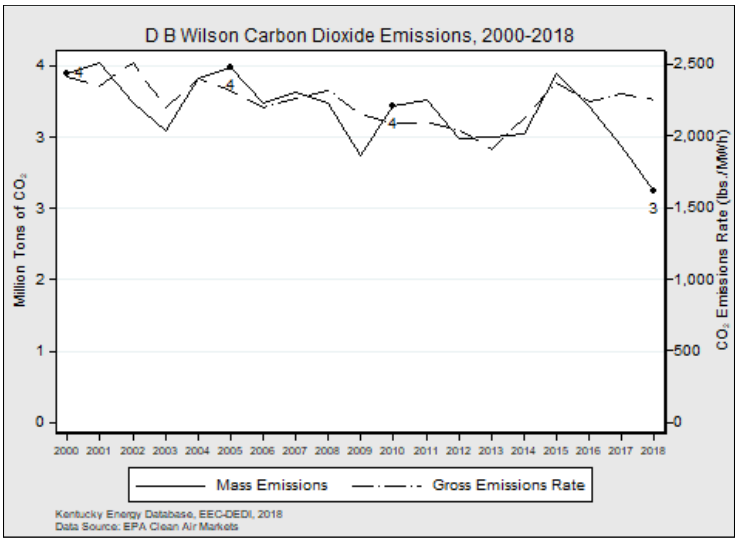
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1984**		**Coal**	**566**	**62%**	**2,416**	**2,256**	**2,252**	**4.2**	**0.96**
1	1984		Coal	566	62%	2,416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

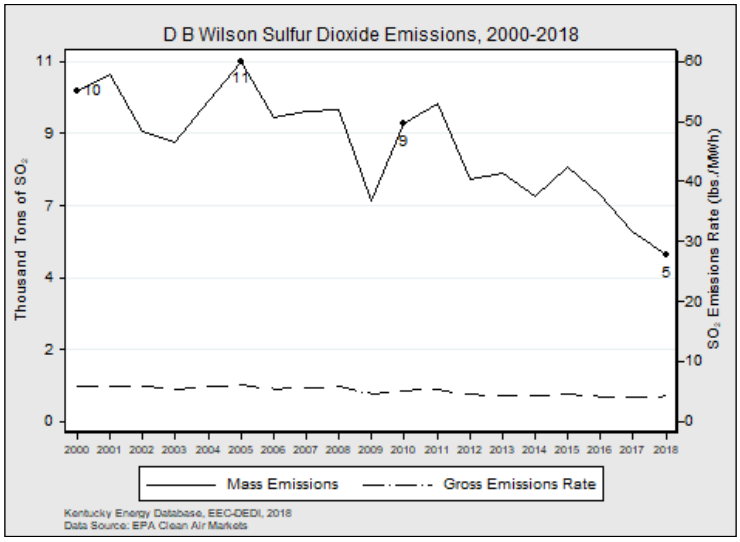


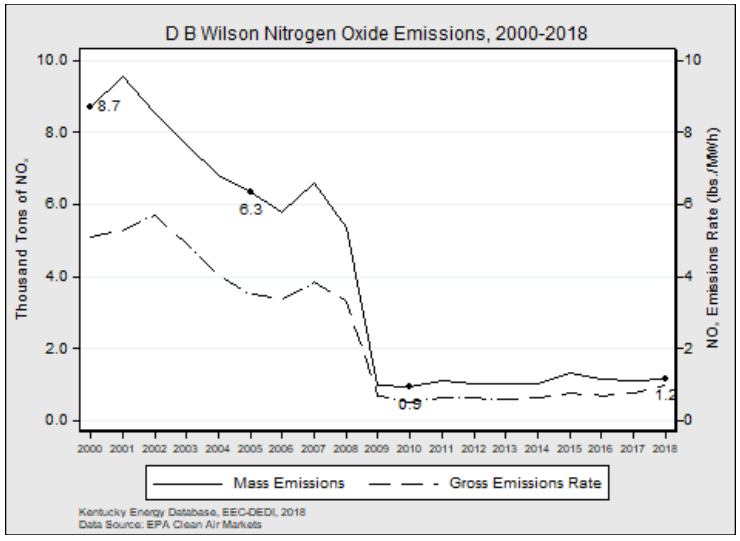


State	2018 Tons	Percentage
Total	1,307,770	100%
Western Kentucky	1,307,770	100%

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.





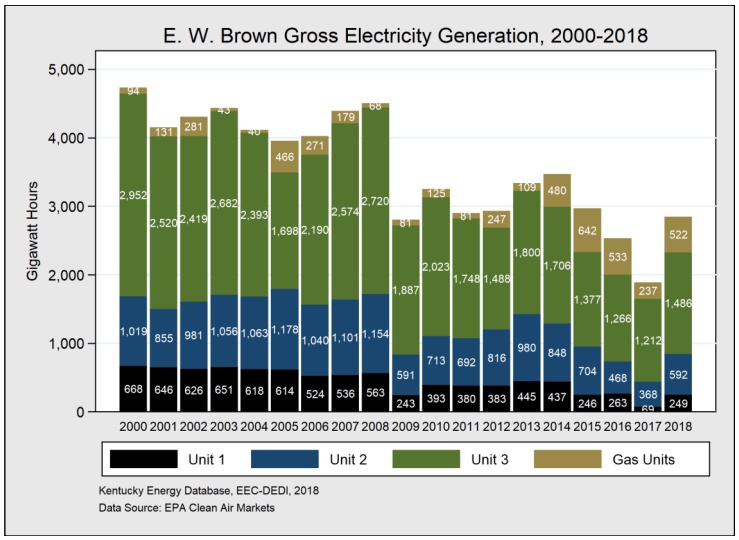
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	5,081	-44%
Rate (lbs./MWh)	4.21	-18%

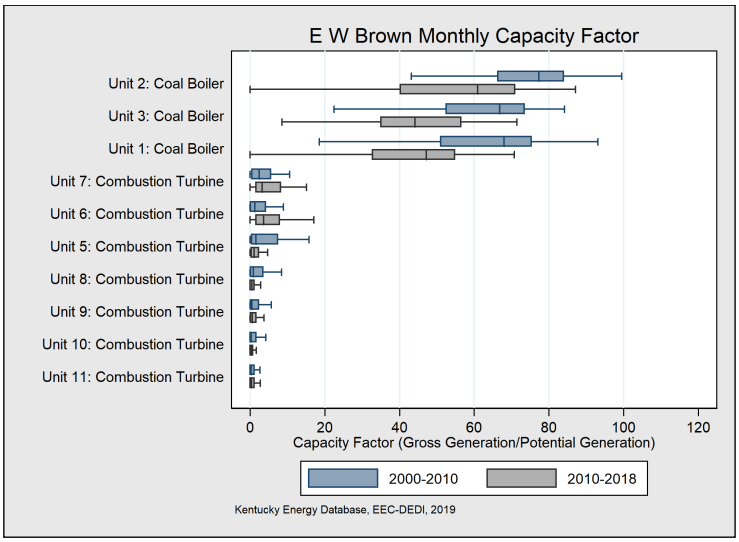
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,156	+24%
Rate (lbs./MWh)	0.96	+83%

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



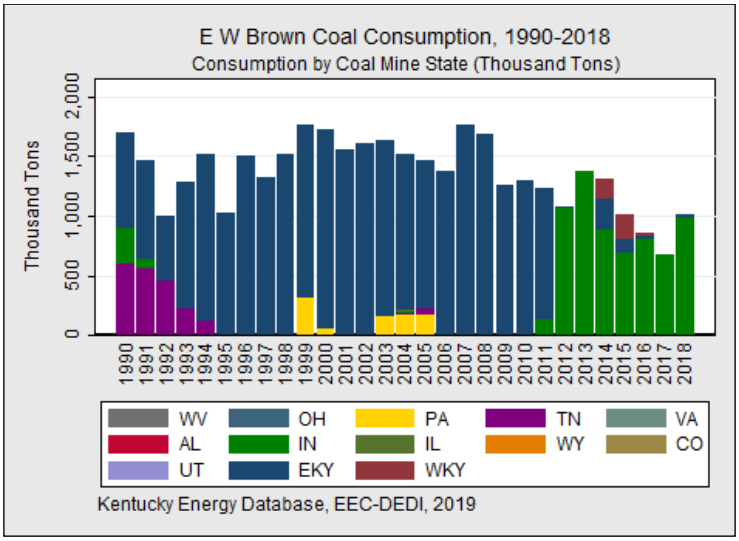


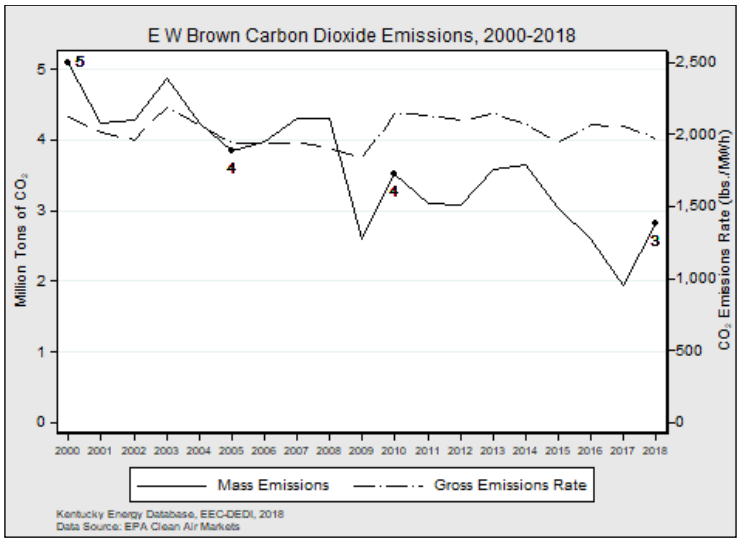
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1955**		**Coal**	**684**	**32%**	**2,849**	**2,035**	**1,970**	**1.47**	**0.7**
1	1957	2019	Coal	106	22%	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

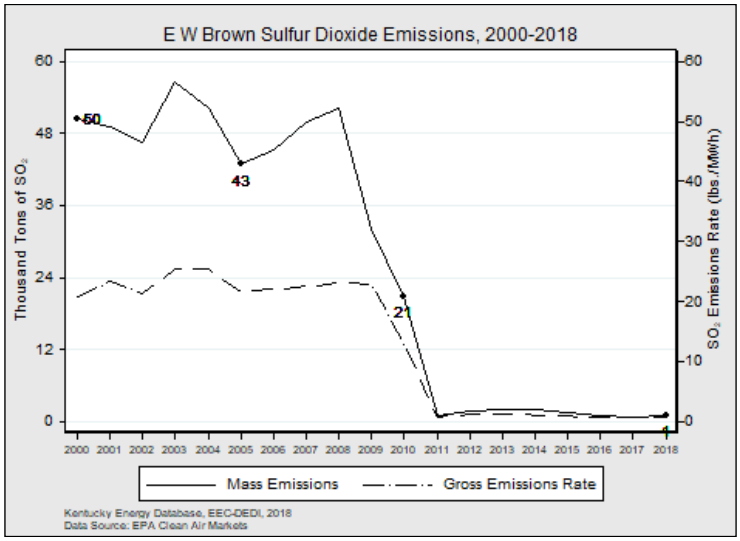


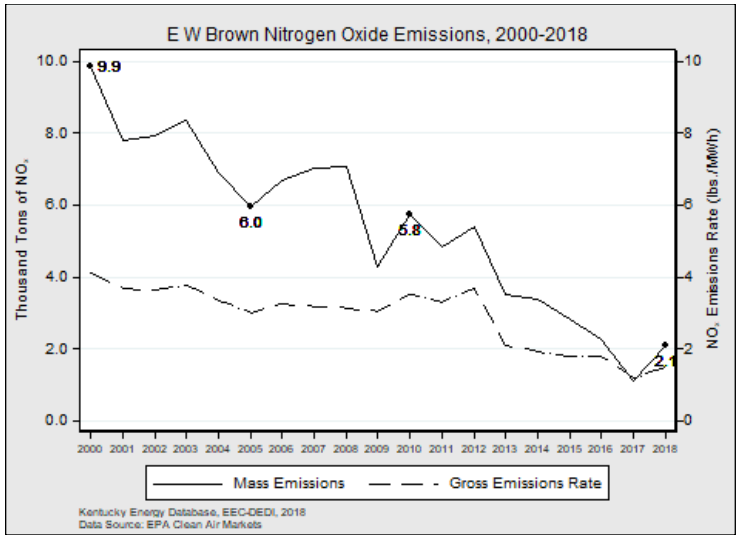


State	2018 Tons	Percentage
Total	1,307,307	100%
Indiana	889,927	68%
Eastern Kentucky	215,969	17%
Western Kentucky	201,411	15%

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.





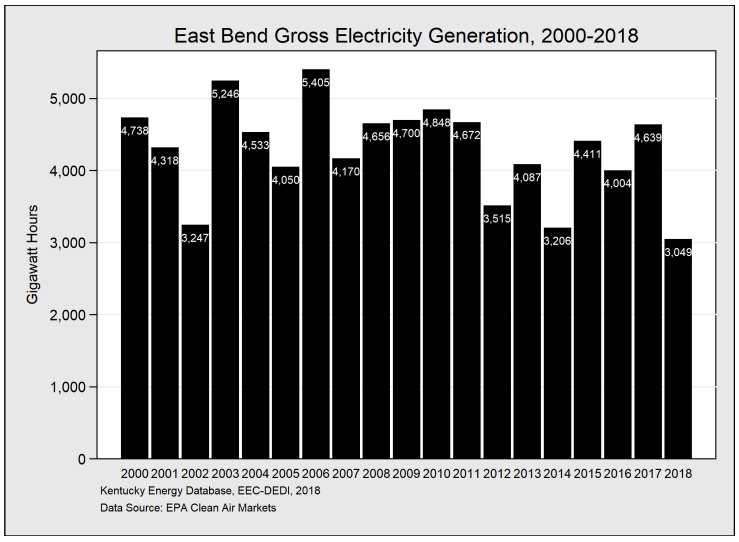
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	1,015	-95%
Rate (lbs./MWh)	0.71	-94%

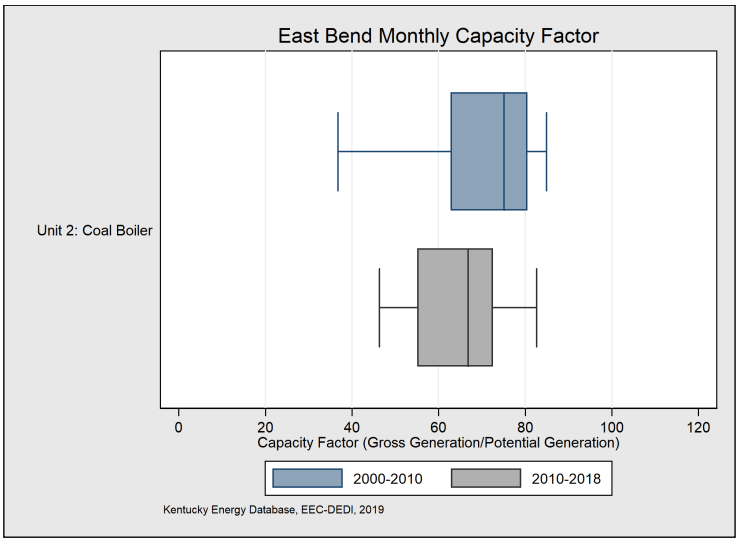
The E. W. Brown Generating Station emitted 1,015 tons of SO_2 in 2018, a decrease of 95% since 2010. The rate of SO_2 emissions decreased by 94% during that period.

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



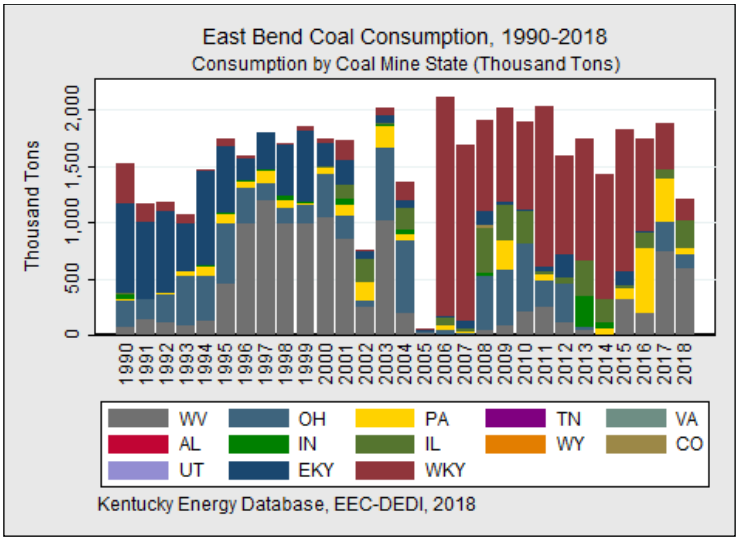


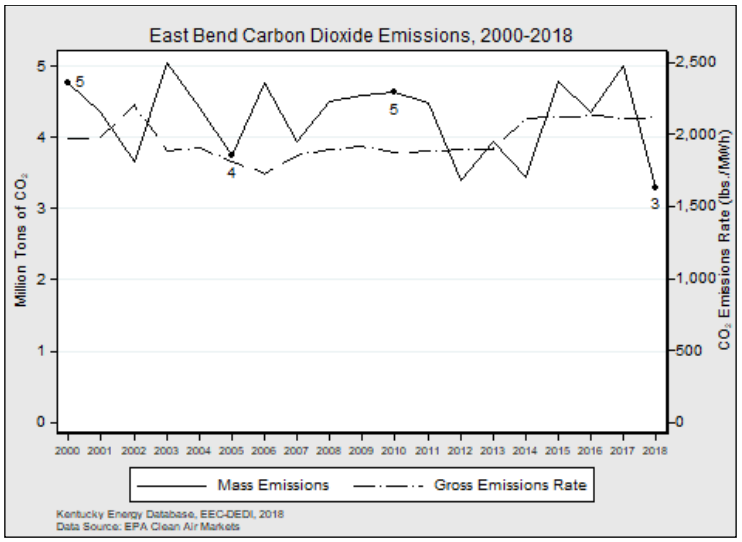
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1981**		**Coal**	**600**	**53%**	**3,049**	**2,793**	**2,118**	**1.32**	**1.26**
2	1981		Coal	600	53%	3,049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

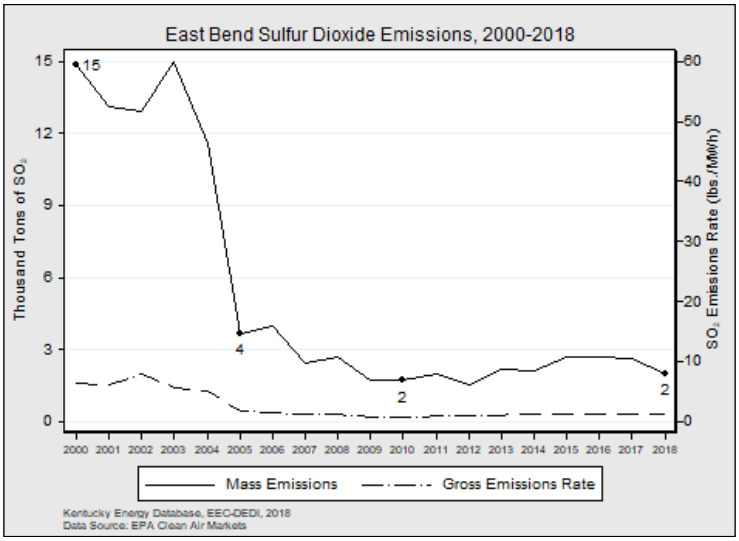


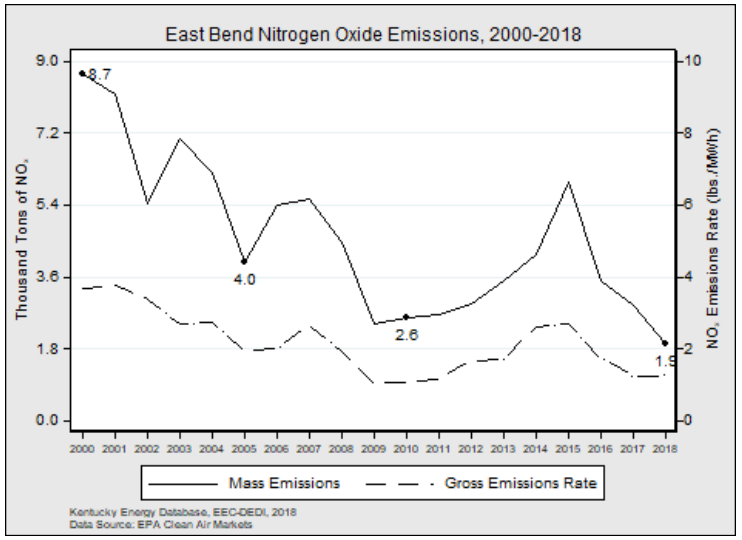


State	2018 Tons	Percentage
Total	1,426,557	100%
Western Kentucky	1,110,137	78%
Illinois	206,939	15%
Indiana	53,316	4%
Pennsylvania	51,477	4%
West Virginia	4,688	0%

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.





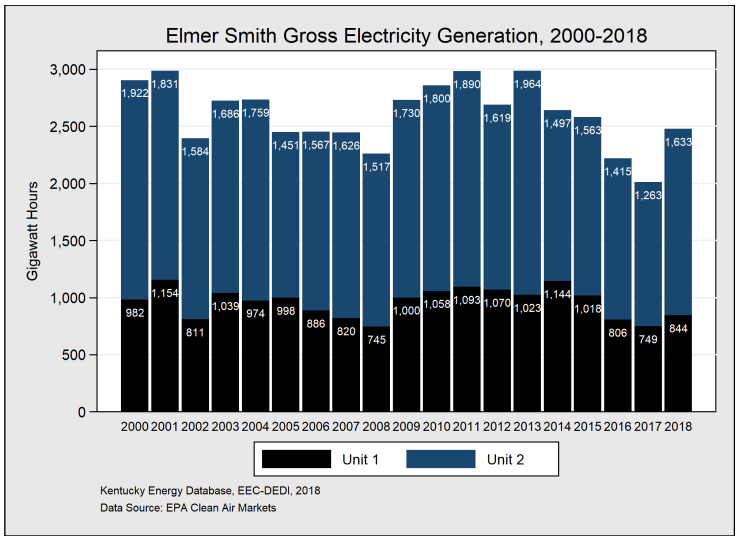
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,012	+18%
Rate (lbs./MWh)	1.32	+87%

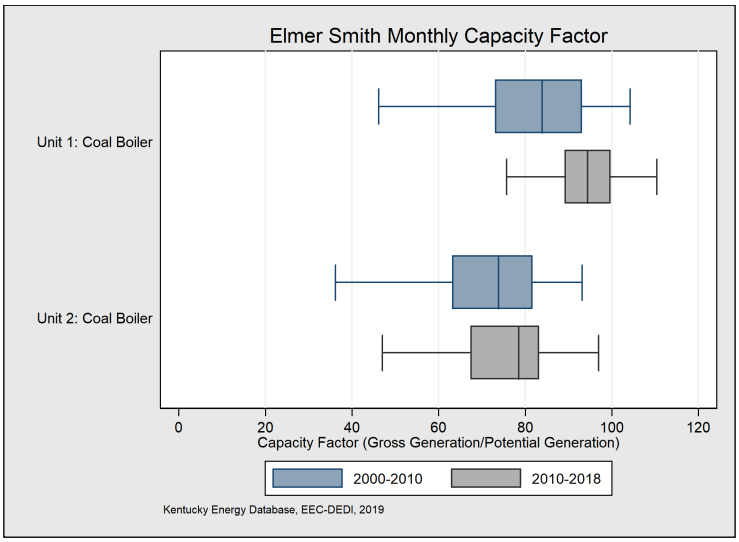
The East Bend Generating Station emitted 2,012 tons of SO_2 in 2018, an increase of 18% since 2010. The rate of SO_2 emissions increased by 87% during that period.

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





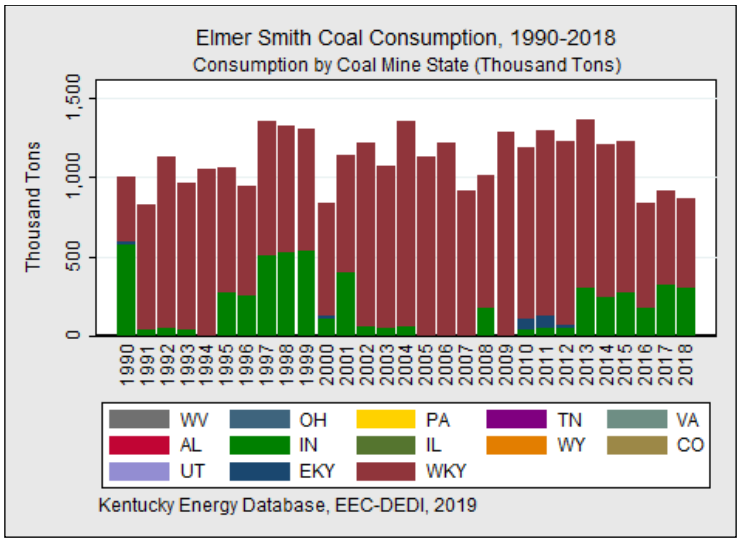
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1964**		**Coal**	**401**	**61%**	**2,478**	**2,210**	**2,040**	**1.69**	**2.21**
1	1964	2019	Coal	139	59%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

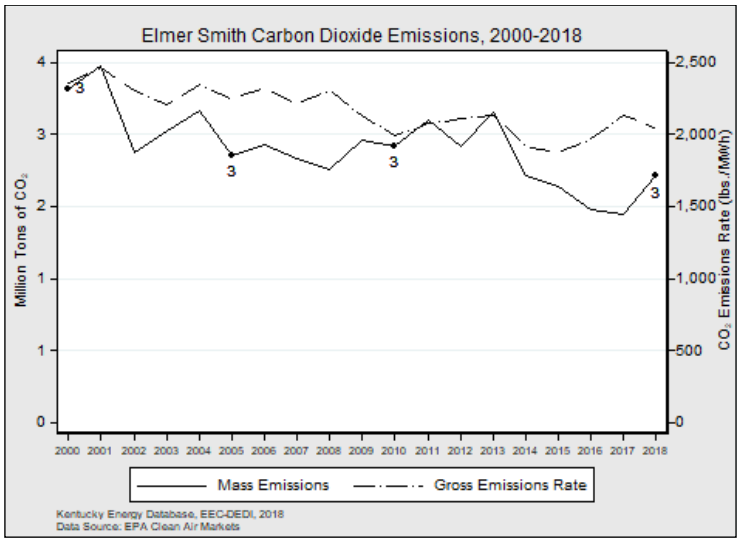
Elmer Smith Station, located in Henderson County, is 54 years old and consists of two coal-fired electricity generating units, which began operating in 1964 and 1974, respectively. The plant has a total nameplate capacity of 401 MW. In 2018, the plant generated 2.4 GWh of electricity and had a plant-wide 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

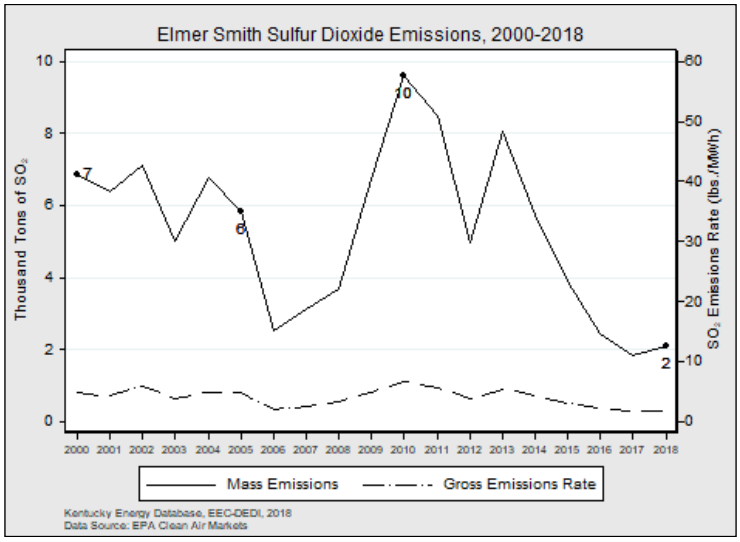


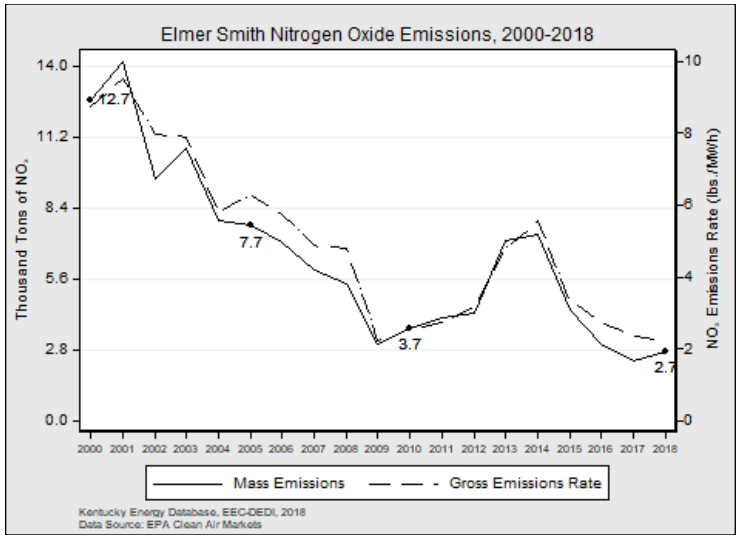


State	2018 Tons	Percentage
Total	1,205,618	100%
Western Kentucky	953,943	79%
Indiana	248,443	21%
Tennessee	3,232	<1%

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.





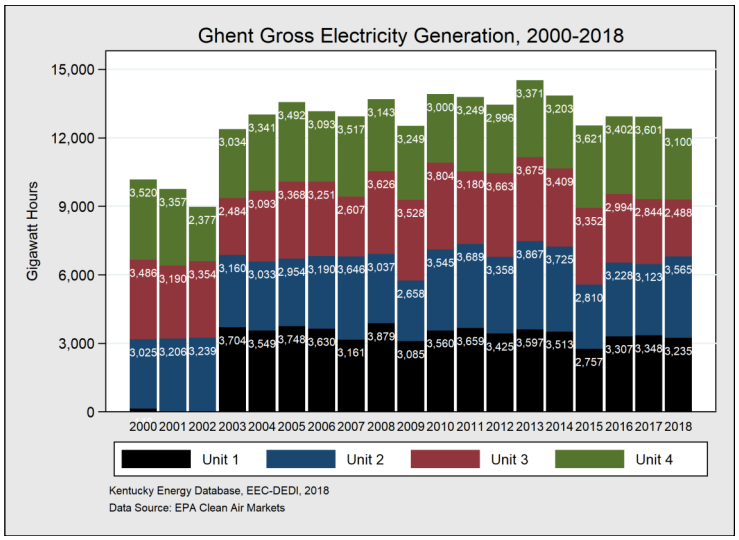
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,088	-78%
Rate (lbs./MWh)	1.69	-75%

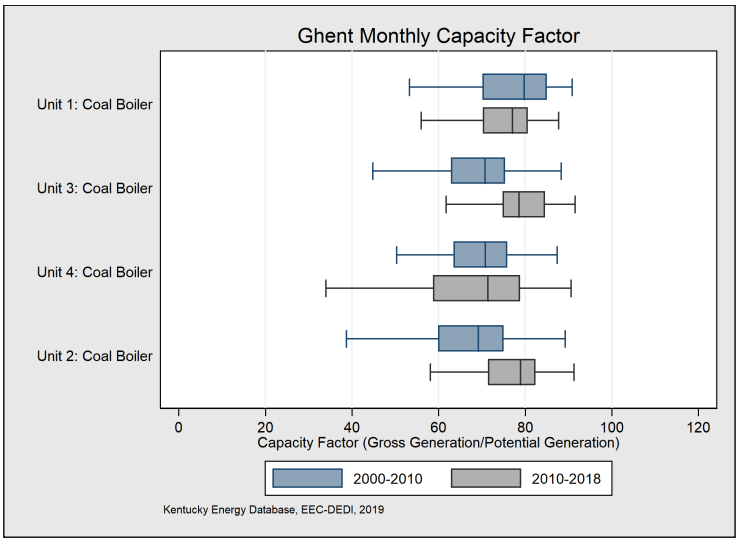
Elmer Smith Station emitted 2,088 tons of SO_2 in 2018, a decrease of 78% since 2010. The rate of SO_2 emissions reduced by 75% during that period.

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



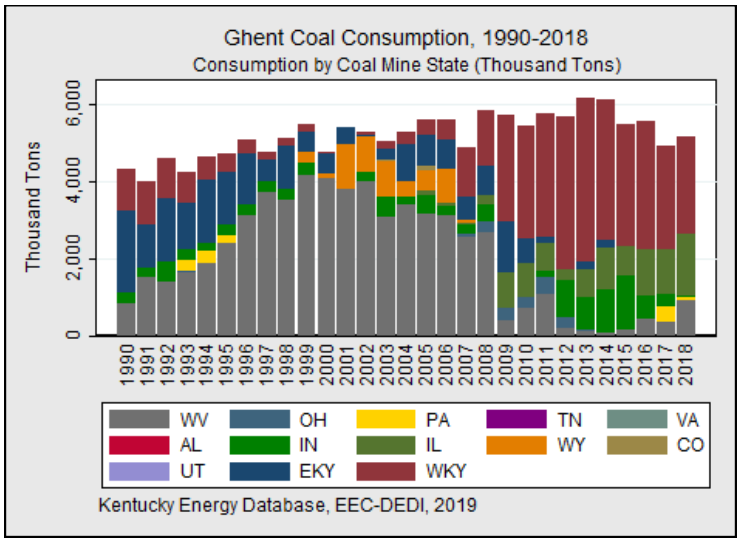


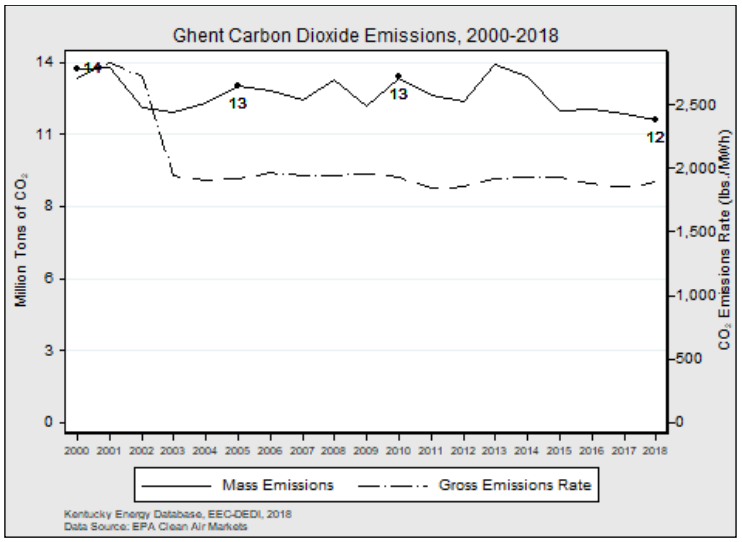
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1973**		**Coal**	**1,932**	**66%**	**12,389**	**11,265**	**1,893**	**1.72**	**1.10**
1	1974		Coal	479	71%	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

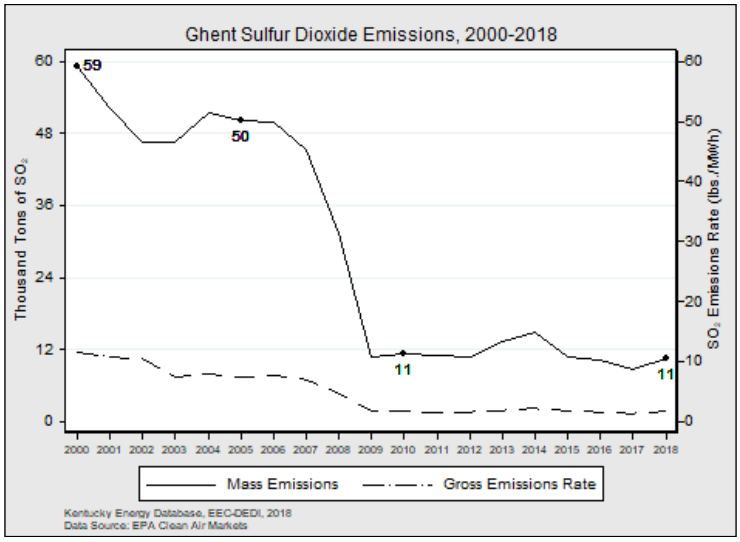


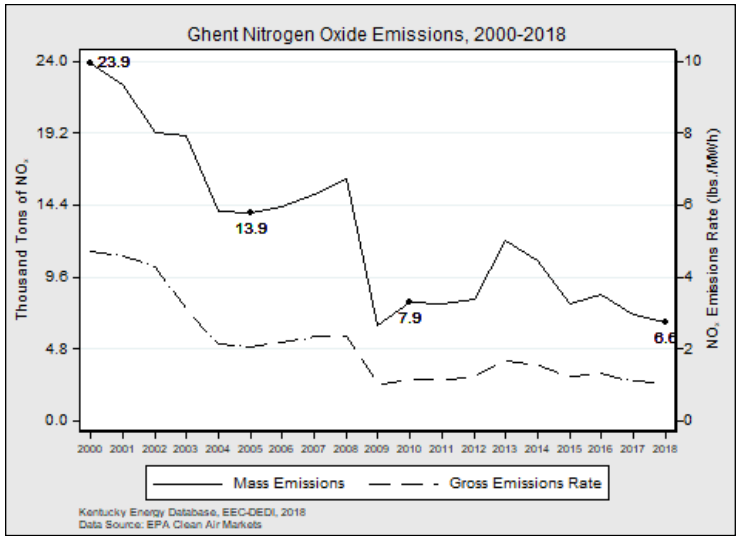


State	2018 Tons	Percentage
Total	6,113,933	100%
Western Kentucky	3,757,227	61%
Indiana	1,122,871	18%
Illinois	1,074,418	18%
Eastern Kentucky	81,467	1%
West Virginia	77,950	1%

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.





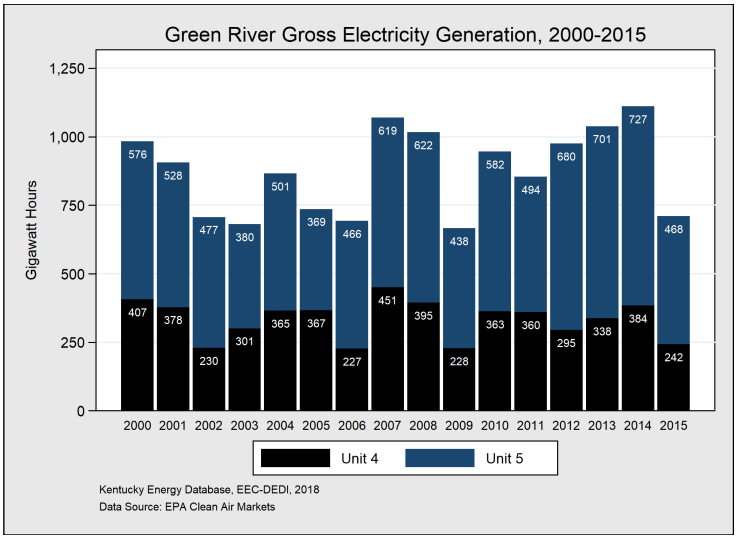
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	10,620	-7%
Rate (lbs./MWh)	1.715	+5%

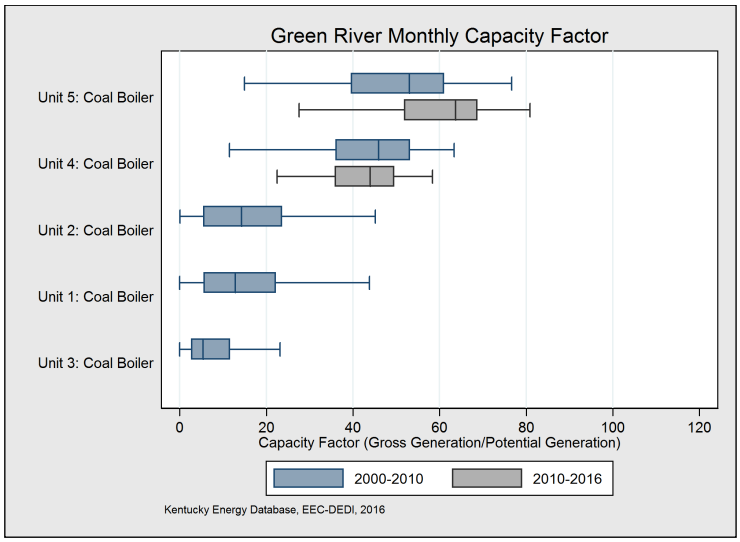
The Ghent Generating Station emitted 10,620 tons of SO_2 in 2018, a decrease of 7% since 2010. The rate of SO_2 emissions increased by 5% during that period.

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



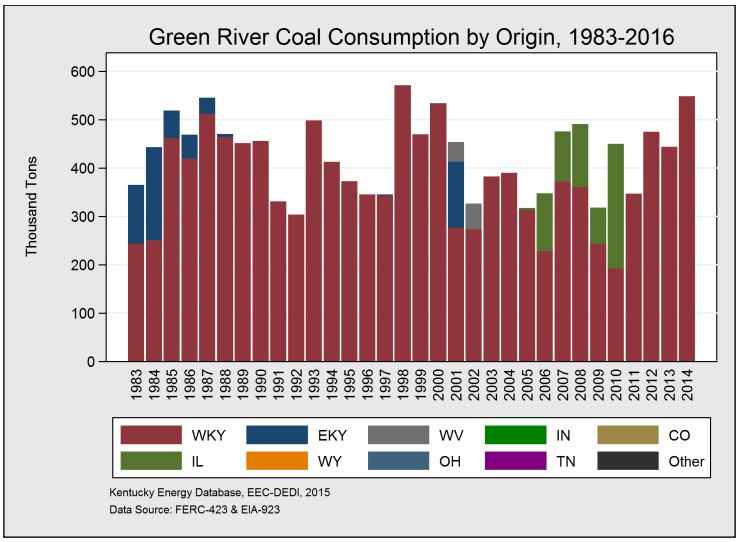


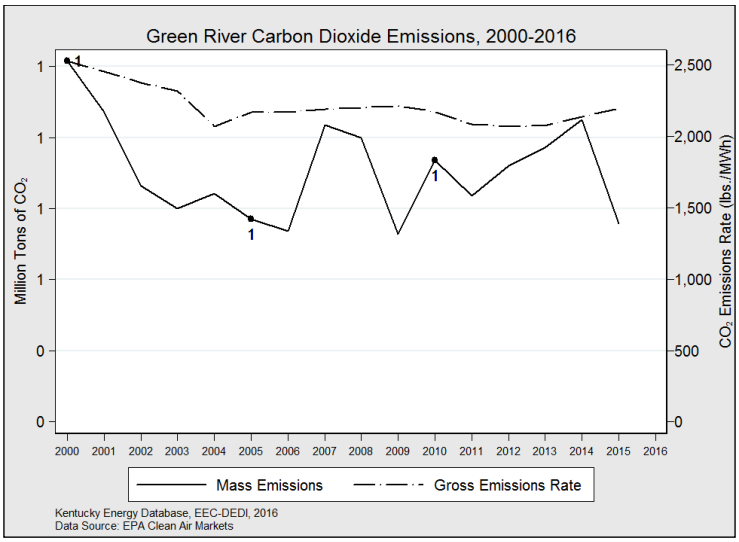
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1950**	**2015**	**Coal**	**215**	**38%**	**710**	**656**	**2,135**	**39.55**	**4.54**
4	1959	2015	Coal	95	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

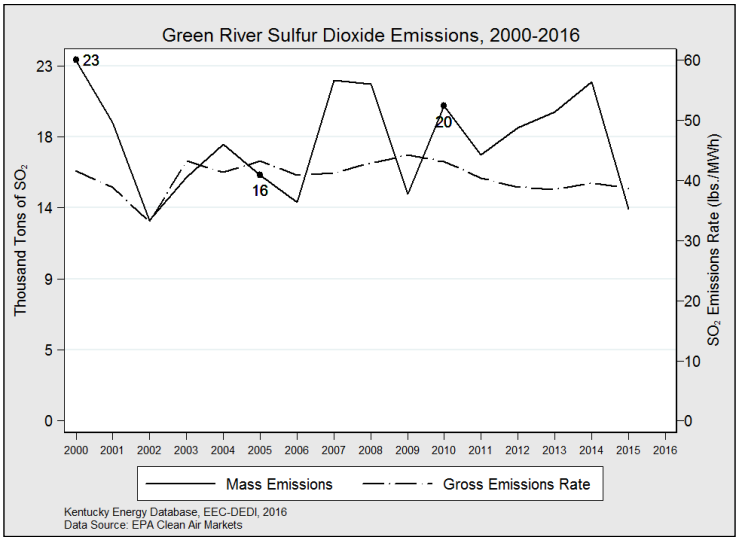


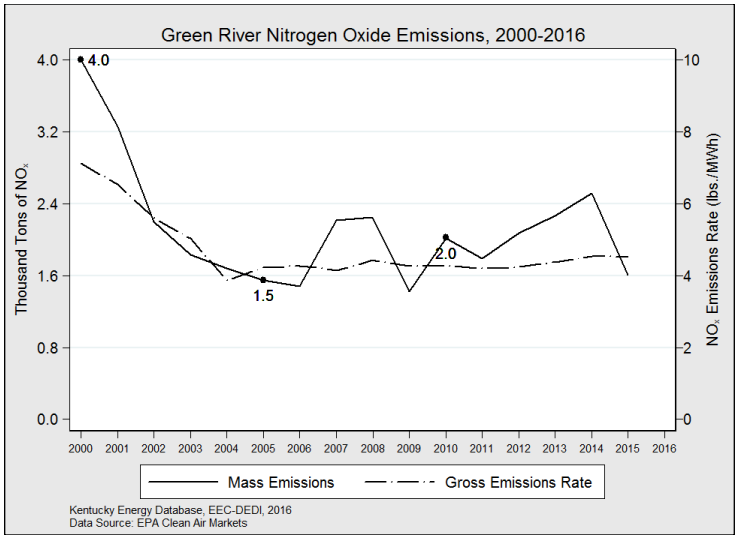


State	2009 Tons	Percentage
Total	318,193	100%
Western Kentucky	243,180	76%
Illinois	75,013	24%

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.





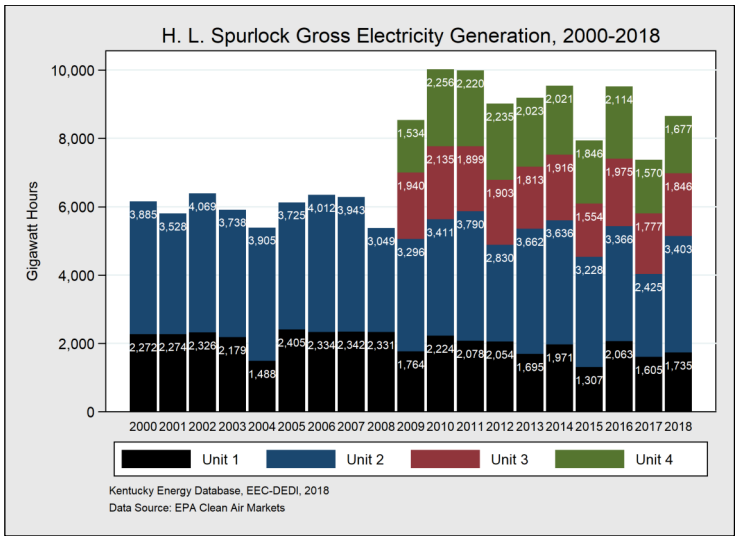
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	21,967	-6%
Rate (lbs./MWh)	39.55	-5%

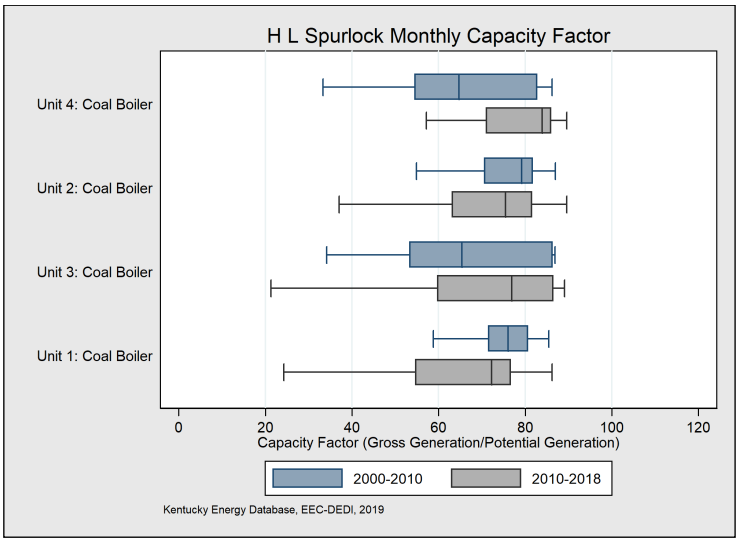
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	2,519	-37%
Rate (lbs./MWh)	4.54	-36%

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



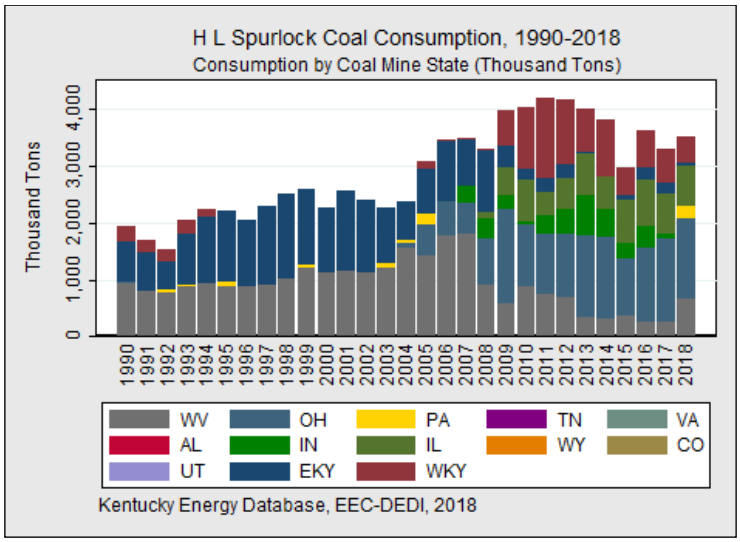


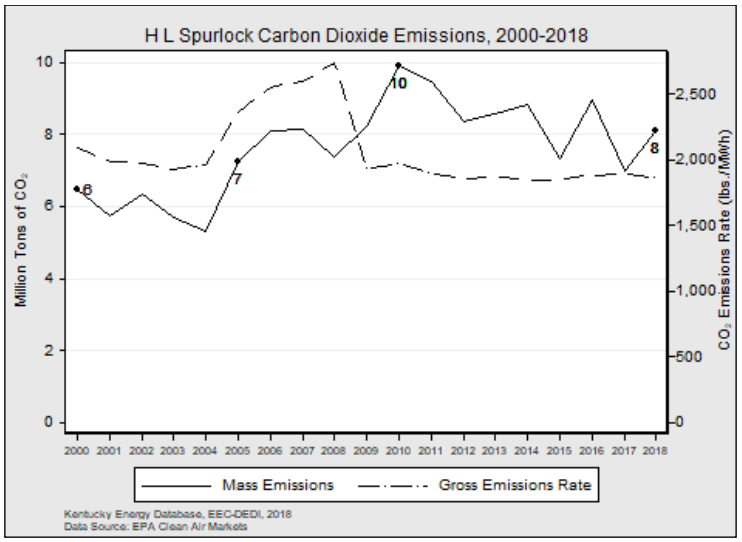
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1977**		**Coal**	**1,346**	**65%**	**8,661**	**7,772**	**1,871**	**0.86**	**0.73**
1	1977		Coal	300	59%	1,735	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

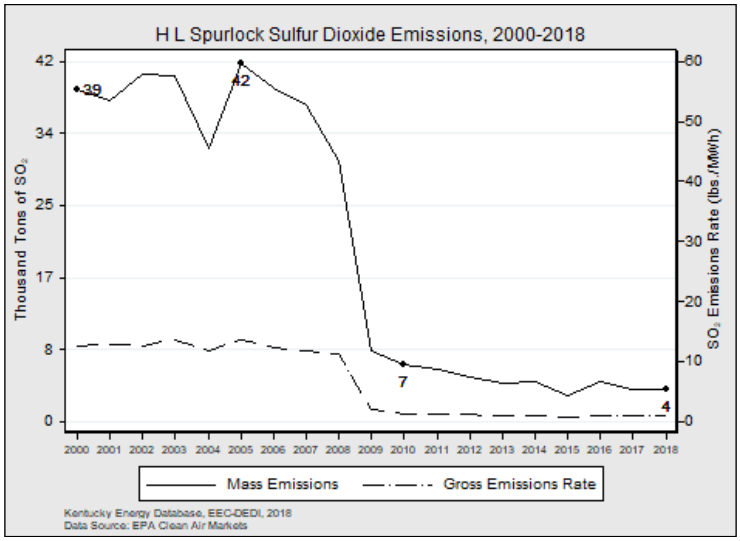


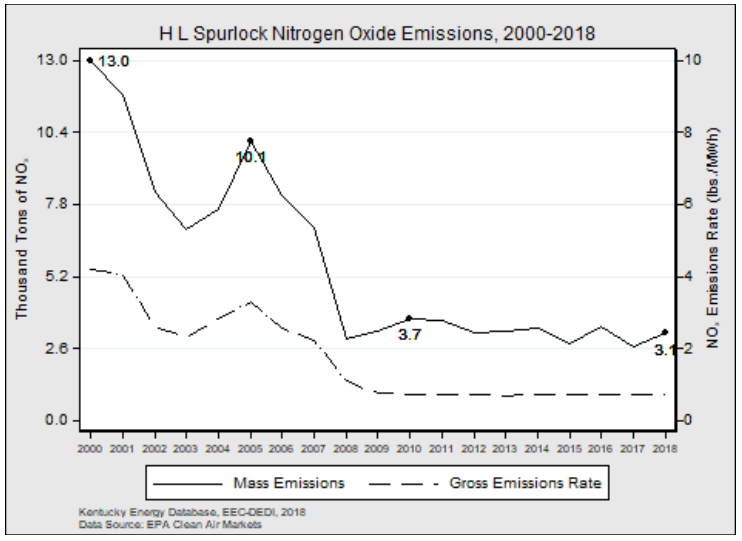


State	2018 Tons	Percentage
Total	3,811,444	100%
Ohio	1,432,105	38%
Western Kentucky	985,592	26%
Illinois	588,114	15%
Indiana	497,504	13%
West Virginia	308,129	8%

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.





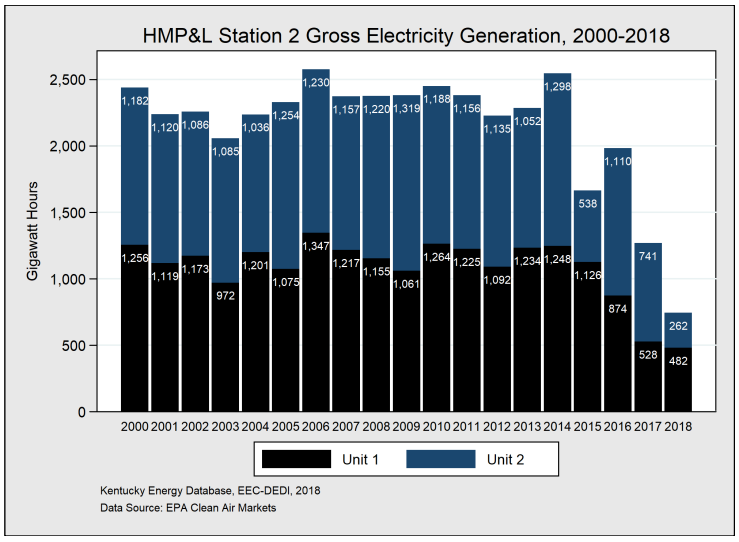
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,738	-43%
Rate (lbs./MWh)	0.86	-35%

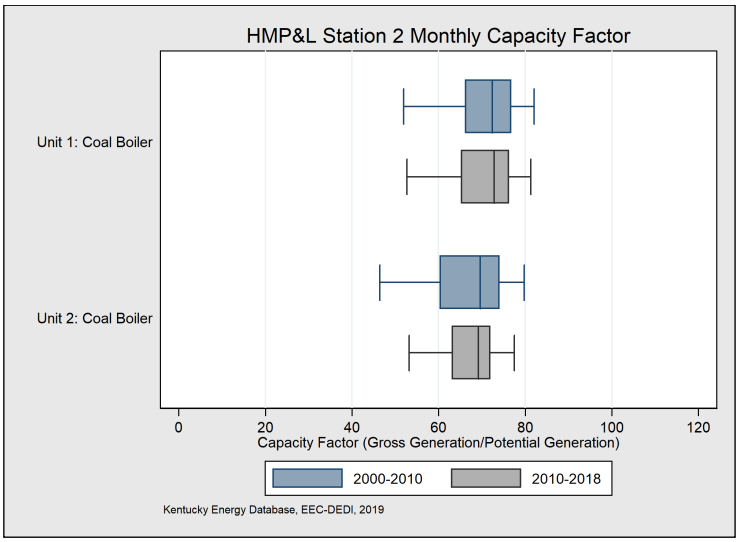
The H. L. Spurlock Power Station emitted 3,738 tons of SO_2 in 2018, a decrease of 43% since 2010. The rate of SO_2 emissions reduced by 35% during that period.

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



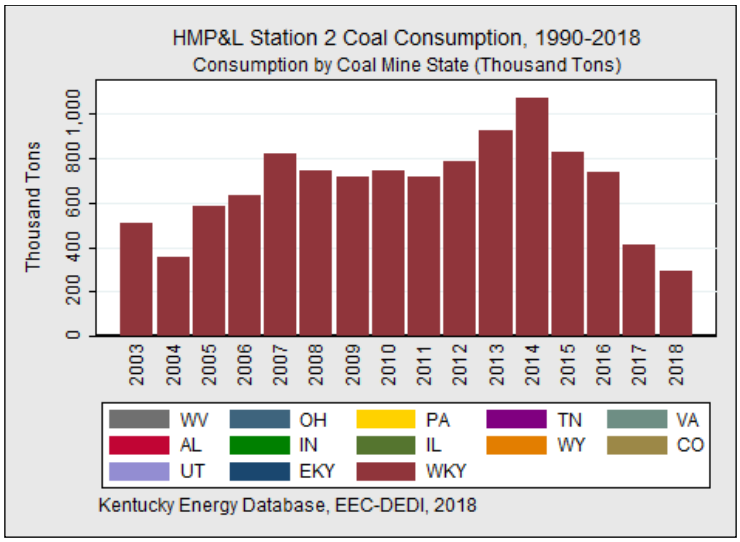


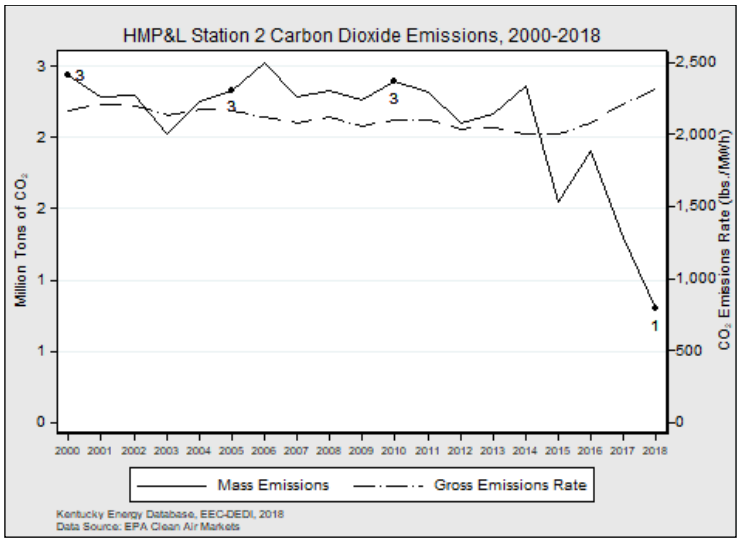
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1973**		**Coal**	**405**	**21%**	**744**	**649**	**2,311**	**2.28**	**1.97**
1	1973	2019	Coal	200	28%	482	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

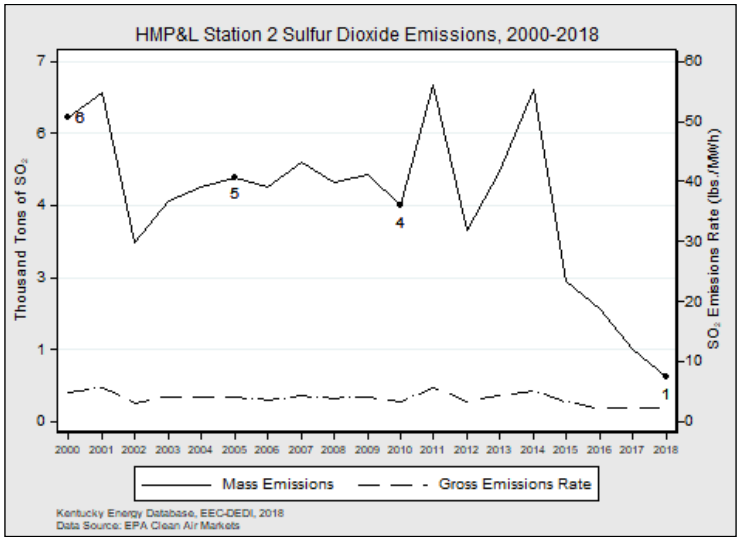


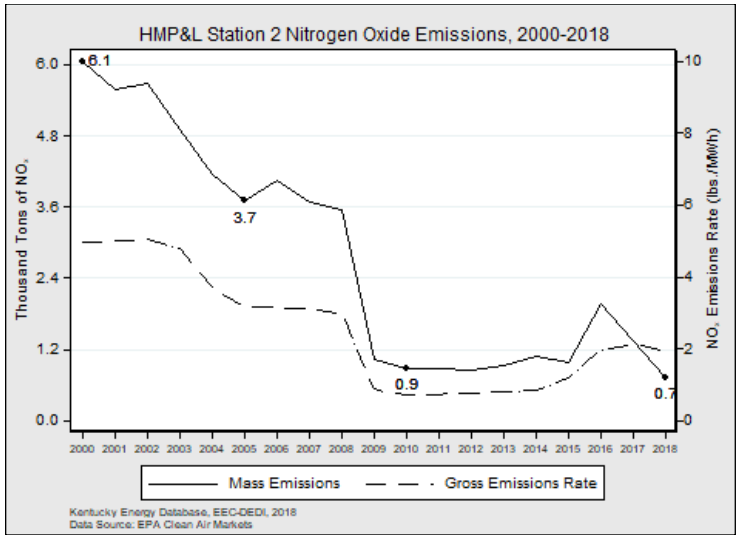


State	2018 Tons	Percentage
Total	1,070,604	100%
Western Kentucky	1,070,604	100%

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.





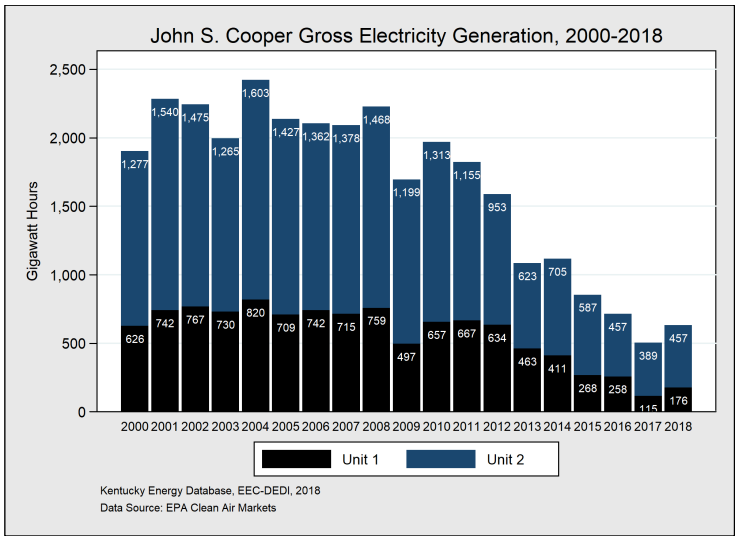
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	847	-80%
Rate (lbs./MWh)	2.28	-33%

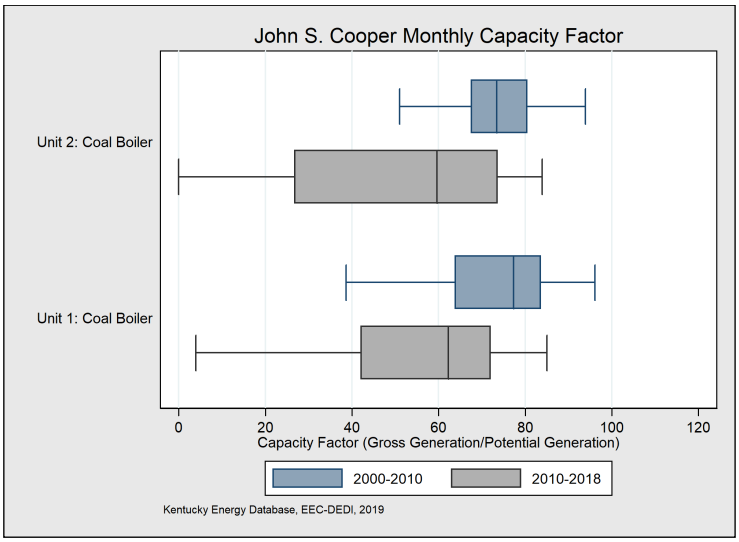
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	733	-17%
Rate (lbs./MWh)	1.97	+175%

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



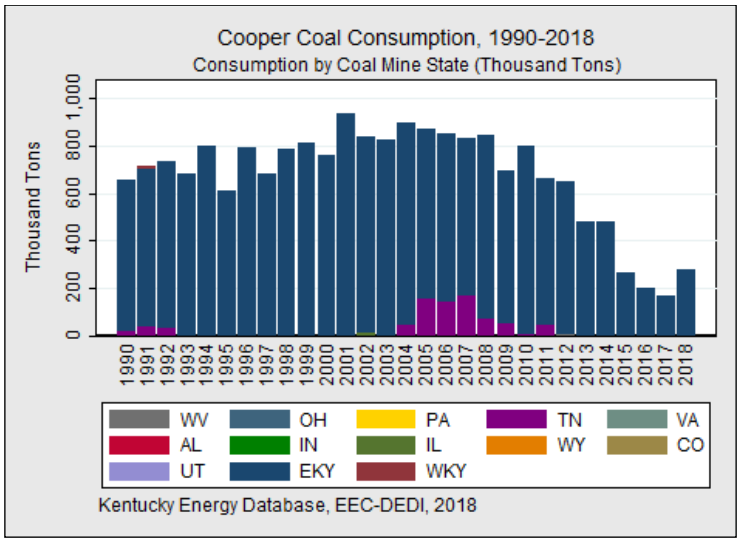


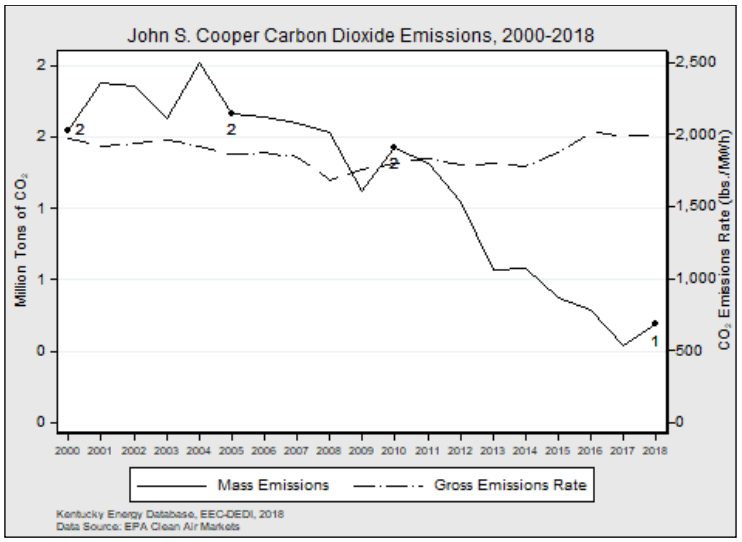
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1965**		**Coal**	**341**	**18%**	**633**	**562**	**1,990**	**0.47**	**1.39**
1	1965		Coal	116	16%	176	163	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

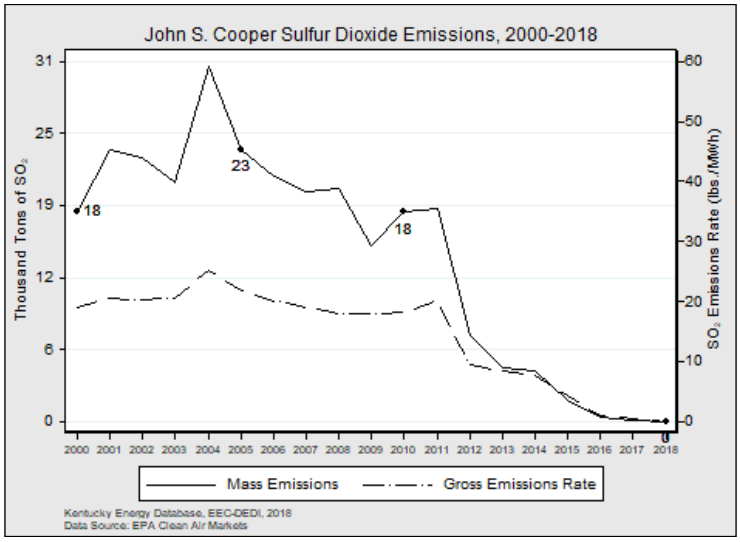


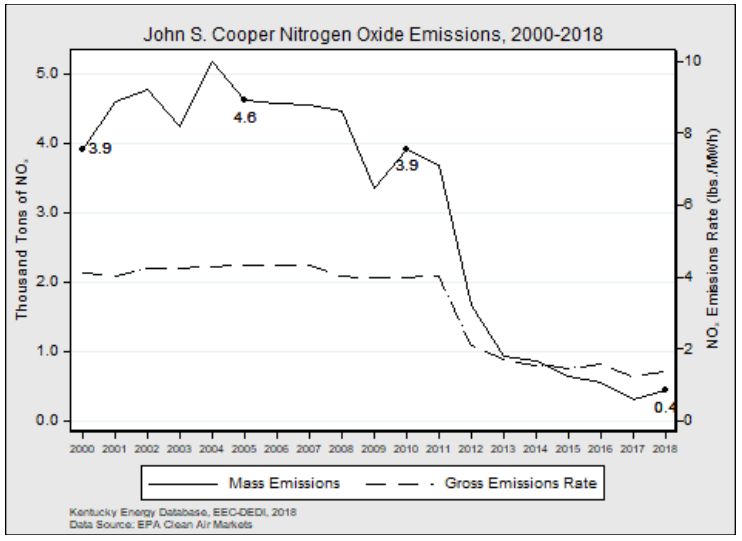


State	2016 Tons	Percentage
Total	477,513	100%
Eastern Kentucky	477,513	100%

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.





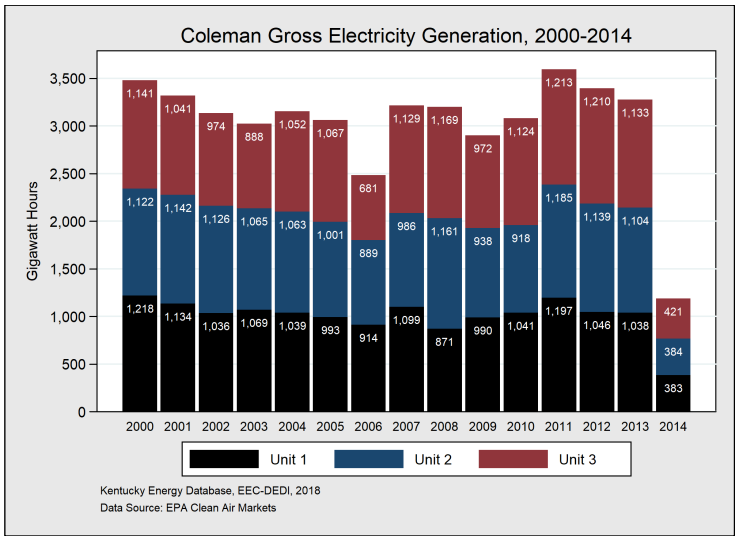
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	148	-99%
Rate (lbs./MWh)	0.47	-97%

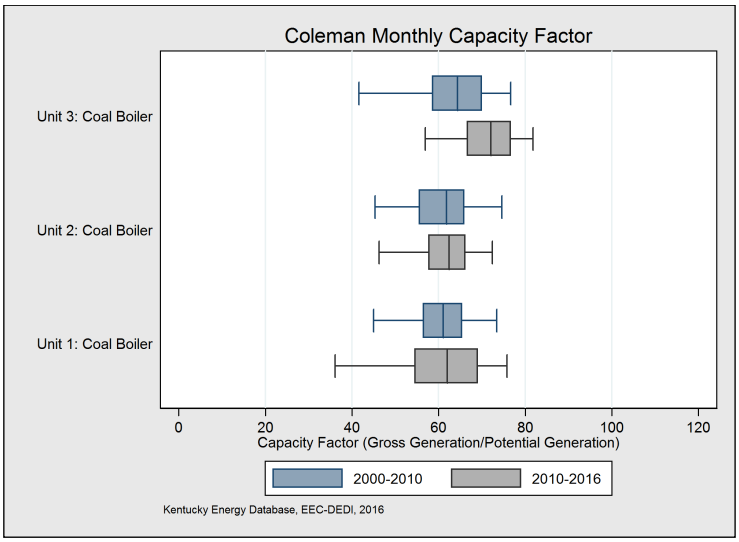
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	439	-89%
Rate (lbs./MWh)	1.39	-65%

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



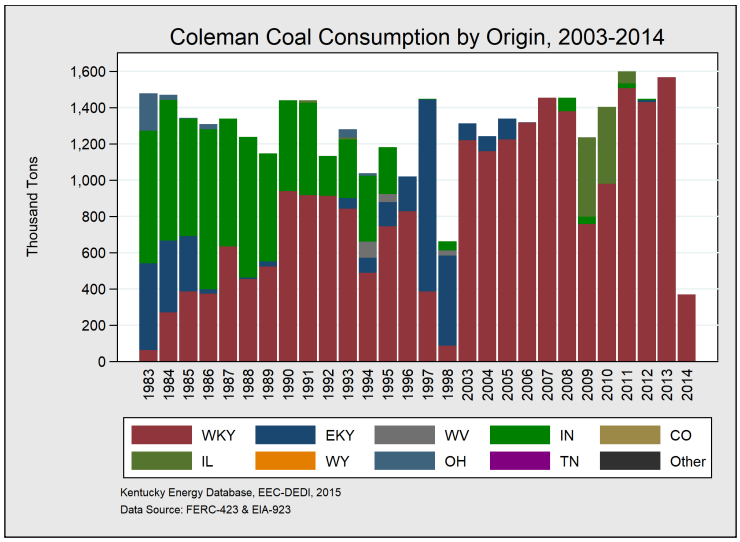


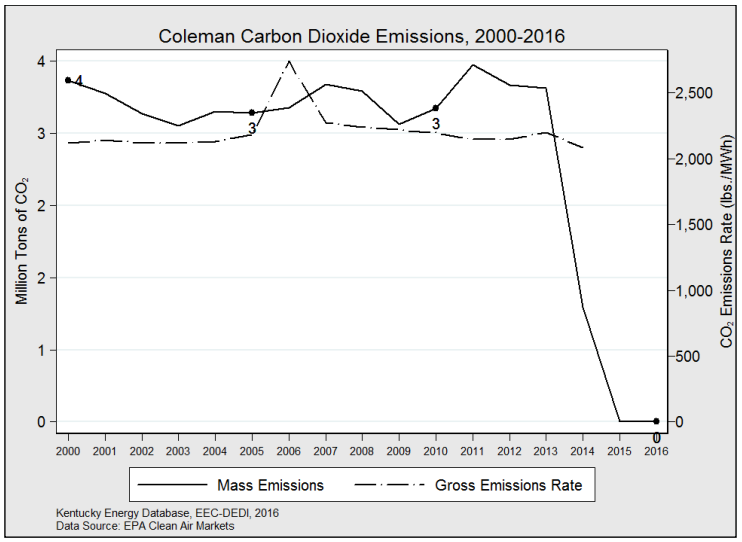
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1969**	**Idled**	**Coal**	**602**	**23%**	**1,188**	**1,065**	**2,086**	**1.56**	**3.62**
1	1969	Idled	Coal	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

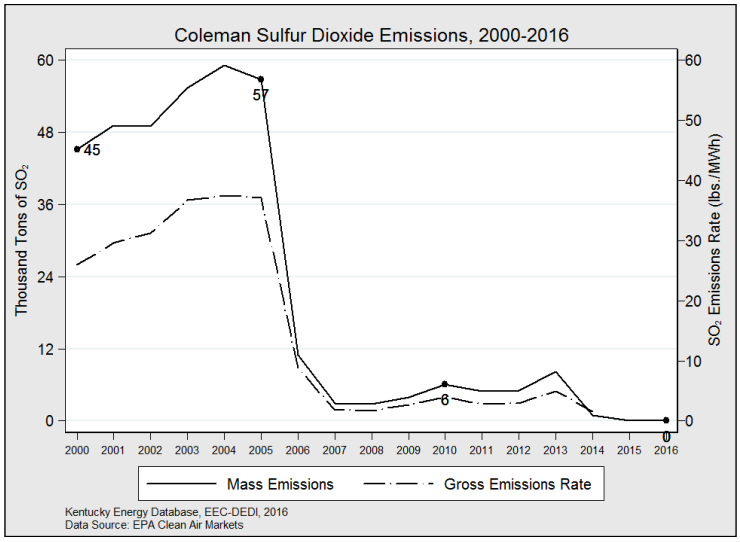


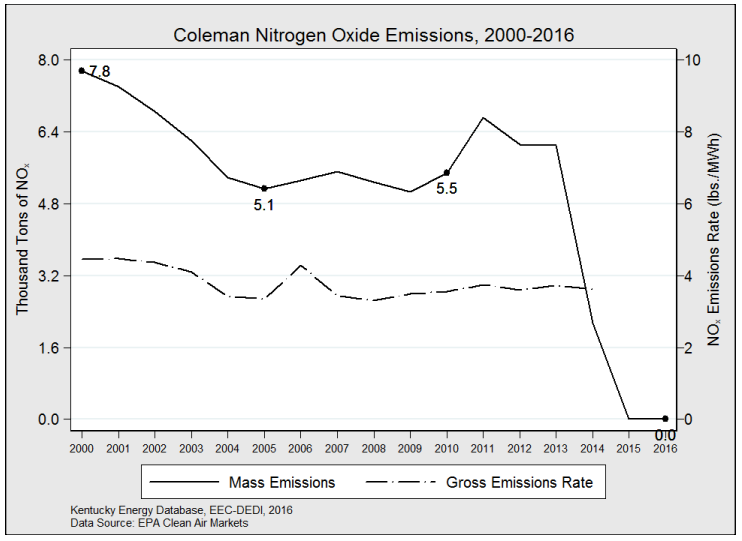


State	2014 Tons	Percentage
Total	369,730	100%
Western Kentucky	369,730	100%

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.





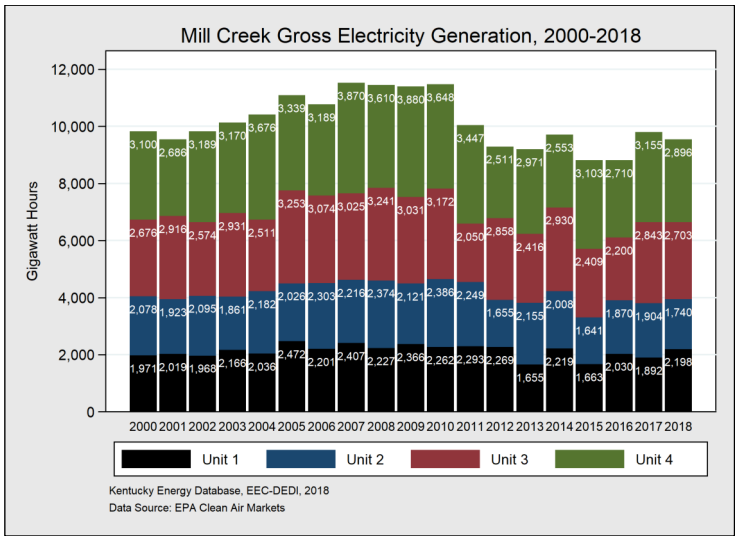
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	923	-98%
Rate (lbs./MWh)	1.56	-94%

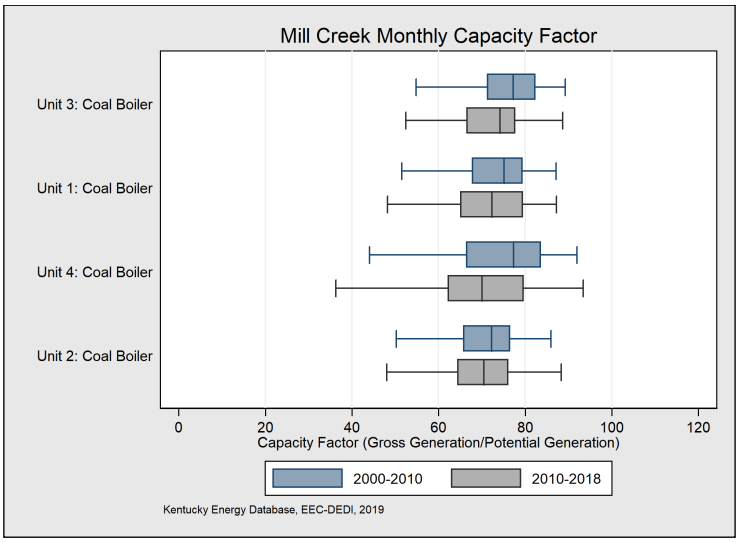
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	2,152	-72%
Rate (lbs./MWh)	3.62	-19%

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



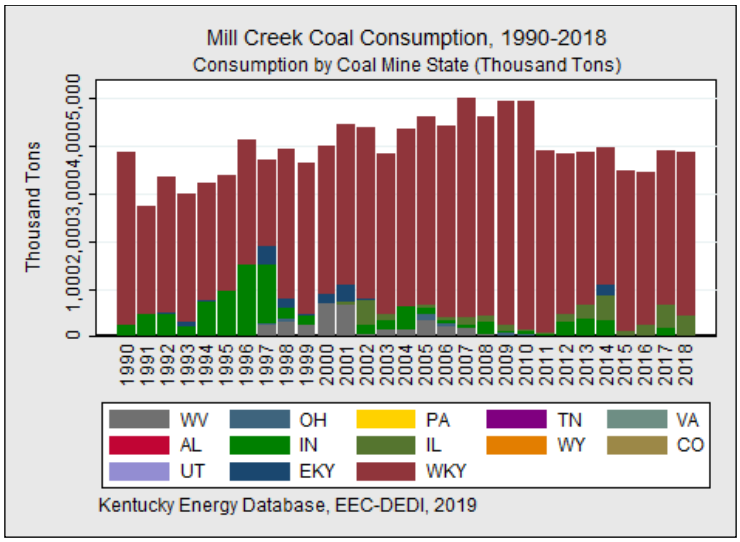


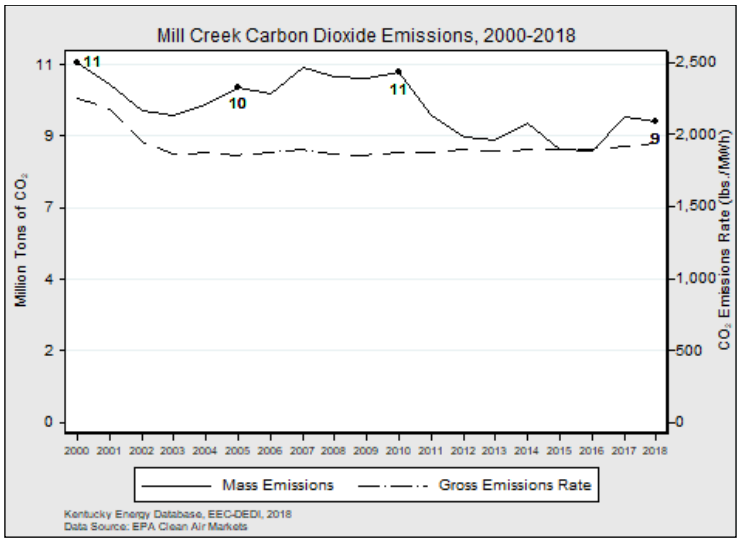
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1972**		**Coal**	**1,472**	**67%**	**9,537**	**8,640**	**1,940**	**0.79**	**1.67**
1	1972		Coal	303	74%	2,198	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

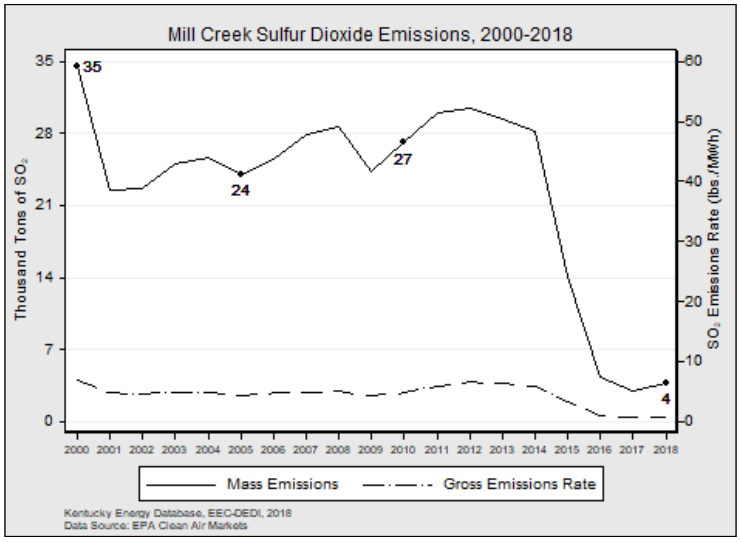


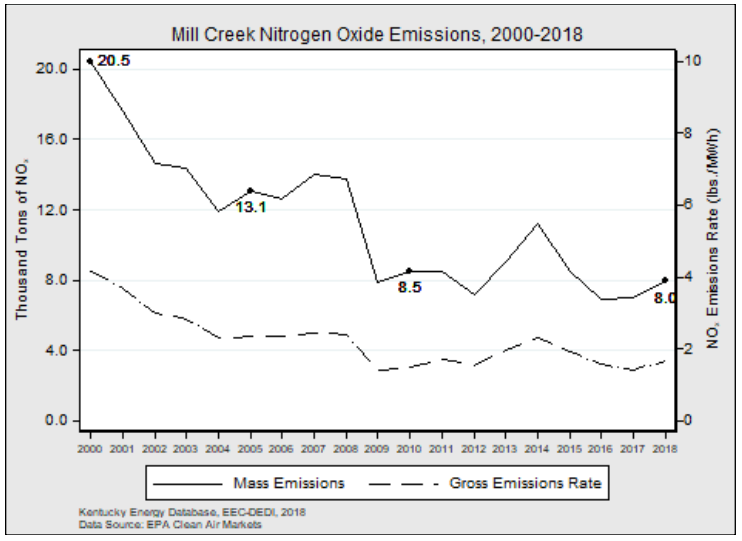


State	2018 Tons	Percentage
Total	3,954,399	100%
Western Kentucky	3,095,324	78%
Indiana	522,728	13%
Illinois	333,227	8%
Eastern Kentucky	3,120	0%

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.





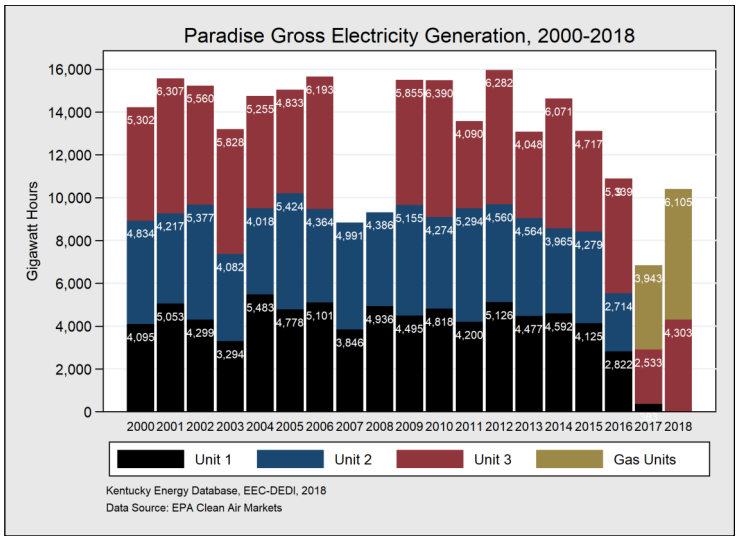
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	3,752	-86%
Rate (lbs./MWh)	0.79	-83%

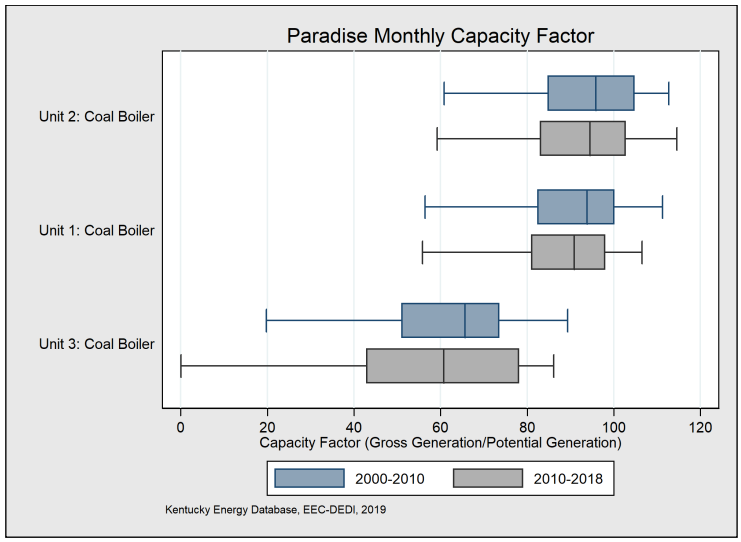
The Mill Creek Generating Station emitted 3,752 tons of SO_2 in 2018, a decrease of 86% since 2010. The rate of SO_2 emissions reduced by 83% during that period.

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



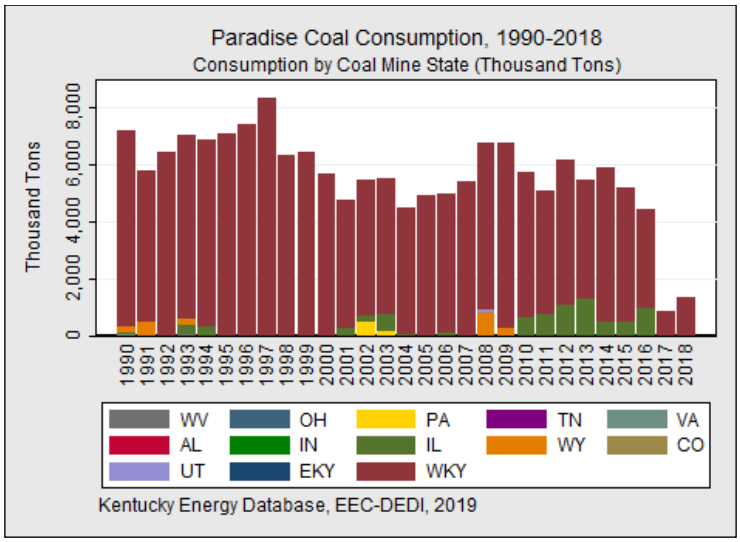


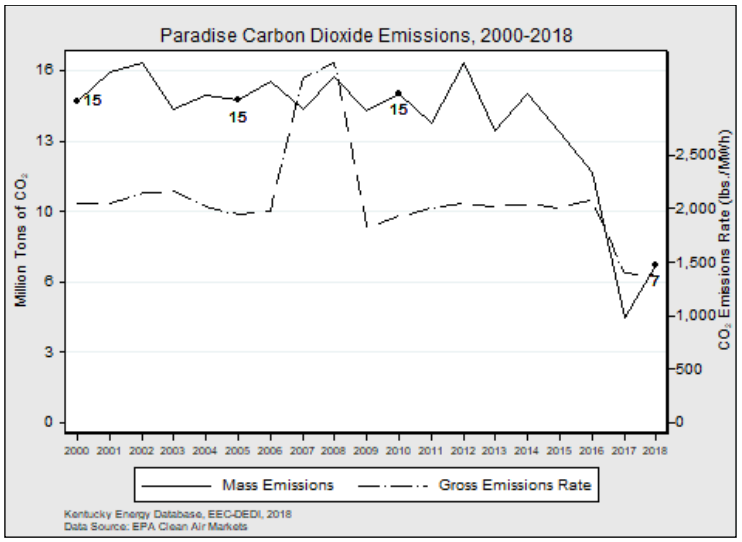
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1963**		**Coal**	**2,131**	**56%**	**10,408**	**9,702**	**1,377**	**0.49**	**0.95**
1	1963	2017	Coal	628	-	-	-	-	-	-
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

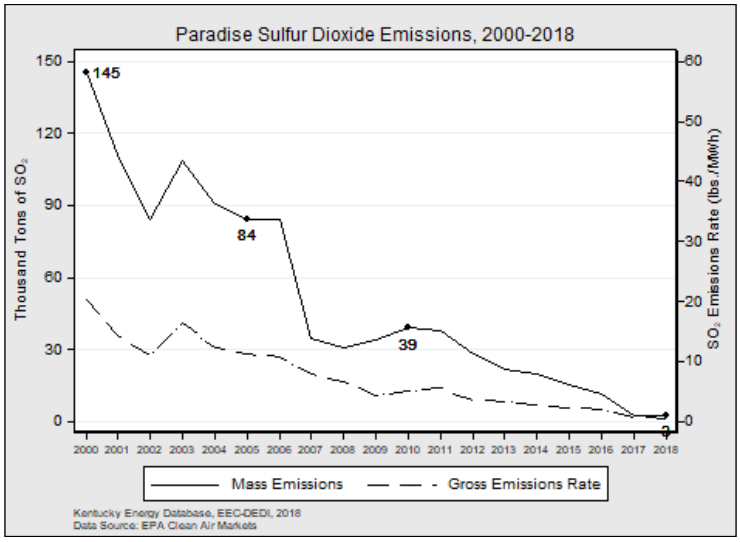


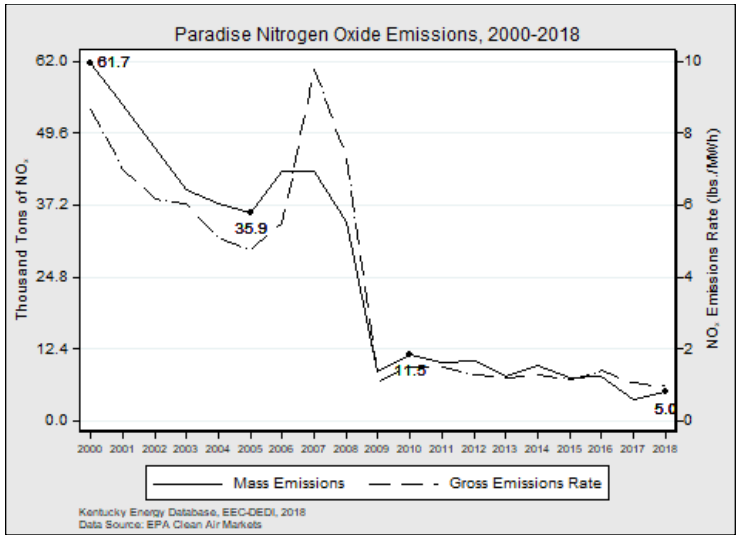


State	2018 Tons	Percentage
Total	5,915,433	100%
Western Kentucky	5,414,270	92%
Illinois	501,163	8%

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.





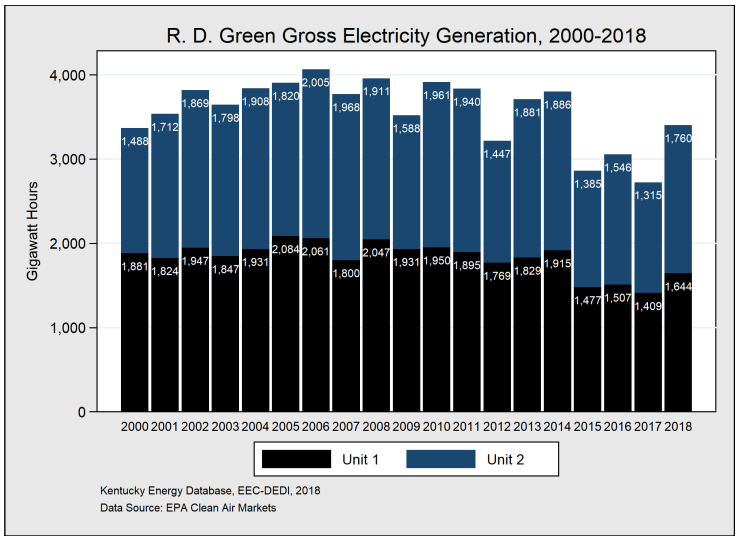
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	2,551	-93%
Rate (lbs./MWh)	0.49	-90%

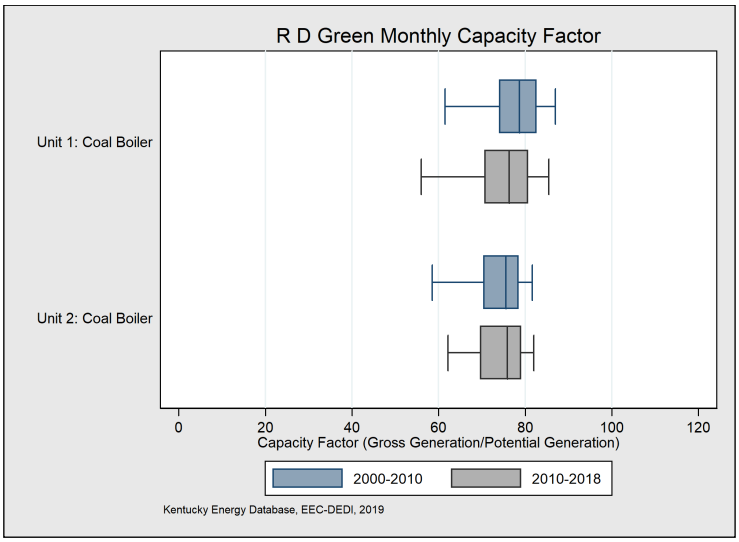
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	4,956	-57%
Rate (lbs./MWh)	0.95	-36%

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



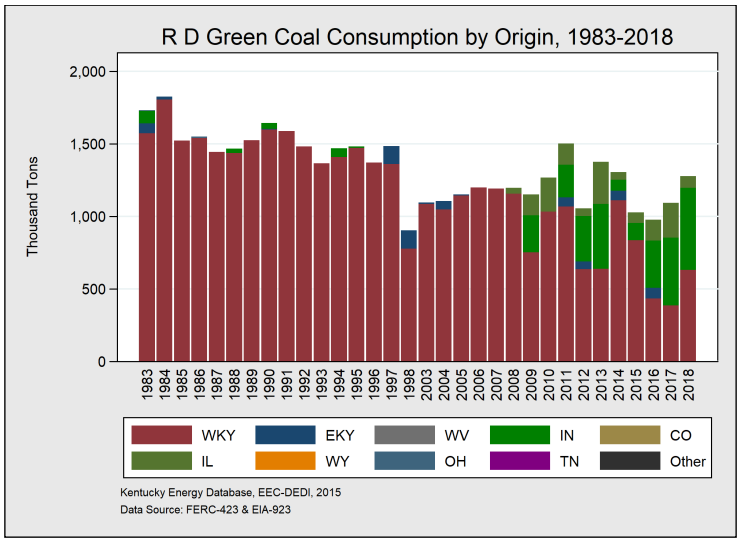


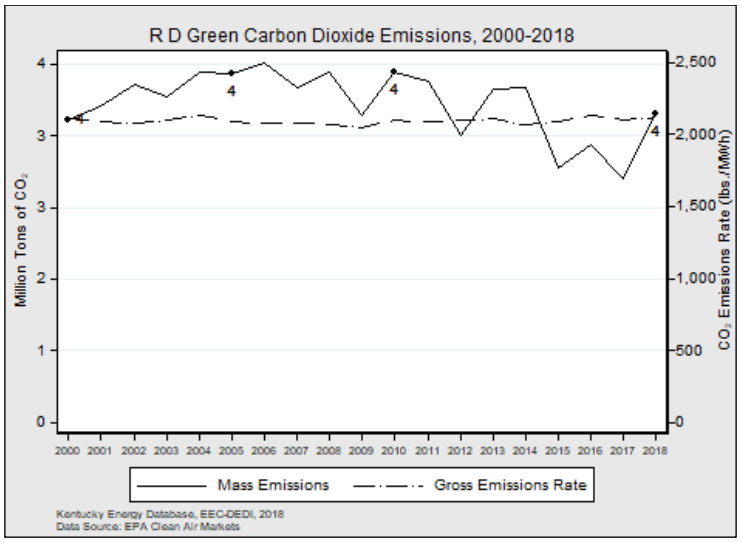
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1979**		**Coal**	**586**	**77%**	**3,404**	**3,059**	**2,118**	**2.42**	**2.01**
1	1979		Coal	293	73%	1,644	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

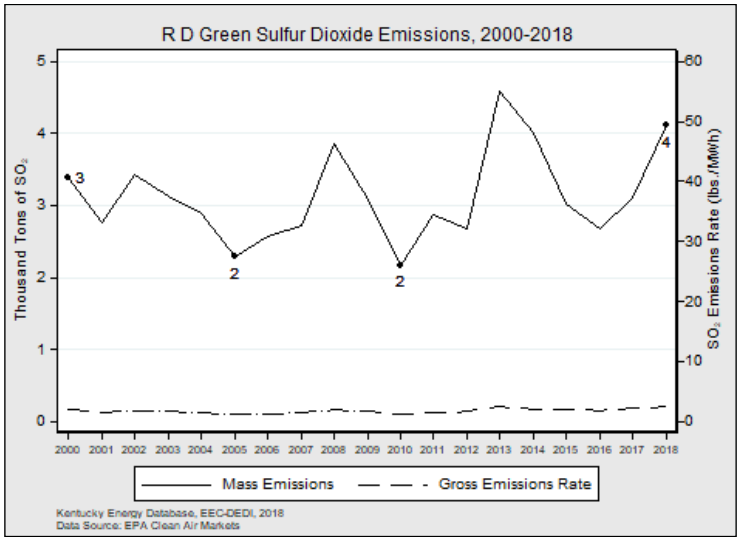


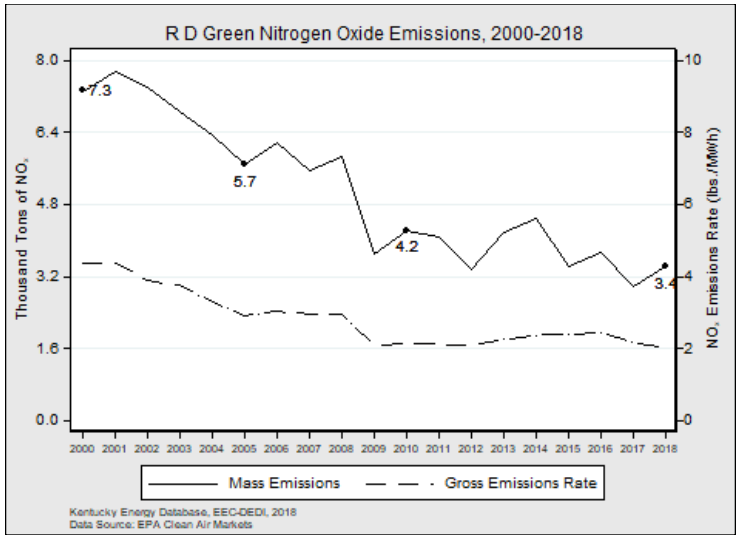


State	2018 Tons	Percentage
Total	1,303,820	100%
Western Kentucky	1,161,670	89%
Indiana	76,380	6%
Illinois	51,238	4%
Eastern Kentucky	14,532	1%

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.





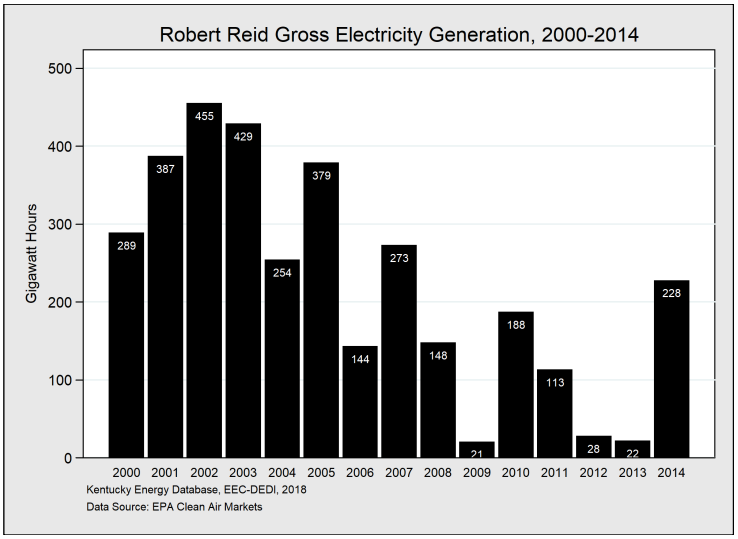
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	4,114	+90%
Rate (lbs./MWh)	2.42	+118%

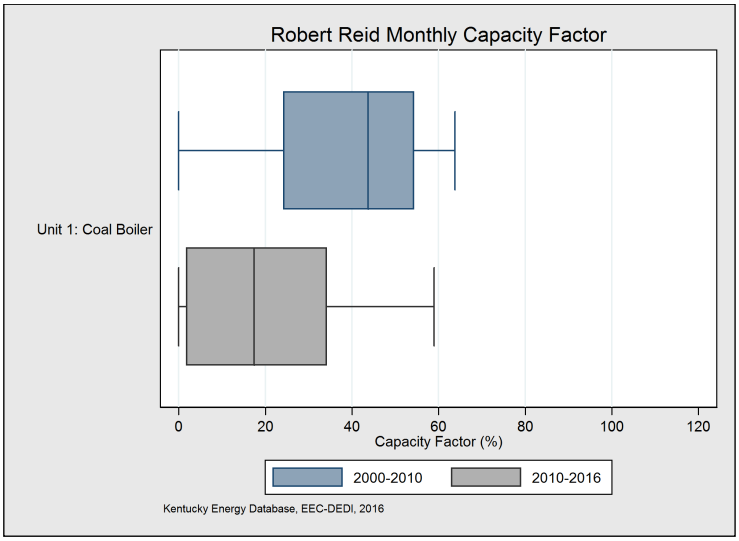
The R.D. Green Station emitted 4,114 tons of SO_2 in 2018, an increase of 90% since 2010. The rate of SO_2 emissions increased by 118% during that period.

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



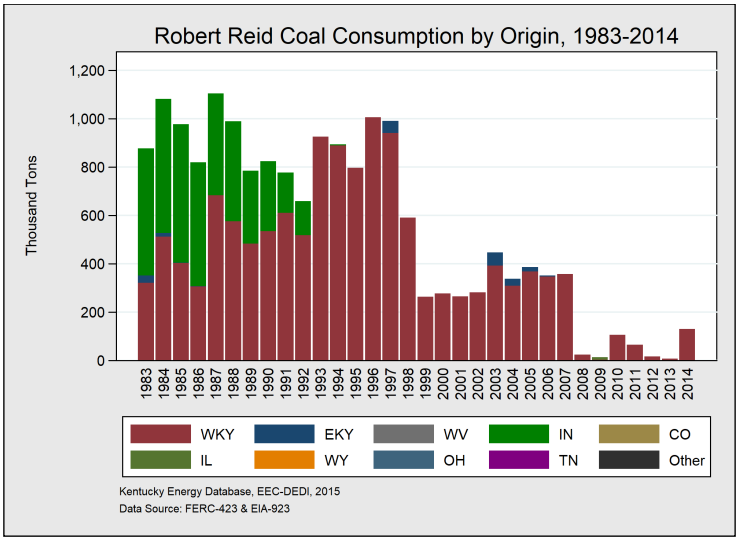


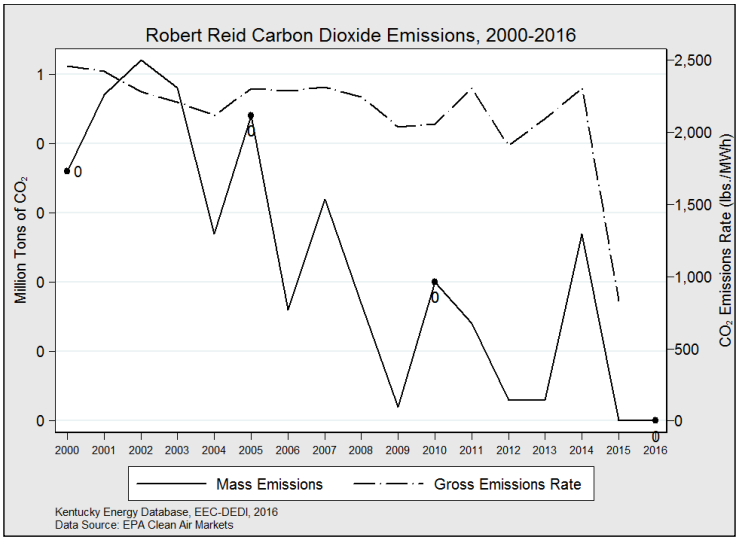
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1966**	**2017**	**Coal**	**96**	**27%**	**228**		**2,327**	**50.37**	**4.72**
1	1966	2017	Coal	96	27%	228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

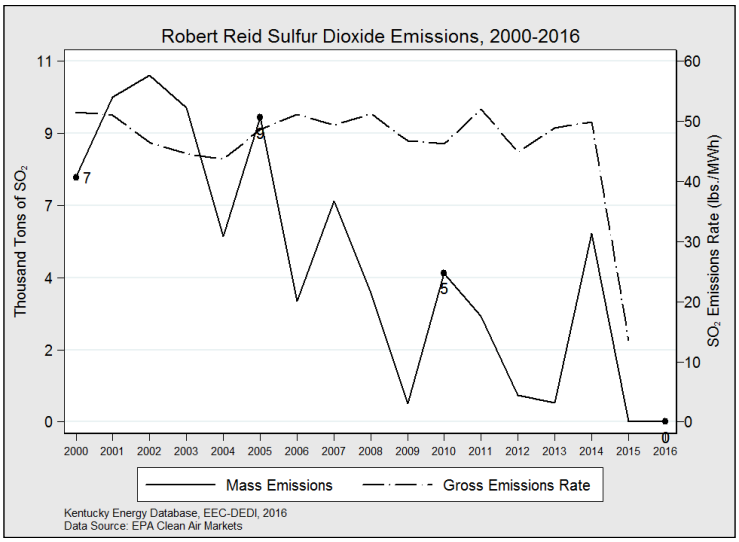


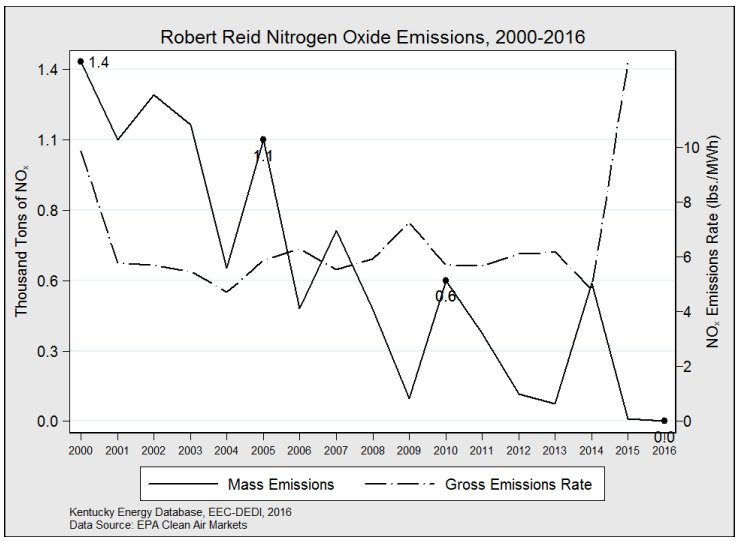


State	2014 Tons	Percentage
Total	12,643	100%
Illinois	9,664	76%
Western Kentucky	2,979	24%

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.





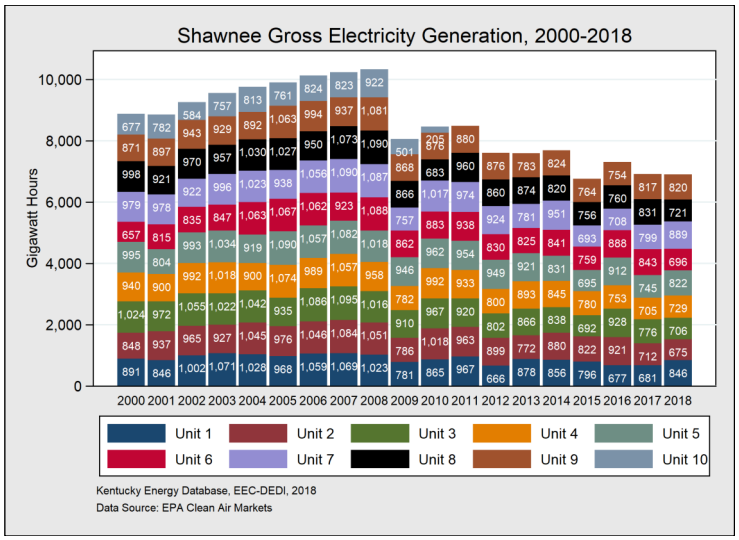
Sulfur Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	5,742	-23%
Rate (lbs./MWh)	50.37	-2%

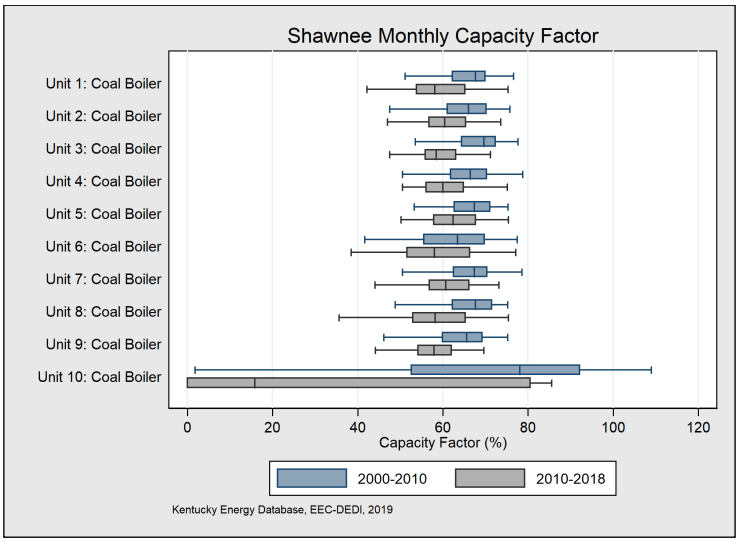
Nitrogen Dioxide	2014 Value	Since 2000
Emissions (Tonnage)	539	-62%
Rate (lbs./MWh)	4.72	-52%

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



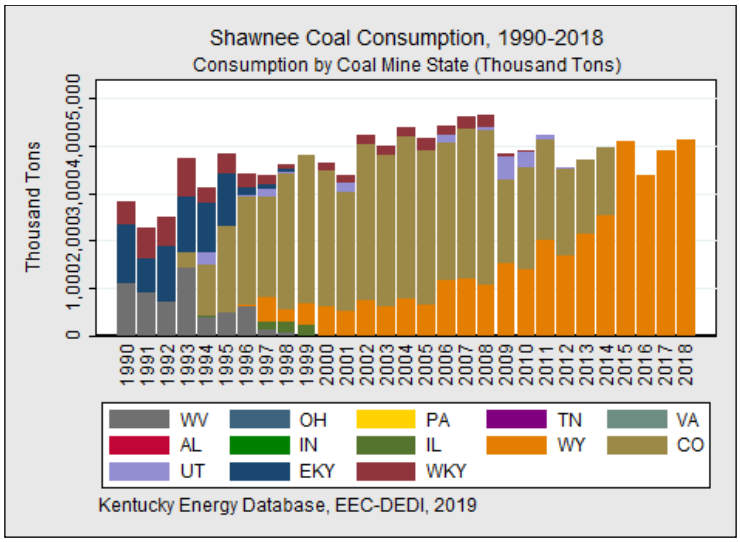


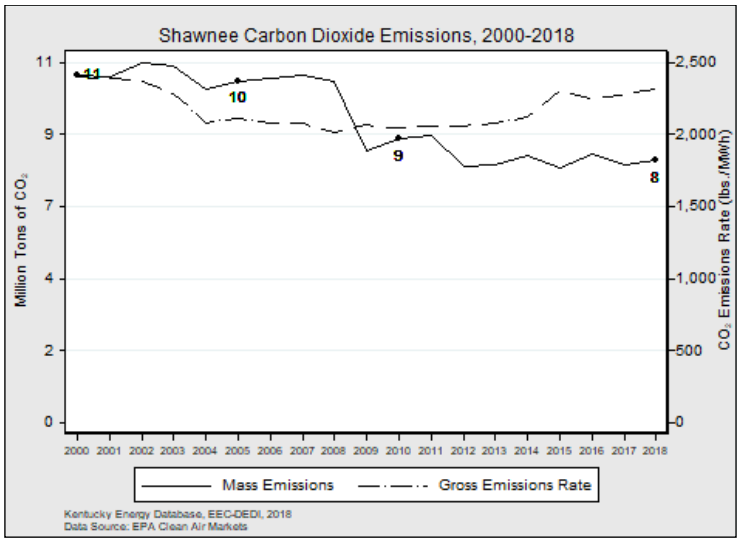
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1953**		**Coal**	**1,206**	**58%**	**6,903**	**6,285**	**2,316**	**4.39**	**2.38**
1	1953		Coal	134	63%	846	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

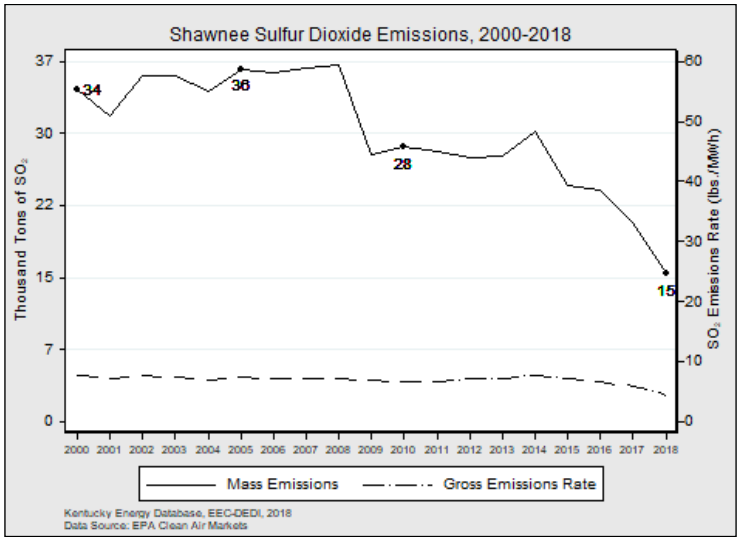


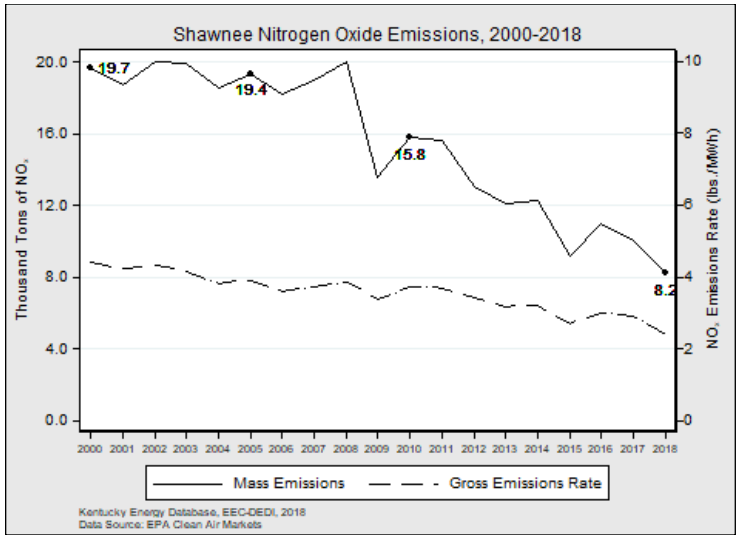


State	2018 Tons	Percentage
Total	3,940,564	100%
Wyoming	2,532,750	64%
Colorado	1,407,814	36%

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.





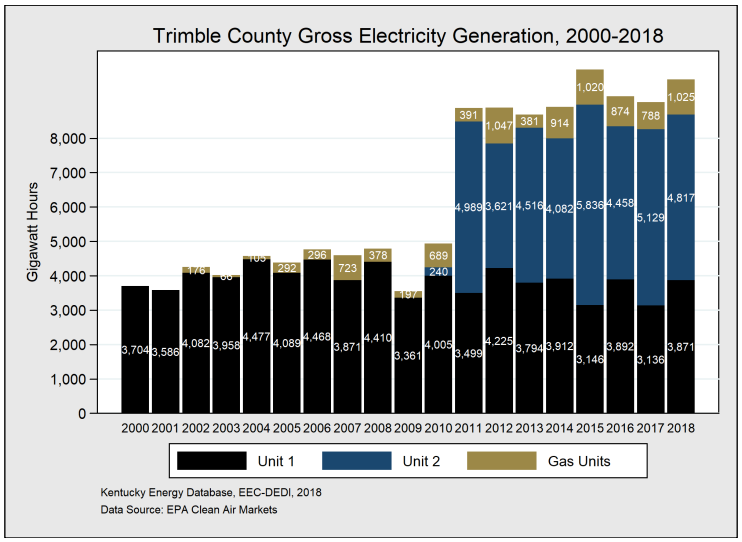
Sulfur Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	15,149	-46%
Rate (lbs./MWh)	4.39	-34%

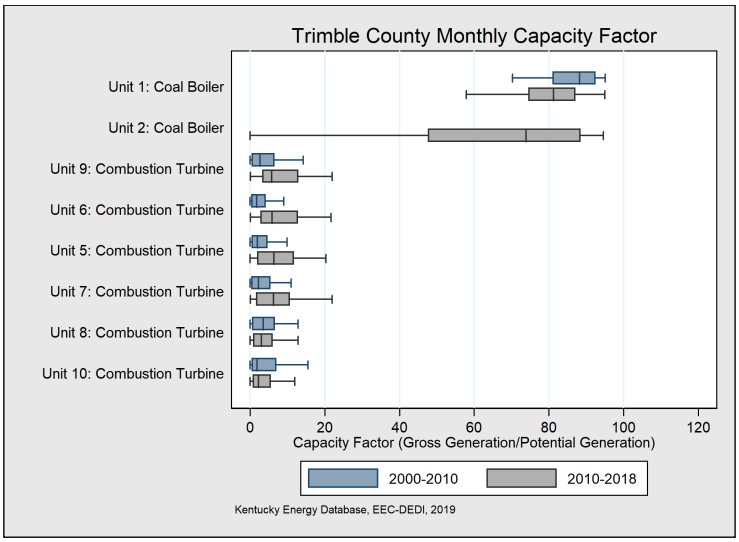
Nitrogen Dioxide	2018 Value	Since 2010
Emissions (Tonnage)	8,228	-46%
Rate (lbs./MWh)	2.38	-36%

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



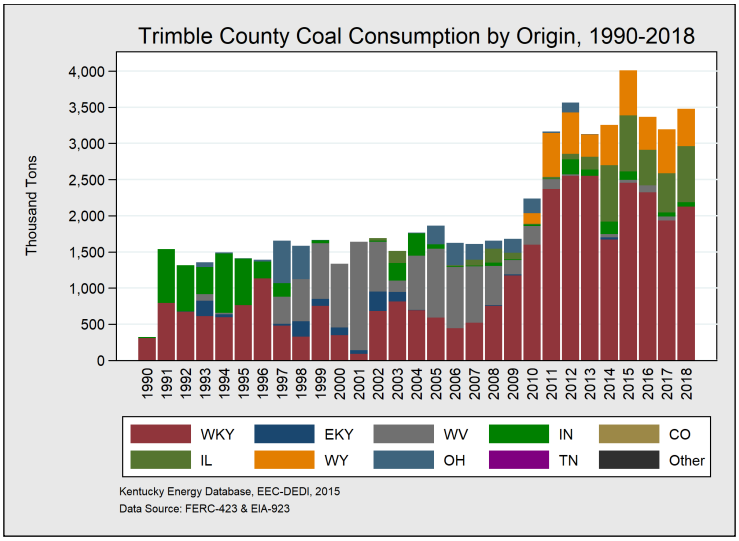


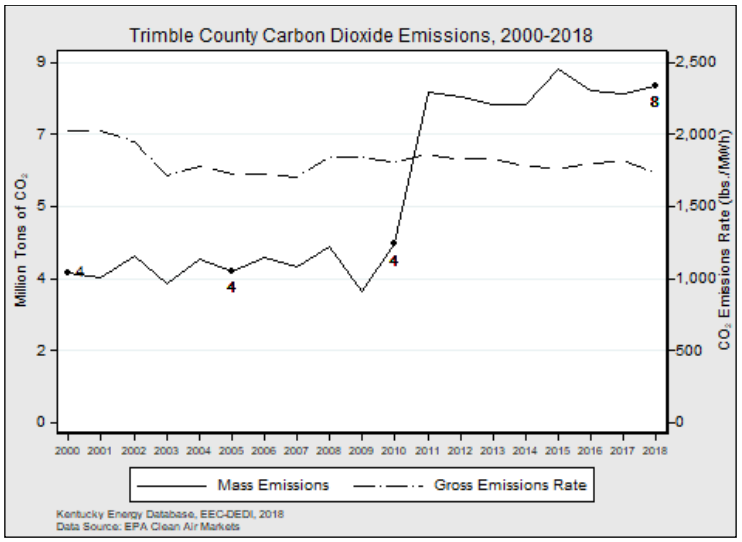
Unit Number	Online Year	Retire Year	Fuel	Capacity (MW)	Capacity Factor* (%)	Gross Generation* (GWh)	Net Generation* (GWh)	CO_2 Rate* (lbs./MWh)	SO_2 Rate* (lbs./MWh)	NO_x Rate* (lbs./MWh)
Plant	**1990**		**Coal**	**4,370**	**72%**	**9,714**	**8,018**	**1,732**	**0.83**	**0.52**
1	1990		Coal	511	79%	3,871	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

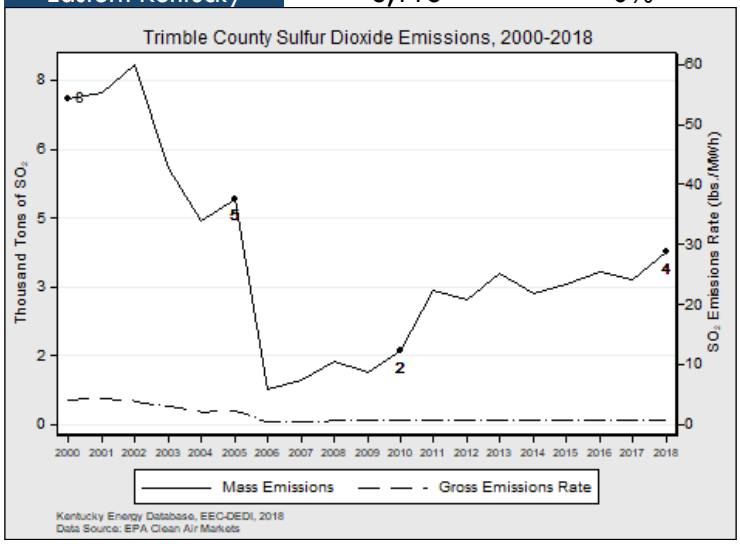


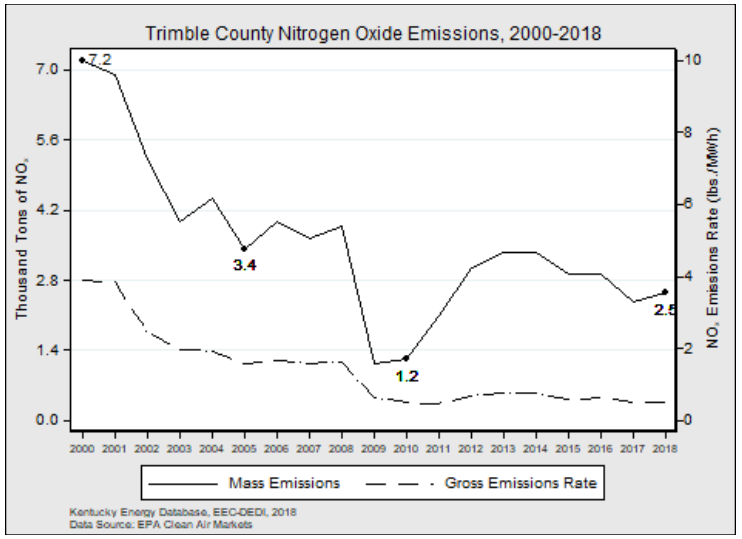


State	2018 Tons	Percentage
Total	3,253,066	100%
Western Kentucky	1,699,398	52%
Illinois	777,258	24%
Wyoming	555,436	17%
Indiana	173,111	5%
West Virginia	44,747	1%
Eastern Kentucky	3,116	0%

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

The Kentucky Energy and Environment Cabinet would like to recognize the following individuals for their numerous contributions to the 2019 edition of the Kentucky Energy Profile.

Author:

Greg Bone, Research Analyst, Kentucky Office of Energy Policy

Contributors

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Shiela Medina, Associate Director, University of Kentucky Center for Applied Energy Research

Please direct all inquiries to Greg Bone (Greg.Bone@ky.gov) or by telephone at 502-782-7246. All of the data in this report are public information aggregated from a variety of state and federal government agencies.

KENTUCKY ENERGY & ENVIRONMENT CABINET

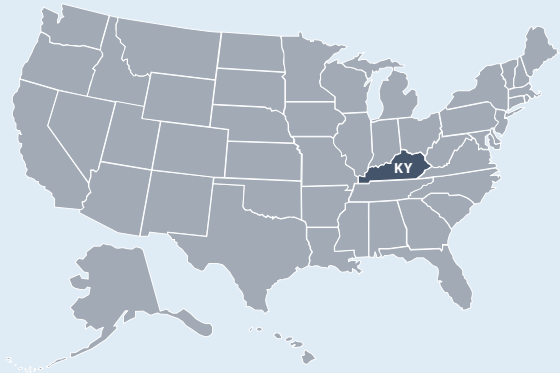
eec.ky.gov

Attachment 1:

Kentucky Energy Sector Risk Profile

State of Kentucky
ENERGY SECTOR RISK PROFILE

U.S. DEPARTMENT OF ENERGY
Cybersecurity, Energy Security, and Emergency Response



Kentucky State Facts

POPULATION 4.47 M

HOUSING UNITS 2.00 M

BUSINESS ESTABLISHMENTS 0.09 M

ENERGY EMPLOYMENT: 42,797 jobs
PUBLIC UTILITY COMMISSION: KY Public Service Commission
STATE ENERGY OFFICE: KY Energy and Environment Cabinet
EMERGENCY MANAGEMENT AGENCY: KY Emergency Management
AVERAGE ELECTRICITY TARIFF: 8.52 cents/kWh
ENERGY EXPENDITURES: $3,893/capita
ENERGY CONSUMPTION PER CAPITA: 372 MMBtu
(15th highest of 50 states and Washington, D.C.)
GDP: $208.1 billion

Data from 2020 or most recent year available.
For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 76,610 GWh
COAL: 29,300 MSTN
NATURAL GAS: 317 Bcf
MOTOR GASOLINE: 48,100 Mbbl
DISTILLATE FUEL: 22,700 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 57 plants, 71.8 TWh, *9.7 GW total capacity*
- **Coal:** 14 plants, 51.7 TWh, *13.5 GW total capacity*
- **Hydro:** 10 plants, 4.2 TWh, *1.1 GW total capacity*
- **Natural Gas:** 15 plants, 15.3 TWh, *8.5 GW total capacity*
- **Petroleum:** 1 plant, 0.1 TWh, *0.0 GW total capacity*
- **Wind & Solar:** 6 plants, 0.0 TWh, *0.0 GW total capacity*
- **Other sources:** 11 plants, 0.4 TWh, *0.1 GW total capacity*

COAL: 41,800 MSTN
NATURAL GAS: 90 Bcf
CRUDE OIL: 2,500 Mbbl
ETHANOL: 900 Mbbl

Data from EIA (2018, 2019).

This State Energy Risk Profile examines the relative magnitude of the risks that the state of Kentucky's energy infrastructure routinely encounters in comparison with the probable impacts. Natural and man-made hazards with the potential to cause disruption of the energy infrastructure are identified. Certain natural and adversarial threats, such as cybersecurity, electromagnetic pulse, geomagnetic disturbance, pandemics, or impacts caused by infrastructure interdependencies, are ill-suited to location-based probabilistic risk assessment as they may not adhere to geographic boundaries, have limited occurrence, or have limited historic data. Cybersecurity and other threats not included in these profiles are ever present and should be included in state energy security planning. A complete list of data sources and national level comparisons can be found in the Data Sources document.

Kentucky Risks and Hazards Overview

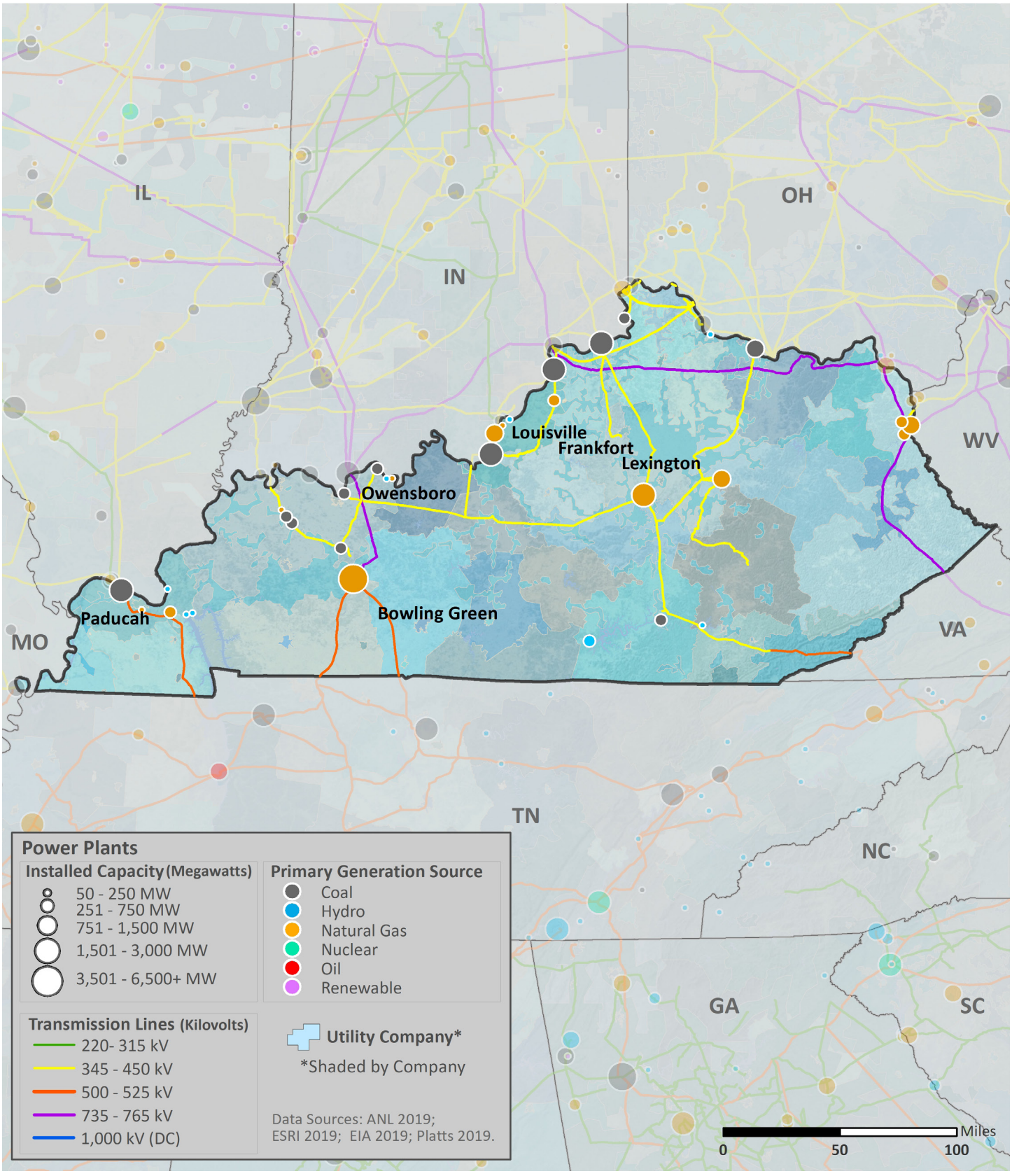
- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Winter Storms & Extreme Cold** at $33 million per year *(7th leading cause nationwide at $418 million per year)*.
- Kentucky had 305 Major Disaster Declarations, 0 Emergency Declarations, and 5 Fire Management Assistance Declarations for 11 events between 2013 and 2019.
- Kentucky registered 14% fewer Heating Degree Days and 23% greater Cooling Degree Days than average in 2019.
- There is 1 Fusion Center located in Frankfort.

Annualized Frequency of and Property Damage Due to Natural Hazards, 2009–2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized ($Million per year)
Drought	2	$0
Earthquake (≥ 3.5 M)	<1	$0
Extreme Heat	6	$0
Flood	72	$18
Hurricane	0	$0
Landslide	1	$0
Thunderstorm & Lightning	131	$8
Tornado	18	$20
Wildfire	1	$0
Winter Storm & Extreme Cold	34	$33

Data Sources: NOAA and USGS

ELECTRIC


IL
IN
OH
WV
VA
MO
TN
NC
GA
SC
Louisville
Frankfort
Lexington
Owensboro
Bowling Green
Paducah
Power Plants
Installed Capacity (Megawatts)
50 - 250 MW
251 - 750 MW
751 - 1,500 MW
1,501 - 3,000 MW
3,501 - 6,500+ MW
Primary Generation Source
Coal
Hydro
Natural Gas
Nuclear
Oil
Renewable
Transmission Lines (Kilovolts)
220- 315 kV
345 - 450 kV
500 - 525 kV
735 - 765 kV
1,000 kV (DC)
Utility Company*
*Shaded by Company
Data Sources: ANL 2019; ESRI 2019; EIA 2019; Platts 2019.
Miles
0
50
100

Electric Infrastructure

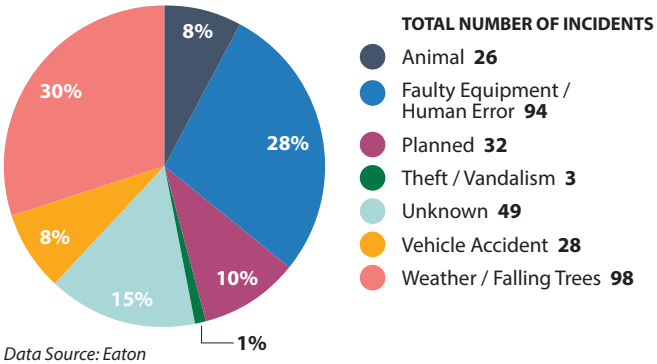
- Kentucky has 56 electric utilities:
  - *3 Investor owned*
  - *24 Cooperative*
  - *29 Municipal*
  - *0 Other utilities*
- Plant retirements scheduled by 2025: 7 electric generating units totaling 2,294 MW of installed capacity.
- In 2018, the average Kentucky electric customer experienced 1.8 service interruptions that lasted an average of 6.8 hours.
- In Kentucky, between 2008 and 2017:
  - *The greatest number of electric outages occurred in **January** (6th for outages nationwide)*
  - *The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)*
  - *Electric outages affected 203,086 customers on average*

Electric Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	86%	36%
Commercial	13%	26%
Industrial	<1%	38%
Transportation	<1%	<1%

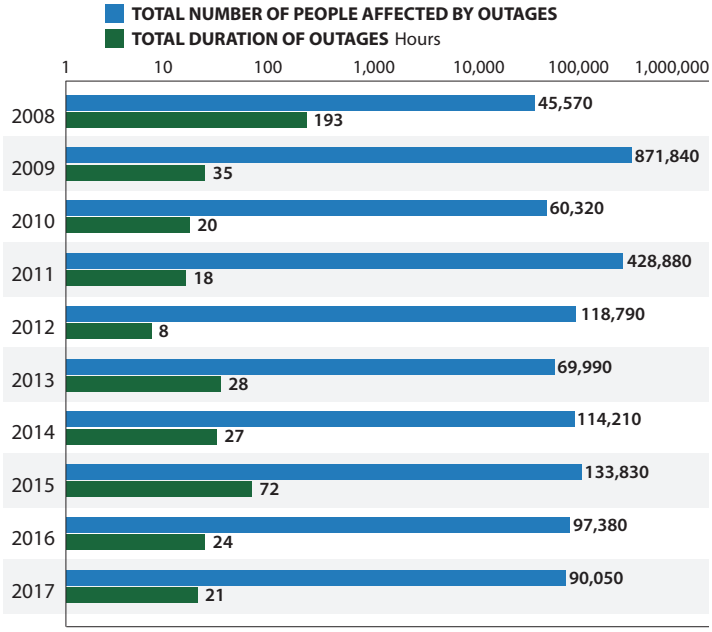
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



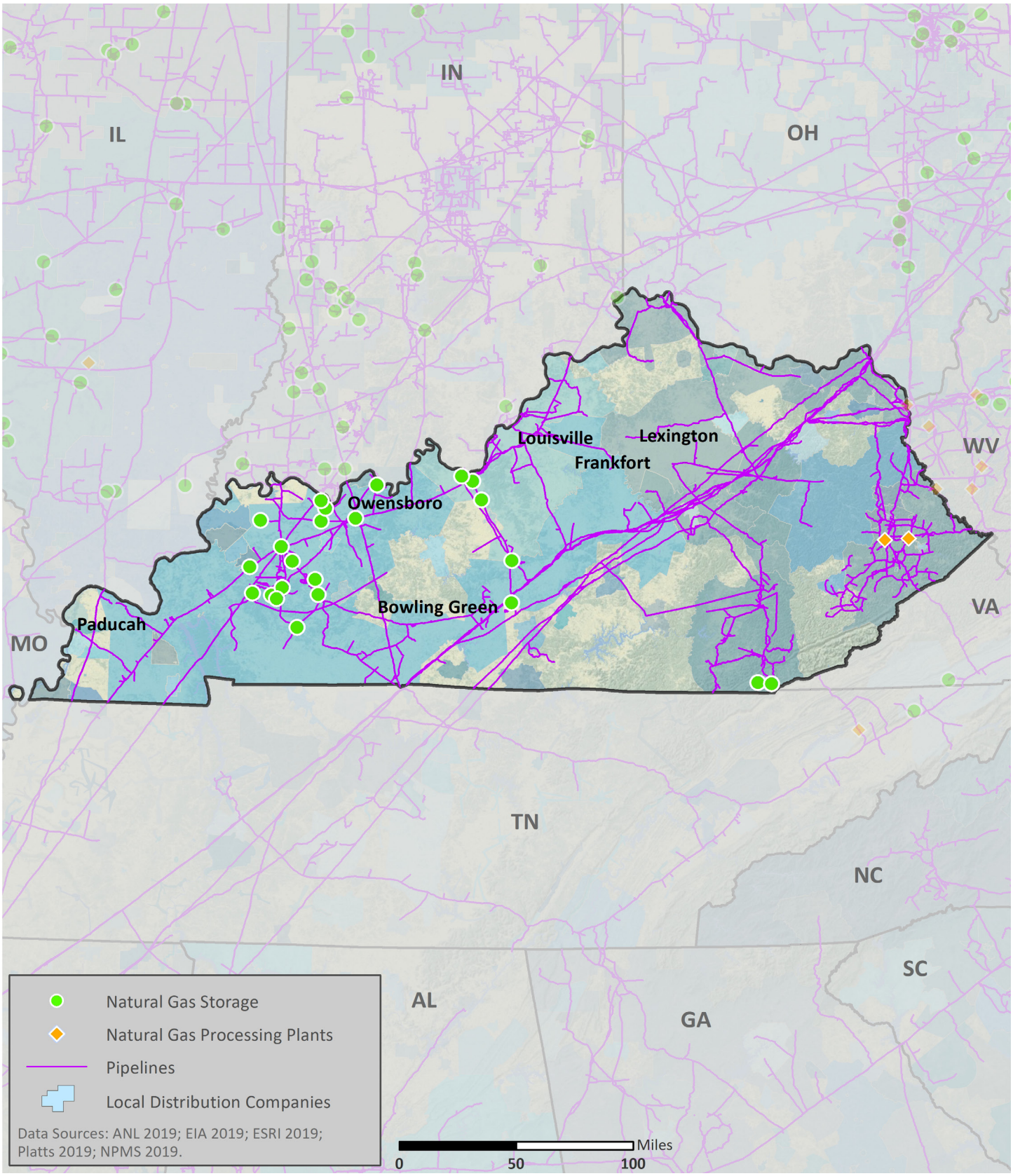
Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017



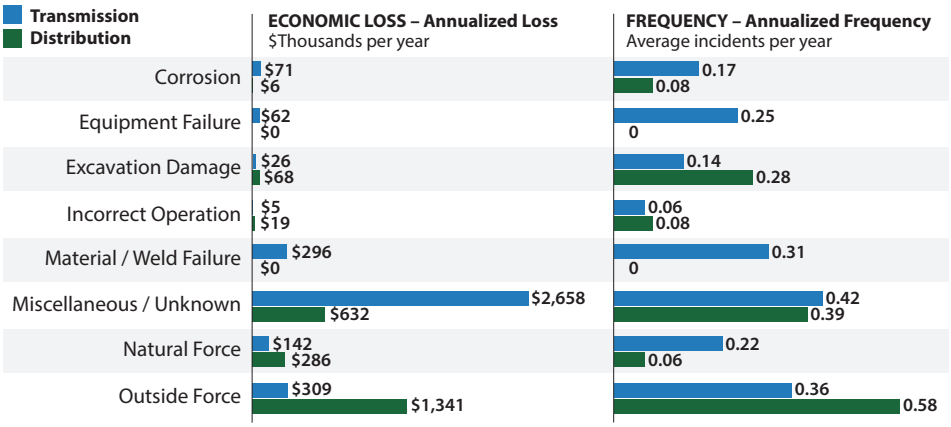
Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton

NATURAL GAS


IN
IL
OH
WV
VA
MO
TN
NC
SC
AL
GA
Louisville
Lexington
Frankfort
Owensboro
Bowling Green
Paducah
Natural Gas Storage
Natural Gas Processing Plants
Pipelines
Local Distribution Companies
Data Sources: ANL 2019; EIA 2019; ESRI 2019; Platts 2019; NPMS 2019.
0
50
100
Miles

Natural Gas Transport

Top Events Affecting Natural Gas Transmission and Distribution, 1984–2019



Data Source: DOT PHMSA

- As of 2018, Kentucky had:
  - *6,769 miles of natural gas transmission pipelines*
  - *18,834 miles of natural gas distribution pipelines*
- 72% of Kentucky's natural gas transmission system and 24% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Kentucky's natural gas supply was most impacted by:
  - ***Miscellaneous or Unknown*** *events when transported by transmission pipelines (5th leading cause nationwide at $16.77M per year)*
  - ***Outside Forces*** *when transported by distribution pipelines (leading cause nationwide at $76.59M per year)*

Natural Gas Processing and Liquefied Natural Gas

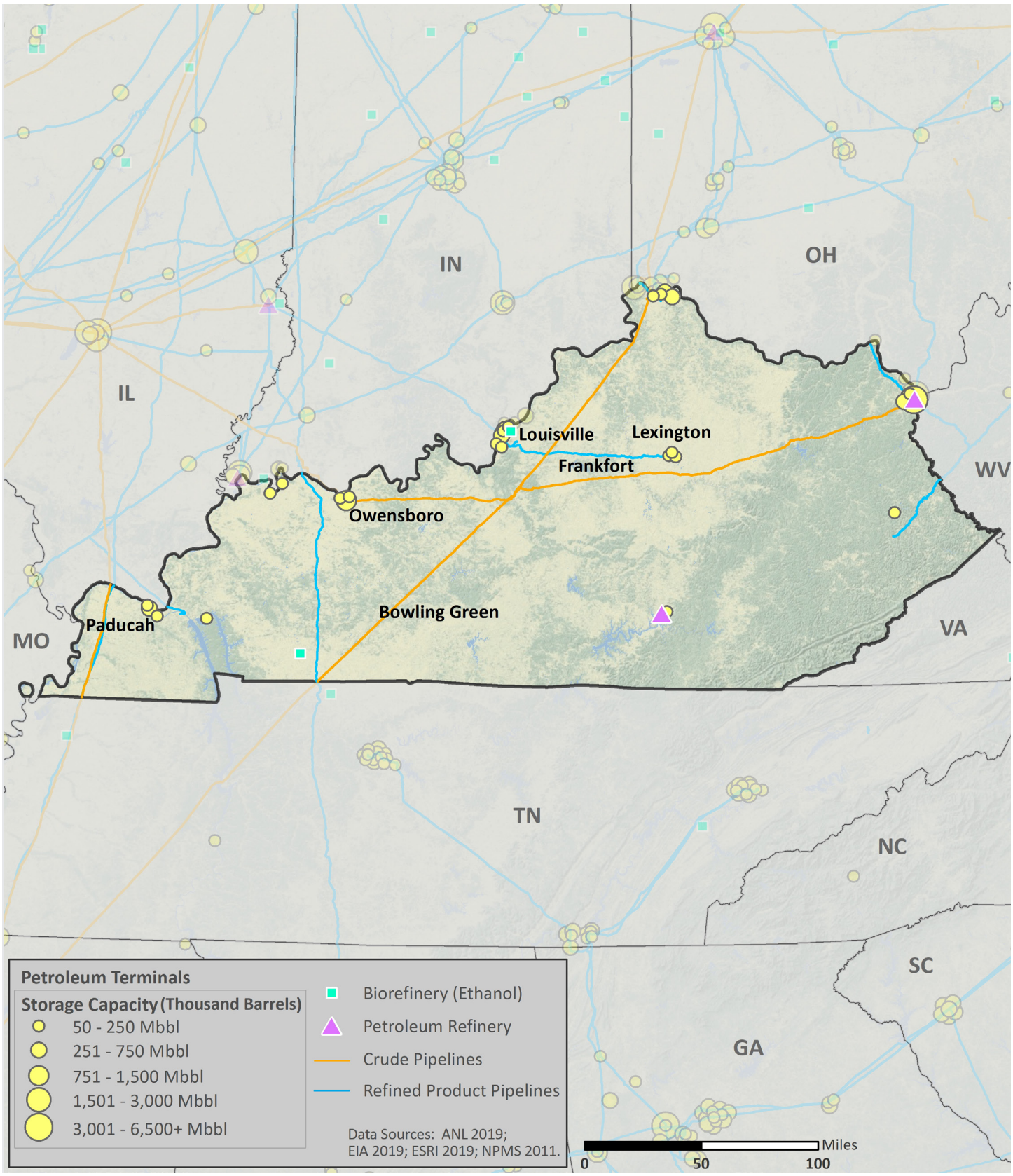
Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	90%	16%
Commercial	10%	12%
Industrial	<1%	37%
Transportation	<1%	<1%
Electric Power	<1%	36%
Other	<1%	<1%

Data Source: EIA

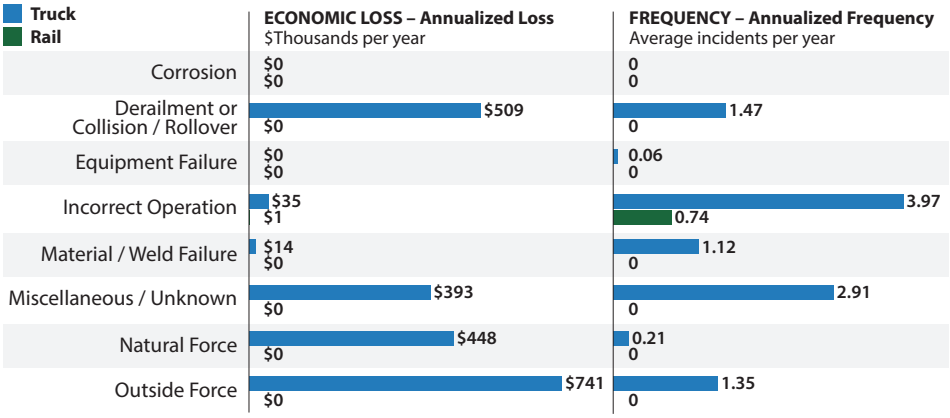
- Kentucky has 2 natural gas processing facilities with a total capacity of 365 MMcf/d.
- Kentucky has 0 liquefied natural gas (LNG) facilities.

PETROLEUM


IN
OH
IL
WV
MO
VA
TN
NC
SC
GA
Louisville
Lexington
Frankfort
Owensboro
Bowling Green
Paducah
Petroleum Terminals
Storage Capacity (Thousand Barrels)
50 - 250 Mbbl
251 - 750 Mbbl
751 - 1,500 Mbbl
1,501 - 3,000 Mbbl
3,001 - 6,500+ Mbbl
Biorefinery (Ethanol)
Petroleum Refinery
Crude Pipelines
Refined Product Pipelines
Data Sources: ANL 2019;
EIA 2019; ESRI 2019; NPMS 2011.
Miles
0
50
100

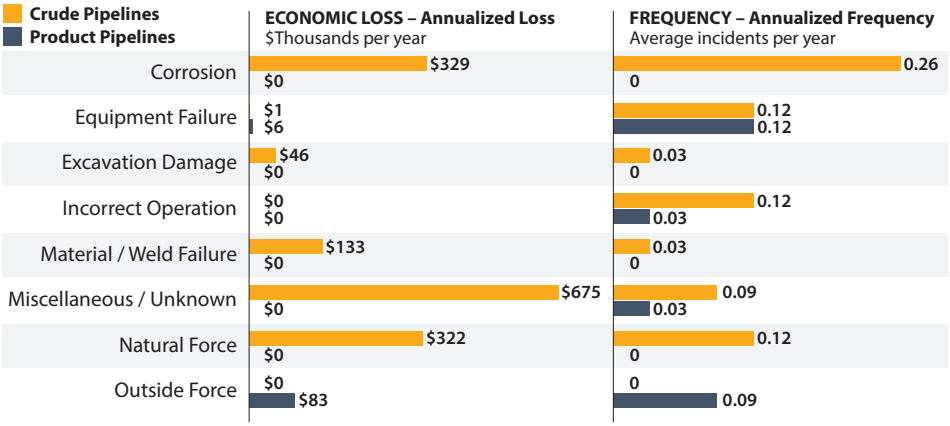
Petroleum Transport

Top Events Affecting Petroleum Transport by Truck and Rail, 1986 – 2019



Data Source: DOT PHMSA

Top Events Affecting Crude Oil and Refined Product Pipelines, 1986 – 2019



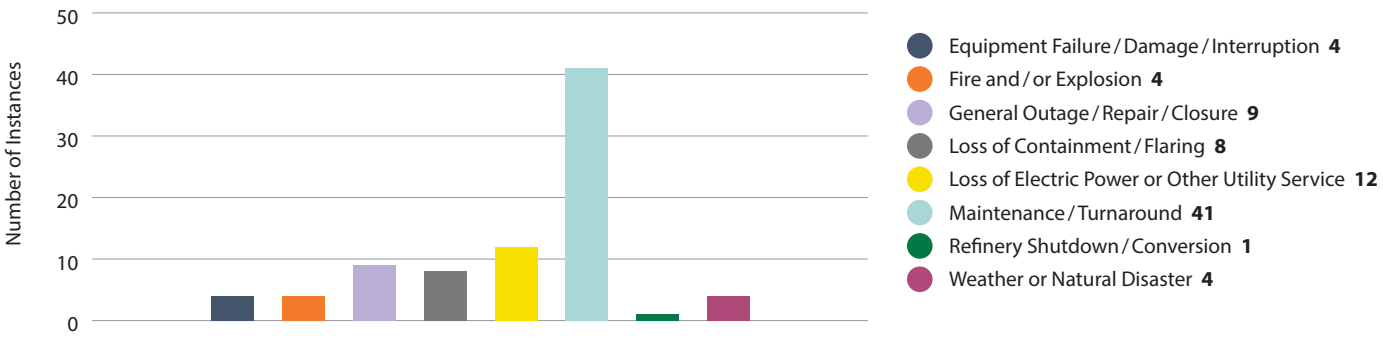
Data Source: DOT PHMSA

- As of 2018, Kentucky had:
  - *601 miles of crude oil pipelines*
  - *275 miles of refined product pipelines*
  - *0 miles of biofuels pipelines*
- 53% of Kentucky's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Kentucky's petroleum supply was most impacted by:
  - ***Outside Forces*** *when transported by truck (2nd leading cause nationwide at $60.45M per year)*
  - ***Incorrect Operations*** *when transported by rail (4th leading cause nationwide at $2.02M per year)*
  - ***Miscellaneous or Unknown*** *events when transported by crude pipelines (5th leading cause nationwide at $4.71M per year)*
  - ***Outside Forces*** *when transported by product pipelines (leading cause nationwide at $19.06M per year)*
- Disruptions in other states may impact supply.

Petroleum Refineries

- Kentucky has 2 petroleum refineries with a total operable capacity of 282.5 Mb/d.
- Between 2009 and 2019, the leading cause of petroleum refinery disruptions in Kentucky was:
  - ***Maintenance*** *(2nd leading cause nationwide)*

Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing

APPENDIX F:

Energy Disruption Tracking Log

Kentucky ESF 12-Energy Disruption Tracking Log
Energy and Environment State Energy Office SEO-EEC
Severe Weather, 13 April Activation Order : 20221495

Date of monitoring	Energy Source Affected	Companies/Industries and Contact	Initiating Event	Event Description & Requests	Possible Cause	Area Affected	Type and Number of Customers Affected	Restoration Actions	ESF 12 actions	Governement Actions	Federal Actions	Event Close date
1/11/2021	Electric, Propane, Natural gas, Petroleum (propane)	Local, State, Private (Propane Distributors)	Winter Storm w/snow, ice, high winds, tornadoes, flooding, cybersecurity, man made (winter storm)	Several suppliers ran out of propane but there were no reports of residential outages	High demand for propane in Northeast made for long wait times at area terminals	Region, County, City (Western KY)	Propane Gas Users-50	HOS waiver approved-Logged into Web EOC and distributed to energy partners in ReadyOp	Validiated necessity of request, SEO-EEC routes request to KDOT (ESF 1)	KYEM opened emergency shelters in affected areas	PHMSA waiver issued 1/12/21, includes KY	1/15/2021
										Level 3 activation		

APPENDIX G:

Hours of Service (HOS) Waivers

APPENDIX G: Hours of Service (HOS) Exemption Request

Guidance for States on Relief from Federal Motor Carrier Safety Regulations in an Energy Emergency

NASEO
National Association of State Energy Officials

Guidance for States on Relief from Federal Motor Carrier Safety Regulations in an Energy Emergency

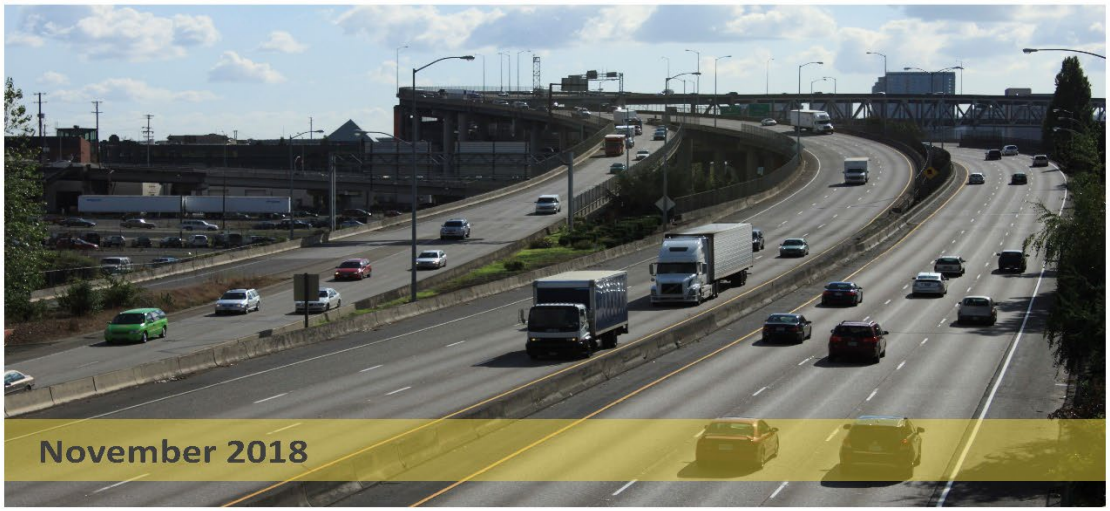


Image source: rlmartin

The Federal Motor Carrier Safety Administration (FMCSA), a stand-alone Department of Transportation (DOT) agency, has developed a detailed set of rules designed to keep roads safe by ensuring drivers limit the long hours they spend behind the wheel.

https://www.fmcsa.dot.gov/regulations/hours-of-service

These Hours of Service (HOS) regulations apply to all DOT regulated commercial motor vehicle operators in the US. All carriers and drivers operating commercial motor vehicles (CMVs) must comply with the HOS regulations found in 49 CFR 395. “Hours of service” refers to the maximum amount of time drivers are allowed to be on duty including driving time, and specifies number and length of rest periods, to help safeguard that drivers stay awake and alert.

In some cases due to extreme cold weather companies and/or trade associations in the energy industry may request a HOS exemptions. These requests are in direct conflict with federal and state regulations that have been developed for public safety and protection of the transportation infrastructure and must be carefully evaluated before exemptions are recommended and approved.

The State Energy Office (SEO) is not a regulatory agency – the SEO provides situational awareness with energy partners, KYDOT and KYEM regarding energy emergencies and can only make recommendations to KYDOT, or in certain cases, to the Federal Motor Carrier Safety Administration (FMCSA). FMSCA and KYDOT are the agencies with statutory authority to grant exemptions. The guidelines for recommended information the trade association should assemble are presented in Attachment 1.

The protocol outlined in this appendix provides responsible agencies with the best available information to make such decisions.

- Requests for an HOS exemption typically originate from an oil company, common carrier, or a trade association. Such requests are directed to KYTC, FMSCA or the SEO who will route the request in lieu of the company.

- The affected company/trade association will contact its respective membership to determine the magnitude, scope and estimated duration of the problem and follow minimum guidelines for gathering appropriate information.

- Upon notification of the request the SEO initiates fact-finding with the affected company/carrier/trade association. (In some cases to other state energy offices, industry, law enforcement agencies, weather prediction centers and federal agencies to assist in validating facts). Examples of energy partner situational analysis can be found in Attachment 2.

- If the SEO determines that there is not an emergency situation developing, they will advise the company/carrier/trade association and stakeholders that no recommendation is being developed. If the SEO determines that there is an emergency situation developing, the SEO will contact the EEC secretary and ESF 1-KYDOT for further action and recommendation for the Office of the Secretary.

Examples of draft recommendation can be found in Attachment 2. A formal request of the trade association is provided in Attachment 3.

- Upon receipt of the HOS exemption recommendation by the Office of the Secretary, KYDOT will conduct an internal review of the facts and make a decision. The KYDOT may accept or modify the recommendation, if approved KYDOT will request an HOS exemption Declaration of Emergency and Exemption of Hours of Service Regulations will be issued. A copy of the Declaration of Emergency and Exemption of Hours of Service Regulations for Delivery are provided in Attachment 4 and 5. A draft Declaration of Emergency Template is in Attachment 6.

- If the KYDOT disapproves the request, the SEO will be notified and SEO will notify the trade association and the respective stakeholders.

- Once the Declaration of Emergency and Exemption of Hours of Service Regulations is approved the KYDOT provides a signed copy to the KYDOT Fusion Center and the SEO. The SEO will upload the declaration to WebEOC and distribute to the requesting trade association and the respective stakeholders through ReadyOp.

- A Federal Motor Carrier Safety Administration (FMCSA) Regional Emergency Declaration for 49 CFR 390.23 is provided in Attachment 7.

Points of Contacts:

Kentucky Transportation Cabinet 4/1/2021

- Matt Cole, Commissioner Vehicle Regulation – 502-564-7000 or Matthew.Cole@ky.gov
- Todd Shipp, Assistant General Counsel – 502-564-7650 or
- todd.shipp@ky.gov
- Will Fogle, Executive Director Office of Legal Services – 502-564-7650 or William.Fogle@ky.gov
- Mary Cook, Assistant Director Division of Motor Carriers – 502-564-7000 or Mary.Morris@ky.gov
- William Hayes, ESF-1 Transportation- Incident Management- 502.229.5329 or William.hayes@ky.gov

More information can be found in the KY Petroleum Shortage Plan Annex (Appendix H)

Attachment 1:

Hours of Service (HOS) Exemption Requests

Guidelines
Hours of Service Exemption Requests

Kentucky Energy and Environment Cabinet
State Energy Office

The following guidelines have been developed to assist the energy industry by outlining the types of information needed from the affected business (usually an oil company or common carrier) or a trade association, to verify the nature, scope and estimated duration of the problem.

The SEO is not a regulatory agency – it can only make recommendations to KYTC, or in certain cases, to the Federal Motor Carrier Safety Administration (FMCSA). KYTC and FMCSA are the agencies with statutory authority to grant exemptions. The SEO can assist with routing requests and distributing the exemptions to KYEM and other ESF and energy partners.

Below is the recommended information needed to enable a rapidly response to an HOS exemption requests.

Guidelines for Requests

- Situation overview – a brief narrative outlining the nature of the problem (who, what, where, why, when).
- Who is having a problem? How widespread is it? Does in involve more than one company?
- What is the problem? Clearly define the exact nature of the problem. What are the impacts on consumers? Are there outages? If so for how long? How many consumers and what types of consumers (residences, motoring public, commercial businesses, factories, etc.) are affected?
- What caused the problem? Can you identify factors that contributed to the problem? (Weather, refinery breakdowns, product allocation, transportation bottlenecks such as queues at loading racks, etc.)
- Are you aware of other suppliers having similar problems – either in Kentucky or surrounding states?
- What is the industry doing to resolve the problem? Have you/ marketers/ retailers contacted alternate supply sources (if so, give names and contact numbers) or alternate transportation (e.g., common carriers).
- What specific relief are you requesting? What is the minimum amount of time this relief would be needed?
- What would happen if the requested relief was not granted?

Attachment 2:

Hours of Service (HOS) Exemption-Situational Analysis

EXAMPLE:

Hours of Service Exemption-Situational Analysis

Kentucky Energy and Environment Cabinet

State Energy Office

On Wednesday, January 21, 2009 the Kentucky Energy and Environment Cabinet (EEC) received a request from the Kentucky Propane Gas Association (KPGA) asking for relief from the driver hours of service (HOS) provisions of 49 CFR 395.3. The requested relief involves the delivery of propane from the present through February 9, 2009.

A declaration of emergency under the provisions of 49 CFR 390.23 would provide the relief being requested.

The text of the e-mail request from KPGA, is reproduced below:

> Situation Overview as of January 21, 2009
>
> Due to extreme cold weather in the northeastern states, supply of propane has put pressure on the TET pipeline resulting in allocation from Coshocton terminal east. TET began closing on the weekends in order to build inventories and reduce lines during the week. Trucks began moving down the pipeline looking for product last week putting additional pressure on Todhunter and Princeton terminals. As of this afternoon today, Todhunter had 60-70 trucks waiting in line with wait times approaching 6-10 hours. Princeton had 25 trucks in line with similar wait times.
>
> TEPPCO announced this afternoon that they have been experiencing unprecedented demand at Todhunter, which has lead to an excessive amount of trucks waiting in line at Todhunter and because of this situation, effective Monday morning, 1/26, at 0001 AM , Todhunter and Princeton will be placed on allocation. The ratio at Todhunter will be 12:1 and the ratio at Princeton will be 6:1. This allocation will surely place more stress on the system.
>
> The terminal at Markwest has shut down and won't be running again until Friday, January 23. They continue to experience mechanical problems and remain questionable. The cavern at Catlettsburg is empty and they are loading as they produce product for a minimal capacity of only 20 loads per day.
>
> In addition, surrounding and nearby states (Ohio, Virginia, West Virginia, Pennsylvania, New York) [http://www.npga.org/i4a/pages/index.cfm?pageid=832] have been operating under an hours of service exemption resulting in a shortage of truck drivers

coming into Kentucky. These carriers operating in the other states have exceeded their HOS drive time in those states and will be out of hours if they try to make deliveries in Kentucky.

Dealers with rail siding are reporting a shortage of rail cars delivering propane into the state putting additional dependence on over-the-road transports.

The Kentucky Propane Gas Association respectfully requests relief from the driver hours of service provisions of 49 CFR 395.3. The requested relief involves the delivery of propane. The requested relief is needed through February 9, 2009 in order to provide time to replenish supplies and fill customer tanks throughout the state.

A similar request and corroborating information (below) was also received from a trucking company operating in Kentucky (Select Transport, Inc.,)

> We are a carrier based in Ohio but we have trucks stationed around the Siloam, Catlettsburg areas as well as out of the Princeton, In area and we haul propane into Kentucky. The problems are the extreme cold that we have experienced has put a burden on the supply situation from the east coast out through the Midwest states. There are east coast trucks coming out to the terminals in Ohio, Kentucky, Indiana and Illinois to truck propane back out to the east coast. This has made extremely long lines at all of the loading locations in the Midwest who still have product available. Many terminals are either out of product or have been put on such allocation that there is no gas available at these terminals. Drivers are sitting in lines at these loading terminals for 3 to 8 hours in order to get a load to deliver to customers which is eating up their available hours to get loads to customers. Surrounding states have hours of service exemptions in place but we can not effectively use these exemptions if all of the states do not have them in place as the exemptions are for intrastate only. So if we load a load in Ohio destined for Kentucky, we can not deliver in a timely manner as we can not enter the state of Kentucky until the driver abides with the hours of service regulations. Basically all we are getting done is setting in lines. Any help or consideration of relief would be greatly appreciated by everyone in the propane industry in your state.

During the morning of Thursday, January 22, 2009 EEC staff conducted a brief telephone survey to verify the above. Results were:

- TEPPCO Pipeline Manager of Propane Supply said that:
    - TEPCO had indeed been experiencing loading delays at some terminals that serve Kentucky customers with as many as 60 to 80 trucks in line causing a delay of 6 to 8 hours in loading.

- Part of the problem at their Princeton Indiana and Todhunter Ohio terminals was cause by truckers from New England who were coming into the Midwest because they we unable to get propane in New England due to heavy demand from colder-than-normal winter weather. TEPPCO has been on allocation at New England terminals since November 23rd.
- Increase demand at these terminals has also been driven by operational problems and shut-downs at Kentucky's in-state propane terminals.
- TEPPCO has instituted an allocation program at its Princeton and Todhunter terminals in an effort to reduce loading delays.

- MarkWest Energy Partners' representatives said:
  - MarkWest's loading racks (Siloam, KY) had been shut down for several days while lines connecting to new propane storage facilities were tied into the racks. They expect to be loading product by tomorrow (Friday, January 23).
  - Their customers are allowed 100 percent of contract volumes but must pro-rate their purchases over the month.

- Marathon Petroleum said:
  - Marathon's Catlettsburg, KY refinery has had its propane loading racks closed intermittently for a variety of causes including pipe leaks under the loading area.
  - They have customers on 80 percent allocation.
  - Product is available only for their existing customers.
  - Characterized the situation as (tight but product is available).

Weather conditions in Kentucky are to trend toward warmer temperatures over the next few days but the 10-day forecast reflects below freezing temperatures at night. The 10-day forecast for the Northeast US reflects below freezing temperatures and possible snow showers. Conditions in Kentucky and the Northeast will continue to drive strong demand for propane.

At this time KPGA is not aware of any out-of-gas situations at the retail level but retailers are reporting that they are operating with very low stocks and disruptions in the supply flow will place them in critical condition.

RECOMMENDATION: Request that under state and federal authority (KRS 281.730 and 49 CFR 390.23) the Secretary of Transportation grant an Hours of Service Exemption for commercial motor vehicles and its operator transporting propane products until 12:01 a.m. Thursday, February 10, 2009.

Attachment 3:

Propane Industry's Formal Request for Hours of Service Exemption

Kentucky
Propane Gas
Association

Propane Industry's Formal Request for Hours of Service Exemption

This week, Kentucky has experienced a period of sub-zero temperatures with wind chills in the -10 to -25 range. With an already tight supply of propane, our marketers are struggling to keep up with demand for our product. Although the weather forecast indicates that temperatures will moderate in the next few days, the effects of this cold snap will last for several weeks. Therefore, our industry is sending this formal request for an hours of service exemption.

Yesterday, KPGA sent an email to our members asking for comments on our request for an exemption. Many responses were received and all were eager for an HOS exemption. Current reports by members in general indicate a tightening supply situation, terminal bottlenecks, and marketer demand outstripping their suppliers' ability to deliver to the retail plant locations.

Listed below are several actual responses:

- *We are experiencing increased demand along with tight supply. If weather stays little warmer, we would only need the HOS exemption for two to three weeks.*
  Rick Harris, Bright's Bottle Gas, Burgin, Ky., Phone- (859) 748-5382
  Empire Gas, Nicholasville, Mt. Sterling, London, Hazard, Monticello, Ky.
  Phone- (859) 885-7664 / (859) 498-5415 / (606) 864-4046

- *We are having difficulty getting gas ourselves. Common carriers are experiencing longer than normal wait times at the pipelines. We currently have to work our bobtail drivers in shifts to keep up with customer demand. Thank you,*
  –David Miller, Millers Bottled Gas, (270) 842-9427

- *In the Hopkinsville area we are experiencing extremely cold weather today. The cold is to continue throughout the week and we are having a difficult time getting transport deliveries of Propane. The problem seems to be in the transportation of the product, we currently have to transport from St. Louis and Robinson, Ill. The new HOS requirements of the drivers are causing major delays on deliveries to our bulk storage tanks. I understand the Princeton, IN. terminal is on a daily allocation but on Thursday, January 2nd and Friday the 3rd we received over 200 calls from our customers and customers of other companies requesting gas deliveries. Our drivers worked the weekend to get ahead of the weather that was coming in so no patron would be without gas.*

  Due to the delays in transport deliveries to us this is causing a delays to our customer's as well, we cannot deliver product we do not have. If the weather forecast is correct our deliveries should return to somewhat normal by the end of next week. If Kentucky will allow an HOS this will be very beneficial to our customers and everyone who hauls propane in the state. It is my understanding that Indiana has already issued a HOS Exemption and we are asking for the exemption for Kentucky as well. Thank You.
  –John Camp, Southern States Cooperative, Hopkinsville, KY (270) 886-1303

- With colder weather the demand has increased simply to keep warm. Other problem the supply of propane has decreased due to allocations at supply pipe line terminals and the export of the product to other countries for suppliers to make extra profit. With less product to deliver and increased demand, we have to do shorter drops at each tank, equates more driving time to help all customers. Thanks,
  –J.T. Hagedorn, Fischers Tru-Flame Gas Co., (812) 547-2351

- The extreme temperatures are causing delays with transports and deliveries. We expect to be caught up by 12/13/2014. We are currently out of gas at one of my plants and awaiting transport.
  –Don Pruitt, AmeriGas- New Haven, KY (800) 564-3113

- Our demand is almost double to where it was this time last year, We truly need exemption of hours
  –Jimmy Carter, Ferrellgas, Hagerhill, KY (606) 789-4084

- Due to the recent weather situation, the demand has increased drastically. An HOS Waiver would greatly ease the burden we are experiencing with delivering LP. We are playing catch up from the weekend deliveries due to weather, lines and loading delays. Mixed with increase demand and we have a snowball effort for delivering LP. If this lasted through the weekend, it would be a huge help to our customers in providing propane.
  –Charlotte Tate, Southern States Corporate, Richmond, VA (804) 281-1000

In summary, the extreme cold temperatures and snow accumulation across Kentucky has slowed deliveries immensely and drivers are now working overtime to catch up. With continued propane demand along the pipeline system, the terminal system will continue to experience backups and cause hours of service limits to be exceeded.

The Kentucky Propane Gas Association respectfully requests current relief from the driver hours of service provisions of 49 CFR 395.3. The requested relief involves the delivery of propane. The requested relief is needed through **January 28, 2014** in order to provide time to replenish supplies and fill customer tanks throughout the state.

CONTACT:
Jay McCants, Executive Director
Kentucky Propane Gas Association
512 Capitol Ave., Frankfort, KY 40601
(502) 875-2686 office, (502) 875-1595 fax
jmccants@kypropane.org

Attachment 4:

January 23, 2009 Declaration of Emergency

TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.transportation.ky.gov/

Steven L. Beshear
Governor

Joseph W. Prather
Secretary

OFFICE OF THE SECRETARY

OFFICIAL ORDER NO. 105128

SUBJECT: DECLARATION OF EMERGENCY AND EXEMPTION OF HOURS OF SERVICE REGULATIONS FOR DELIVERY OF PROPANE

WHEREAS, extremely cold weather in the New England area has caused sharp increases in the demand for propane and has led to propane buyers trucking propane from propane pipeline terminals in the Midwest; and

WHEREAS, this change in the distribution patterns for propane and recent cold weather in the Midwest has increased demand for propane in the region above historical levels; and

WHEREAS, several propane terminals have experienced temporary shut-downs; and

WHEREAS, this situation has resulted in distribution and delivery problems in that loading delays for propane transports have been reported to be as long as 6 to 7 hours in duration; and

WHEREAS, 49 CFR Part 395, KRS 281.730, and 601 KAR 1:005 impose maximum driving times upon the drivers of motor carriers delivering propane,

NOW THEREFORE, pursuant to the authority vested in me by KRS 281.730 and 49 CFR 390.23, I hereby declare:

1. That a state of emergency exists requiring relief from the hours of service imposed upon the transporters of propane
2. That a commercial motor vehicle and its operator transporting propane shall be exempt from the hours of service imposed under 49 CFR 395, 601 KAR 1:005 and KRS 281.730 during the period of this emergency.
3. That all other safety requirements shall remain in full force and effect.
4. This declaration of emergency shall remain in effect until 12:01 AM EST February 10, 2009, unless extended.
5. That any driver operating under authority of this Declaration of Emergency should have a copy of this Declaration in the cab of the vehicle.

Joseph W. Prather, Secretary
Transportation Cabinet

Done this 23rd day of January, 2009 at Frankfort, Kentucky.

Approved as to Form and Legality:

Office of General Counsel and Legislative Affairs

Kentucky UNBRIDLED SPIRIT

An Equal Opportunity Employer M/F/D

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Attachment 5:

January 8th, 2014 Declaration of Emergency

TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.transportation.ky.gov/

Steven L. Beshear
Governor

Michael W. Hancock, P.E.
Secretary

OFFICE OF THE SECRETARY OFFICIAL ORDER NO. 108656

SUBJECT: DECLARATION OF EMERGENCY AND EXEMPTION OF HOURS OF SERVICE REGULATIONS FOR DELIVERY OF PROPANE

WHEREAS, Kentucky and a significant portion of the United States has experienced a prolonged period of below-freezing temperatures; and

WHEREAS, the current weather forecasts call for this trend to continue well into the middle of January, with weekend temperatures to be in the single digits and wind chills well below zero degrees; and

WHEREAS, cold temperatures across the nation have led to tightening supply situation, and market demand has led to a sharp decline in propane inventories; and

WHEREAS, this situation has resulted in distribution and delivery problems in that loading delays for propane transports have been reported to be as long as 6 to 7 hours in duration, and shut downs entirely at distribution points within the Commonwealth; and

WHEREAS, 49 CFR Part 395, KRS 281.730, 601 KAR 1:005 impose maximum driving time upon the drivers of motor carriers delivering propane;

NOW THEREFORE, pursuant to the authority vested in me by KRS 281.730 and 49 CFR 390.23, I hereby declare:

1. That a state of emergency exists requiring relief from the hours of service imposed upon the transporters of propane;

2. That a commercial motor vehicle and its operator transporting propane shall be exempt from the hours of service imposed under 49 CFR Part 395, 601 KAR 1:005 and KRS 281.730 during the period of this emergency;

3. That all other safety requirements shall remain in full force and effect;

4. That this declaration of emergency shall remain in effect until 12:01 AM EDT, January 28, 2014;

5. That any driver operating under authority of this Declaration of Emergency shall have a copy of this Declaration in the cab of the vehicle.

Michael W. Hancock, P.E., Secretary
Kentucky Transportation Cabinet

Done this 8th day of January, 2014 at Frankfort, Kentucky

Approved as to form and legality:

Office of Legal Services

Kentucky UNBRIDLED SPIRIT

An Equal Opportunity Employer M/F/D

Attachment 6:

Draft Declaration of Emergency

Draft Declaration of Emergency Template

COMONNWEALTH TRANSPORTATION CABINET
FRANKFORT, KY

OFFICE OF THE SECRETARY OFFICIAL ORDER NO. ------

SUBJECT: DECLARATION OF EMERGENCY AND EXEMPTION OF HOURS OF SERVICE REGULATIONS FOR DELIVERY OF _____[specify products/services, e.g. "propane," or "heating fuels"]

WHEREAS, [insert causal factors, e.g. "severe cold weather has resulted in an increased demand for supplies of propane"]; and

WHEREAS, [insert causal factors, e.g. "current weather forecasts call for continuing below freezing temperatures"]; and
WHEREAS, [[insert causal factors, e.g. "this situation has resulted in distribution and delivery problems in that loading delays for propane transports may be as long as 3 to 7 hours in duration"]; and
WHEREAS, 49 CFR Part 395, KRS 281.730, and 601 KAR 1:005 impose maximum driving times upon the drivers of motor carriers delivering ----------. [Identify the same product or products as in the SUBJECT above]

NOW THEREFORE, pursuant to the authority vested in me by KRS 281.730 and 49 CFR 390.23, I hereby declare:

That a state of emergency exists requiring relief from the hours of service imposed upon the transporters of ---------- ----------. [Identify the same product(s) as in the SUBJECT above]

That a commercial motor vehicle and its operator transporting ---------- shall be exempt from the hours of service imposed under 49 CFR 395, 601 KAR 1:005 and KRS 281.730 during the period of this emergency.

That all other safety requirements shall remain in full force and effect.

This declaration of emergency shall remain in effect until 12:01 AM EST [normally set to expire at midnight], [insert date], unless extended.

That any driver operating under authority of this Declaration of Emergency should have a copy of this Declaration in the cab of the vehicle.

_____
XXXXXXXX XXXX, Secretary
Transportation Cabinet
Done this ---- day of -------, 20-- at Frankfort, Kentucky.

Approved as to Form and Legality:

_____
Office of General Counsel and Legislative Affairs

Attachment 7:

February 5th, 2014 Declaration of Emergency

U.S. Department of Transportation
Federal Motor Carrier Safety Administration

Southern Service Center
1800 Century Blvd. – Suite 1700
Atlanta, GA 30345

FEBRUARY 5, 2014

EMERGENCY DECLARATION 49 CFR § 390.23
&
EXTENSION OF STATE DECLARATIONS NOTICE 49 CFR § 390.25

Pursuant to Title 49 CFR §§ 390.23 and 390.25, I, Darrell L. Ruban, Field Administrator of the Federal Motor Carrier Safety Administration, declare an emergency exists that warrants issuance and extension of the State Regional Emergency Declarations continuing the exemptions granted in accordance with §§ 390.23 and 390.25 from Part 390 through 399 of the Federal Regulations (Federal Motor Carrier Safety Regulations), except as otherwise restricted by this declaration. The emergency declarations were in response to the extreme cold experienced throughout the Southern states from the polar vortex and the possible continuing effects of the arctic cold on people and property, including an immediate threat to human life or public welfare in the Southern United States.

The emergency exemption is issued as a result of extreme arctic cold weather conditions causing shortages and interruptions in the availability and/or delivery of propane and other home heating fuels throughout the States affected in the Southern Region to include the following: Kentucky, North Carolina, South Carolina, Georgia, Tennessee, Arkansas, Alabama, Mississippi, Louisiana, Oklahoma and Florida.

This declaration provides for the regulatory relief for commercial motor vehicle operations while providing direct assistance supporting the delivery of propane and home heating fuels into the affected areas and consumers in the above mentioned states during the emergency. Direct assistance terminates when a driver or commercial motor vehicle is used in interstate commerce to transport cargo or provide services not directly supporting the emergency relief effort.

Nothing contained in this declaration shall be construed as an exemption from the controlled substances and alcohol use and testing requirements (49 CFR Part 382), the commercial driver's license requirements (49 CFR Part 383), the financial responsibility (insurance) requirements (49 CFR Part 387), applicable size and weight requirements, or any other portion of the regulations not specifically authorized pursuant 49 CFR §390.23.

Emergency Declaration Restrictions & Limitations

By execution of this Emergency Declaration Extension, motor carriers and drivers providing direct assistance to the propane and home heating fuel emergency within the identified states are **not granted** emergency relief from and must comply with the following Federal Motor Carrier Safety Regulations (FMCSR) and conditions:

1. 49 CFR Part 392 related to the operation of a commercial motor vehicle in accordance with state laws and regulations, including compliance with applicable speed limits.
2. 49 CFR Part 392 related to operation of a commercial motor vehicle while a driver's ability or alertness is so impaired, or so like to become impaired, through fatigue, illness, or any other cause, as to make it unsafe for him/her to begin or continue to operate the commercial motor vehicle.
3. 49 CFR Part 395 related to the preparation, retention and accuracy of a driver's record of duty status (RODS). Drivers are directed to note "Emergency Declaration" in the remarks section of the RODS to identify that their operation is in direct assistance to the emergency relief.

4. A motor carrier whose driver is involved in a crash while operating under this emergency declaration must report any recordable crash within 24-hours, by phone or in writing, to the FMCSA Division Office where the motor carrier is domiciled. The carrier must report – date, time, location, driver and vehicle identification and brief description of the crash.

5. Motor carriers or drivers currently subject to an out-of-service order are **not eligible** for the relief granted by this declaration until they have met the applicable conditions for its rescission and the order has been rescinded by FMCSA.

6. Drivers for motor carriers operating under this declaration must have a copy of the declaration in their possession.

7. Upon termination of direct assistance to the emergency relief effort, the motor carrier and driver is subject to the requirements of 49 CFR Parts 390 through 399, except that a driver may return empty to the motor carrier's terminal or the driver's normal work reporting location under the terms of the declaration. Direct assistance terminates when a driver or commercial motor vehicle is used in interstate commerce to transport cargo not in direct furtherance of the emergency relief efforts. Upon return to the terminal or other location, the driver must be relieved of all duty and responsibilities.

8. Upon termination of direct assistance to the emergency relief effort, no motor carrier shall require or permit any driver used by it to drive, nor shall any such driver drive in interstate commerce until the driver has met the requirements of §395.3(a) and (c), and § 395.5(a).

In accordance with Title 49 CFR § 390.25, this declaration is effective today and shall remain in effect for the duration of the emergency (*as defined in Title 49 CFR § 390.5*) or until 11:59 P.M., CST, March 1, 2014 whichever is less.

Sincerely,

Darrell L. Ruban
Field Administrator

APPENDIX H:

Petroleum Shortage Annex

Kentucky Petroleum Shortage Annex

State Energy Office/Energy and Environment Cabinet
August 2022

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1.0 Introduction and Background

1.1 Purpose

The Kentucky Petroleum Shortage Annex (PSA) is a supplement to the Kentucky Energy Security Plan. The purpose of the PSA is to bring about the rapid recovery of the supply of petroleum fuels during disasters and shortages. The Energy and Environment Cabinet's State Energy Office (SEO-EEC) monitors energy supplies and is responsible for the assessment, and relaying the estimation of the duration and severity of potential energy disruptions. The SEO-EEC validates its assessment through discussions with energy suppliers and in conjunction with the Kentucky Emergency Management Agency (KYEM) and other Emergency Support Function 12 (ESF-12) agencies. The PSA will describe the status of the petroleum infrastructure in the state, outline agency structure and communication networks in place among state, federal, local, and private sector entities, and provide detailed contingency measures for addressing a petroleum shortage and implementation strategies for dealing with energy disruptions in Kentucky. This information will enhance energy emergency planner's response strategies by addressing security challenges and help ensure greater energy systems and communication resiliency during and after an event.

1.2 Annex Assumptions

Planning is imperative for the state in preparation for any anticipated petroleum supply disruption, as well as, to prepare how to mitigate the potential effects of an extended shortage of that petroleum supply. Many events in Kentucky have the potential to cause petroleum shortages, such as, natural disasters, especially large storms that impact the Gulf Coast of the United States. Earthquakes such as one associated with the New Madrid fault, technological failures, major flooding, cyber-attacks or panic buying, may all contribute to such shortages.

Severe power outages may cause immediate fuel shortages due to lack of access such as lacking power to pump fuel. It is not documented how many retail facilities have backup power capabilities and to what extent. But this is an issue that the SEO-EEC is actively addressing.

The PSA encourages the development of emergency plans and strategies for all state, local, and tribal organizations with emergency authorities. This is especially true for those with responsibilities for saving of lives, protecting the public health and safety, and the restoration of critical services. These plans are critical relative to the response to energy emergencies such as a prolonged petroleum shortage. This annex will follow procedures in the Energy Security Plan and Incident Command System for petroleum disruptions.

1.2.1 ESF Primary State Agencies

Designated ESF primary state agencies in Kentucky should have emergency response plans identifying all mission critical functions for its sector of responsibility. This includes a general understanding of the amount of fuel needed to perform identified missions.

1.2.2 County Emergency Management Agencies

County emergency management agencies have emergency response plans identifying mission critical functions for the county and a general approximation of the fuel needed to perform identified missions. This includes the cities, special districts, and regional governments within county borders. County plans should have a fuel annex or section in their plans that identifies:

-Priority tier 1 roads the county will restore to support fuel deliveries and other disaster - relief commodities.

-Fuel Points of Distribution (FPOD) to receive emergency bulk fuel supplies.

-Methods to deliver the fuel from the designated FPODs to critical facilities and to the emergency responders in the field.

2.0 Kentucky Petroleum Infrastructure and Supply Chain

According to EIA, Kentucky accounts for less than 0.1% of U.S. proved crude oil reserves and production. Half the state's counties have producing oil wells, and the highest producing areas are located in eastern and western Kentucky. Although Kentucky's oil production increased in 2019 for the first time in four years, rising to 2.5 million barrels, the state's annual oil production has been less than 3 million barrels for the past two decades. Production declined in 2020 in response to lower oil prices and less petroleum demand during the COVID-19 pandemic.

Kentucky has one operating oil refinery that processes crude oil. The refinery, located in the city of Catlettsburg in northeastern Kentucky, is the 14th largest U.S. refinery and can process 291,000 barrels of crude oil per calendar day to make motor gasoline, distillates, asphalt, heavy fuel oil, and propane. It accounts for about 1.6% of U.S. refining capacity. A smaller refinery located in the city of Somerset in southeastern Kentucky, which processed about 5,500 barrels of crude oil per calendar day, closed in 2020 for economic reasons. Currently, the site is engaged in soybean oil processing and serves as a regional fuel terminal. In 2021, this site added capacity to produce biodiesel and biofuel blending operations.

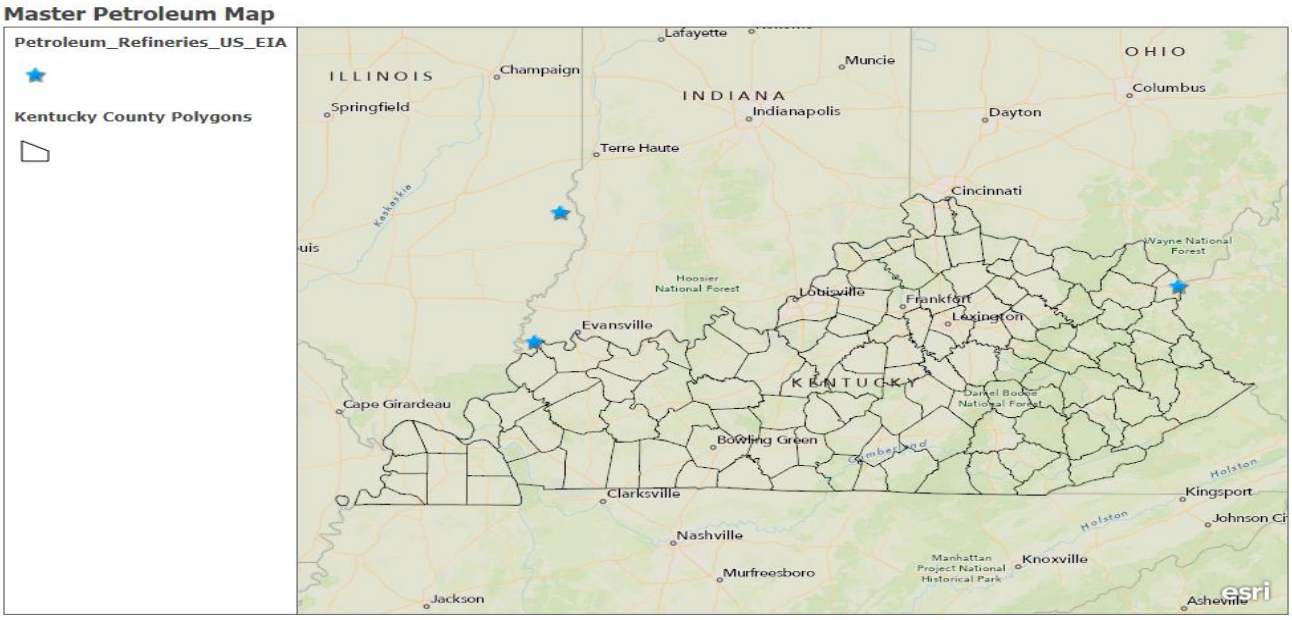


Figure 1: Kentucky Refineries Map

Additional refined petroleum products arrive in the state via interstate pipelines and by river barges at Kentucky ports along the Ohio River. As of 2018, Kentucky had ~601 miles of crude oil pipelines and ~275 miles of refined product pipelines. As of 2022, Kentucky hosts ~22 active fuel terminal locations.

Petroleum Product Pipelines

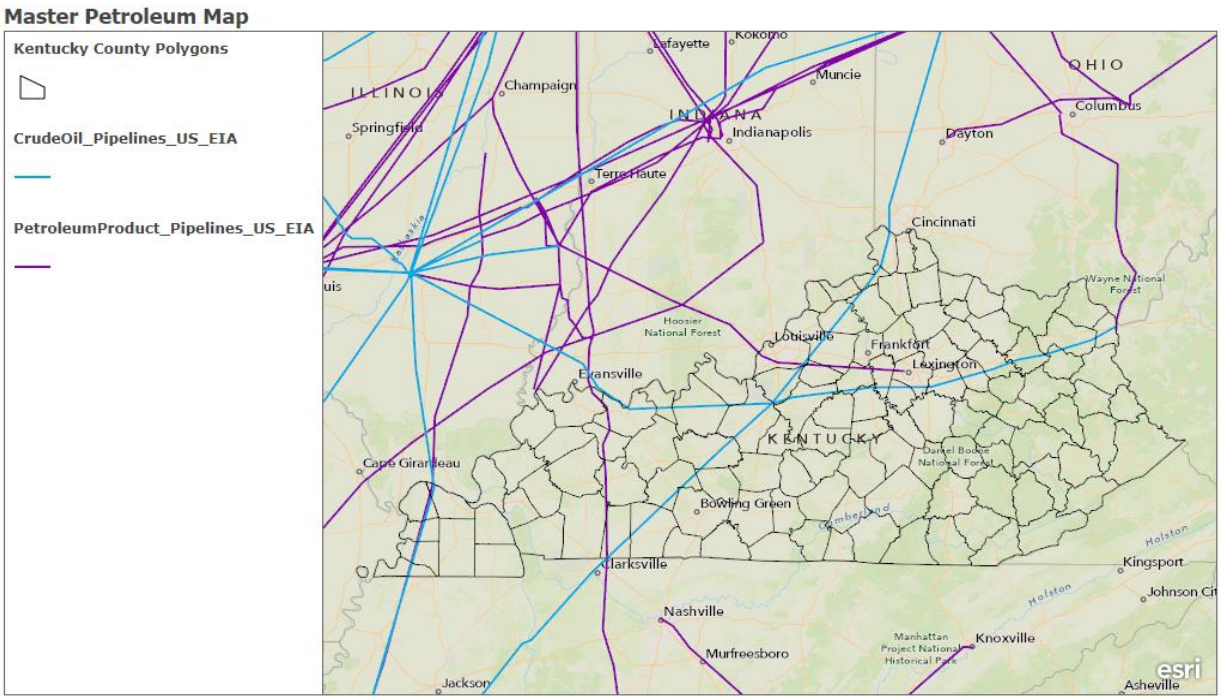


Figure 2: Petroleum Product Pipeline Map

Petroleum Terminals

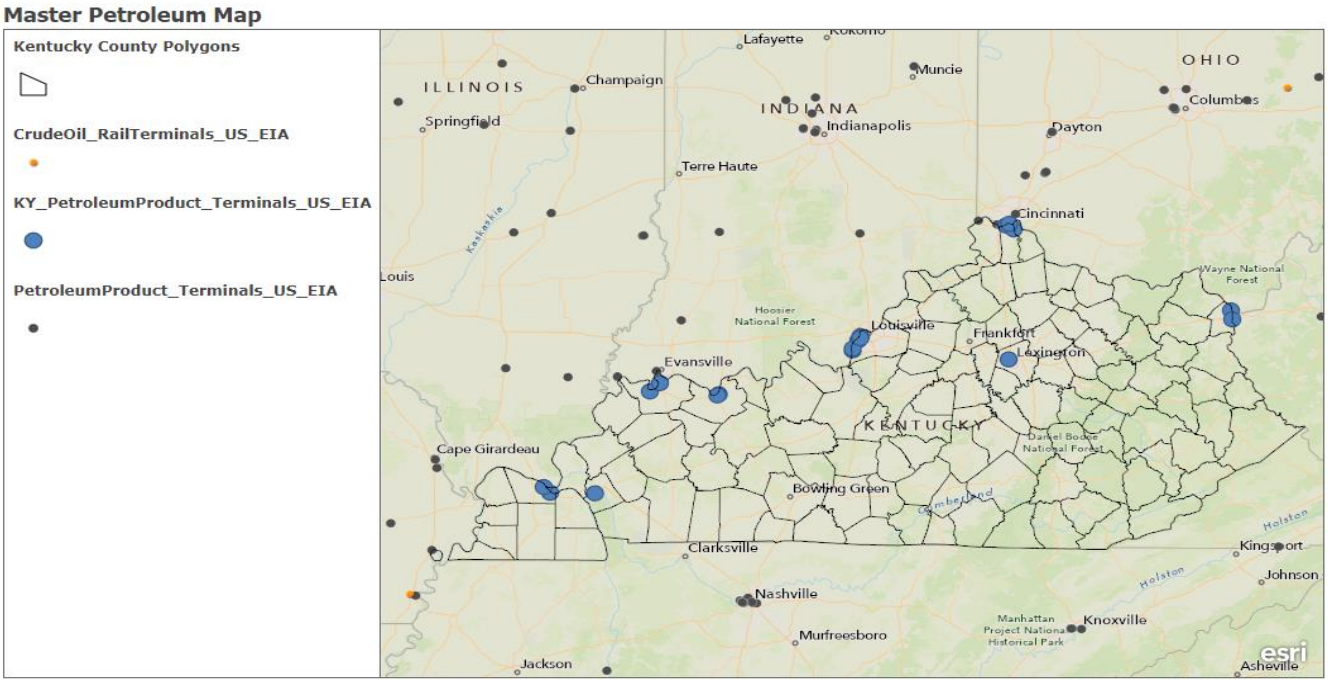


Figure 3: Petroleum Terminal Map

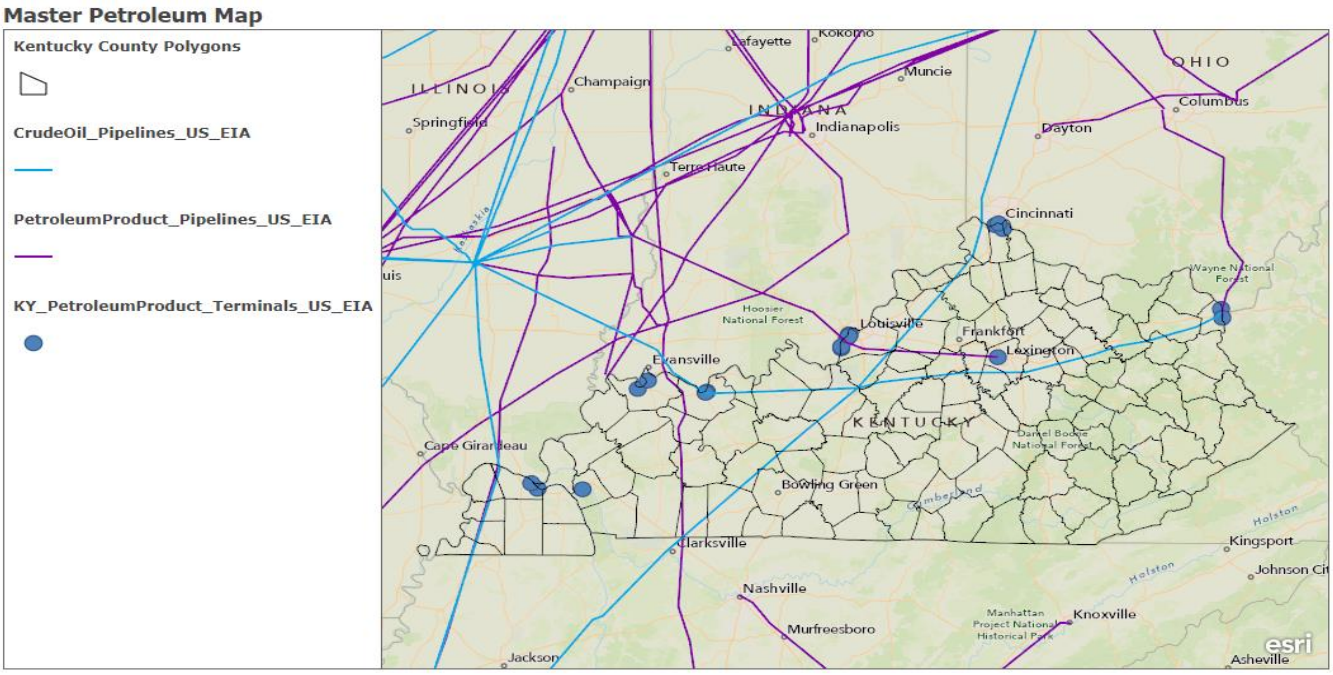


Figure 4: Petroleum Product Pipeline that can access terminals and ones it supplies

The transportation sector accounts for three out of every four barrels of petroleum consumed in Kentucky, and motor gasoline accounts for about two-fifths the state's total petroleum use. Conventional motor gasoline can be sold statewide, except for all or part of three counties around Louisville that allow only reformulated gasoline blended with ethanol to reduce air pollution. In July 2018, the state withdrew three of its counties that make up the southern suburbs of Cincinnati from the federal reformulated gasoline program. The industrial sector accounts for about one-fifth of the petroleum consumed in Kentucky. The remaining small amount of petroleum used in the

state is split almost equally between the commercial sector and the residential sector, where about 7 out of 100 Kentucky households heat with propane, fuel oil, or kerosene.

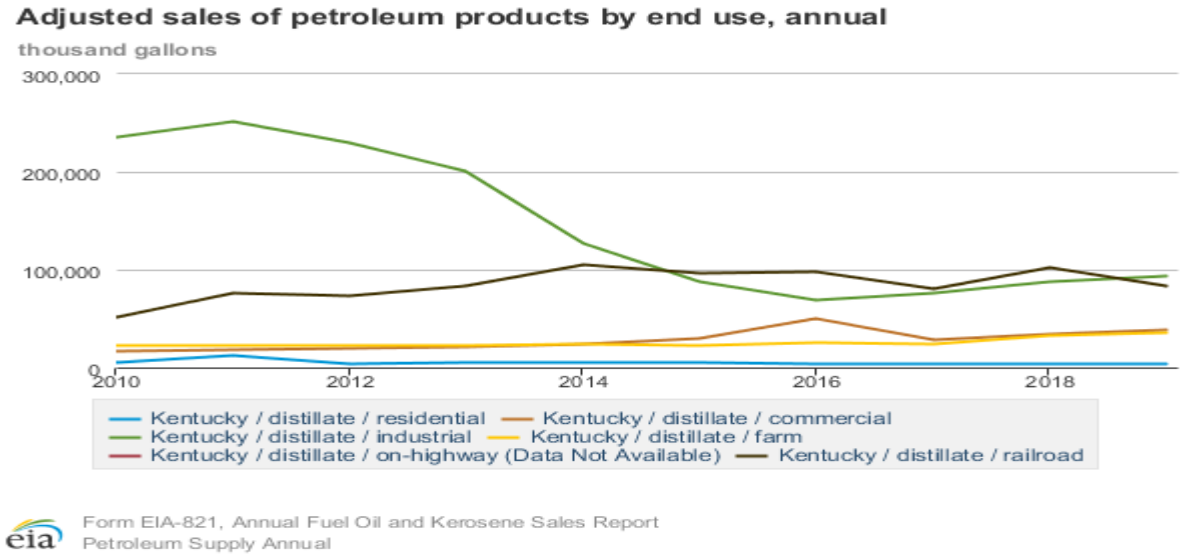


Figure 5: Adjusted Petroleum Sales

The Kentucky Energy Profile provides greater detail related to Kentucky's Petroleum Infrastructure.

2.1 Petroleum Fuels and Supporting Infrastructure

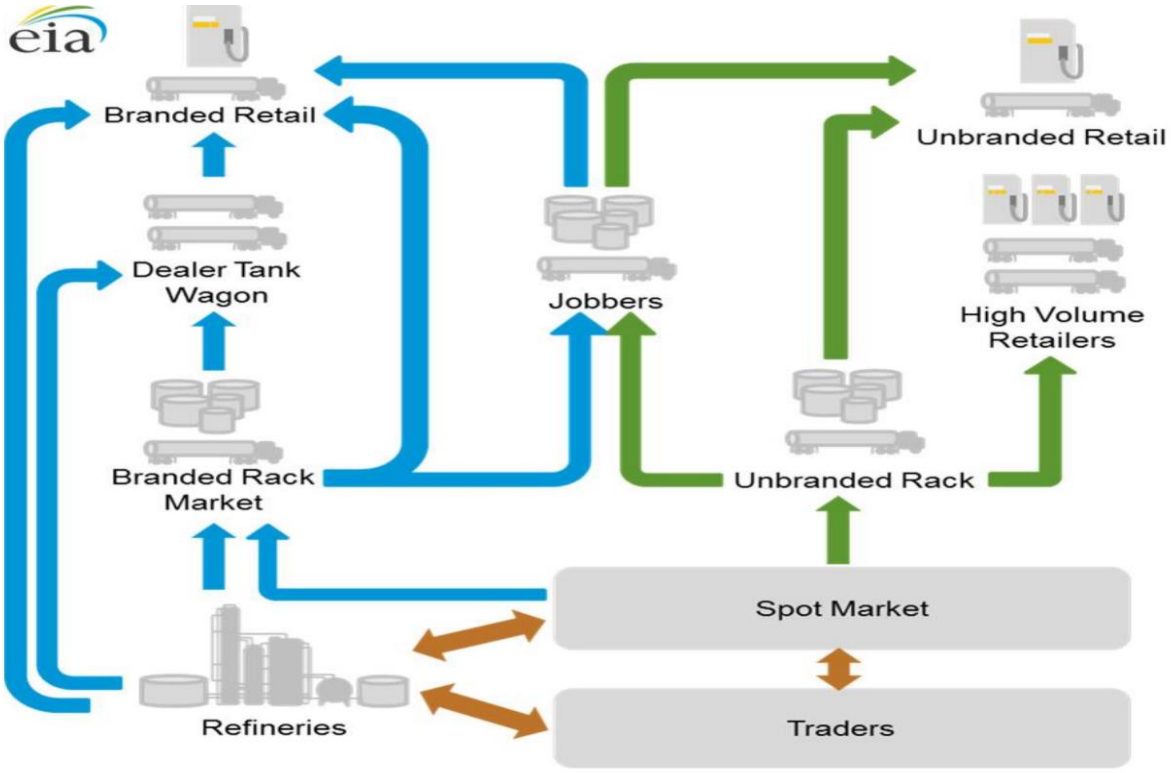
2.1.1 Conventional Gasoline

U.S. petroleum refineries make gasoline and other petroleum products from crude oil and other liquids that are produced in the United States or imported from other countries. Nearly all of the gasoline sold in the United States is produced in the United States.

Most gasoline moves from refineries through pipelines to large storage terminals near consuming areas. Gasoline and other petroleum products are sent through shared pipelines in batches. These batches are not physically separated in pipelines and some mixing, or commingling, of products occurs. Because of this mixing, the gasoline and other products must be tested as they leave pipelines to see if they meet required specifications. If the products fail to meet local, state, or federal specifications, they are sent back to a refinery for additional processing.

From large storage terminals, gasoline is usually sent by truck to smaller blending terminals for processing into finished motor gasoline. This is usually where fuel ethanol is blended into gasoline. Tanker trucks deliver the finished motor gasoline from blending terminals to fueling stations.

The gasoline a company sells in its branded fueling stations is not necessarily produced by that company. Kentucky has over 2,000 operating retail gasoline businesses.



Source: U.S. Energy Information Administration, *California Strategic Reserve Study: Consultant Report*, 2002.[31]

Figure 6: Supply Chain

Spot market refers to sizeable volumes (typically parcels of at least 1 million gallons [approximately 25,000 barrels]) that are sold at the refinery gate and delivered into a specified pipeline or storage facility, as agreed upon by the buyer and the seller. Prices in the spot market move with perceived changes in supply and demand. Prices in these markets reflect regional supply/demand balances, as well as the cost to move product between the markets and product quality differences

Rack market refers to wholesale buyers, such as independent retailers or distributors that operate their own trucks, purchase product delivered into a tank truck at a truck loading rack located at a storage and distribution terminal or refinery. Rack market participants can be distributors that buy branded products that must be sold at a retail outlet under the name of a major oil company; alternatively, the rack market participants can be unbranded suppliers who buy the lowest cost products at a local truck rack for resale to independent, unbranded service stations or for use by commercial/industrial consumers. Branded and unbranded rack pricing varies, and many branded suppliers also post unbranded rack prices. Unbranded product is generally cheaper than branded product; however, these buyers do not get major brand additive packages, and do not have their supply protected when supply is short. During shortages, unbranded buyers may be required to pay above the branded price, and/or be cut off by the branded supplier.

Dealer tank wagon (DTW) markets are where branded retail outlets (dealers) purchase branded gasoline that is delivered by tank truck (tank wagon) to their retail outlets. The price of the gasoline reflects the cost of the product and the cost of delivery.

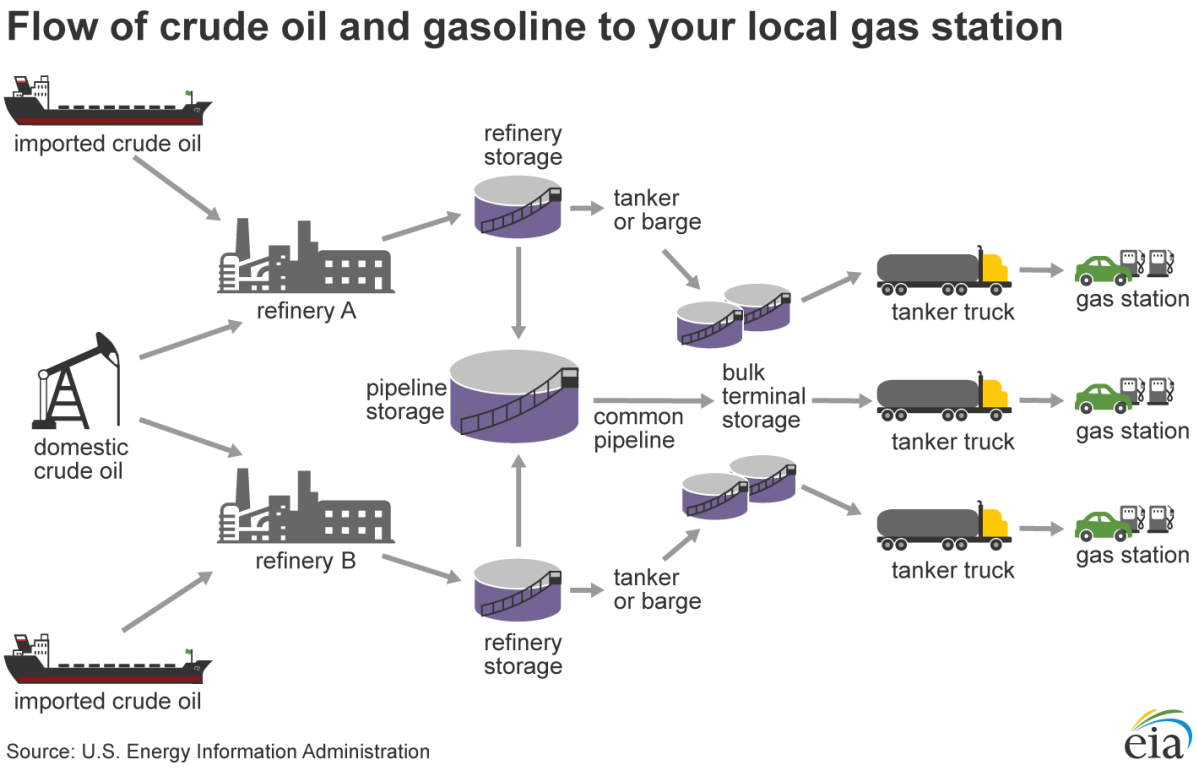


Figure: 7 Petroleum Supply Chain

Petroleum Suppliers

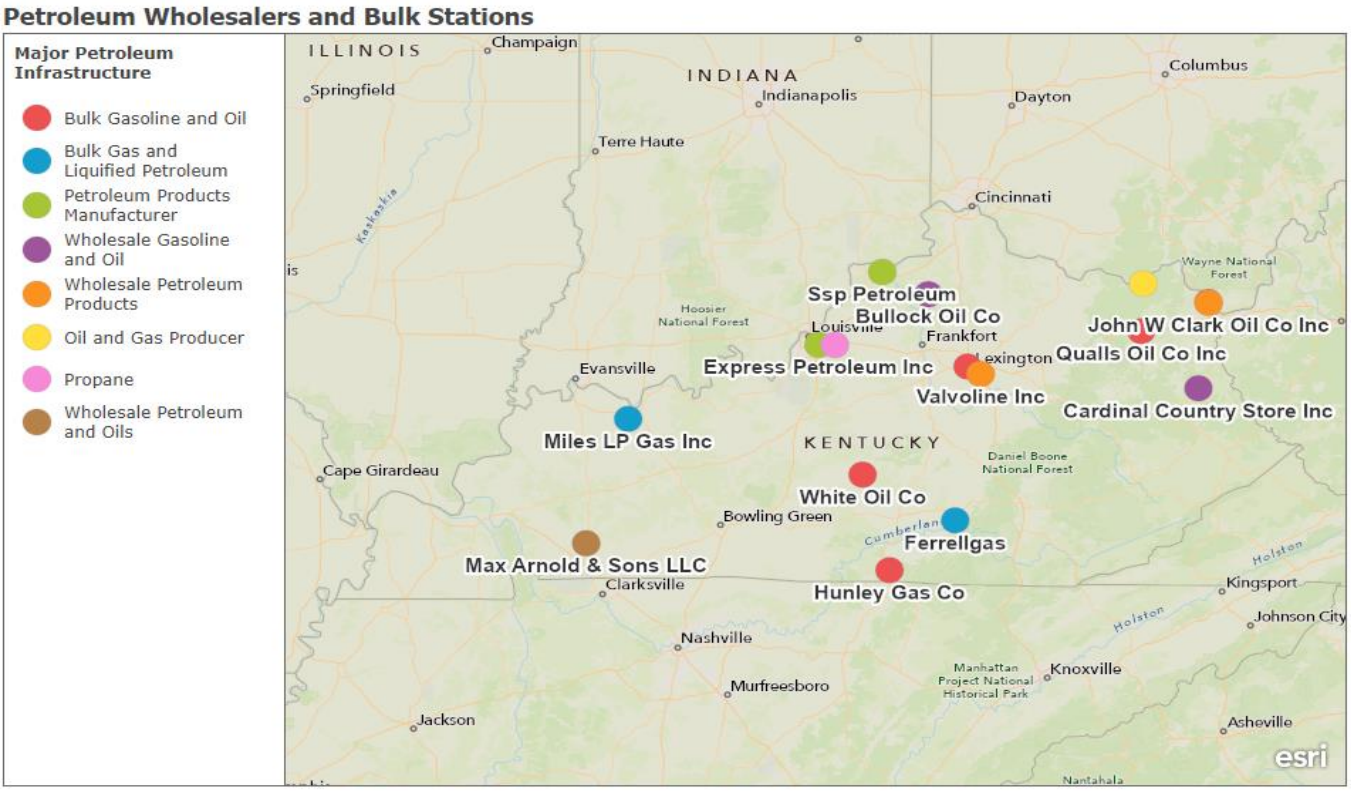


Figure 8: Wholesalers and Bulk Stations Map

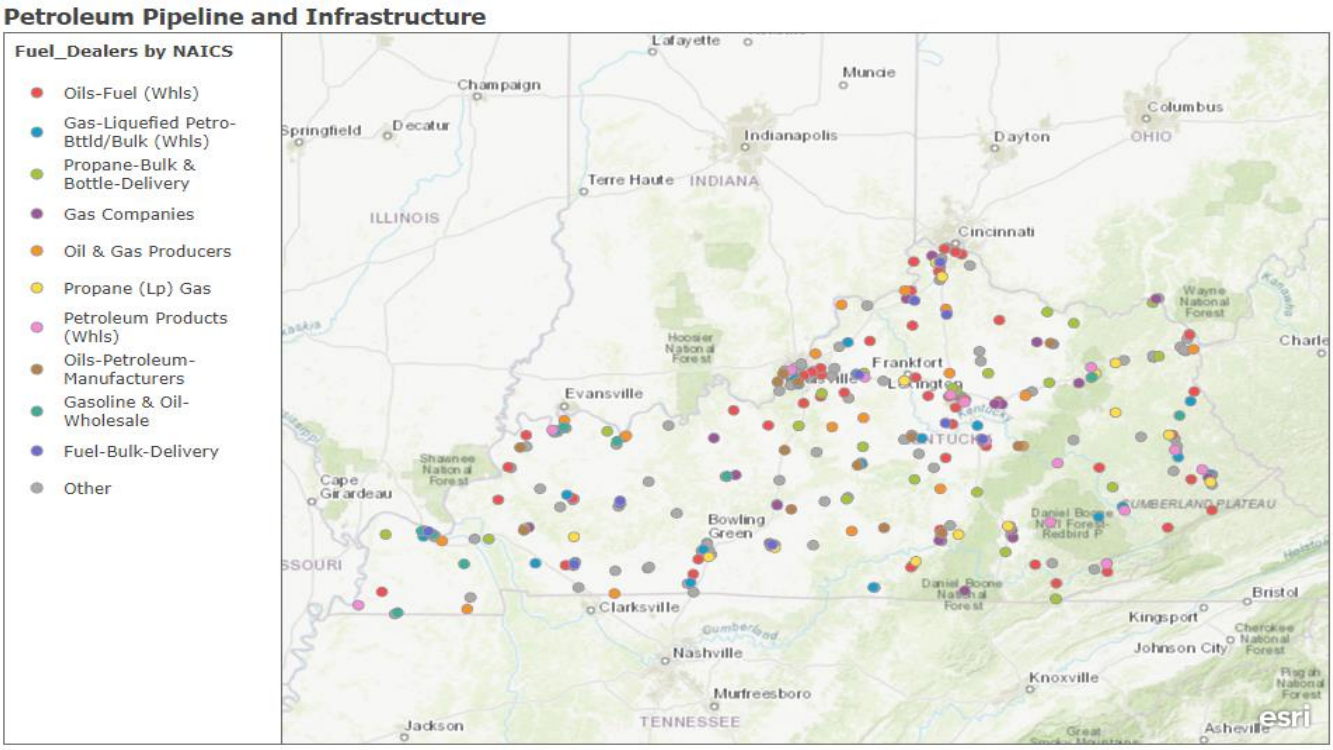


Figure 9: Fuel Dealers by NAICS

The retail market is the market where gasoline is sold to the end consumer at the pump at a gas station or other retail outlet. Retailers typically set prices by comparison to prices at other retail outlets. However, high-volume retailers (HVRs), such as large chain stores, or big box stores, which are focused on selling large volumes of gasoline at low margins, tend to price gasoline based on cost plus the desired margin, rather than based on prices at other retail outlets.

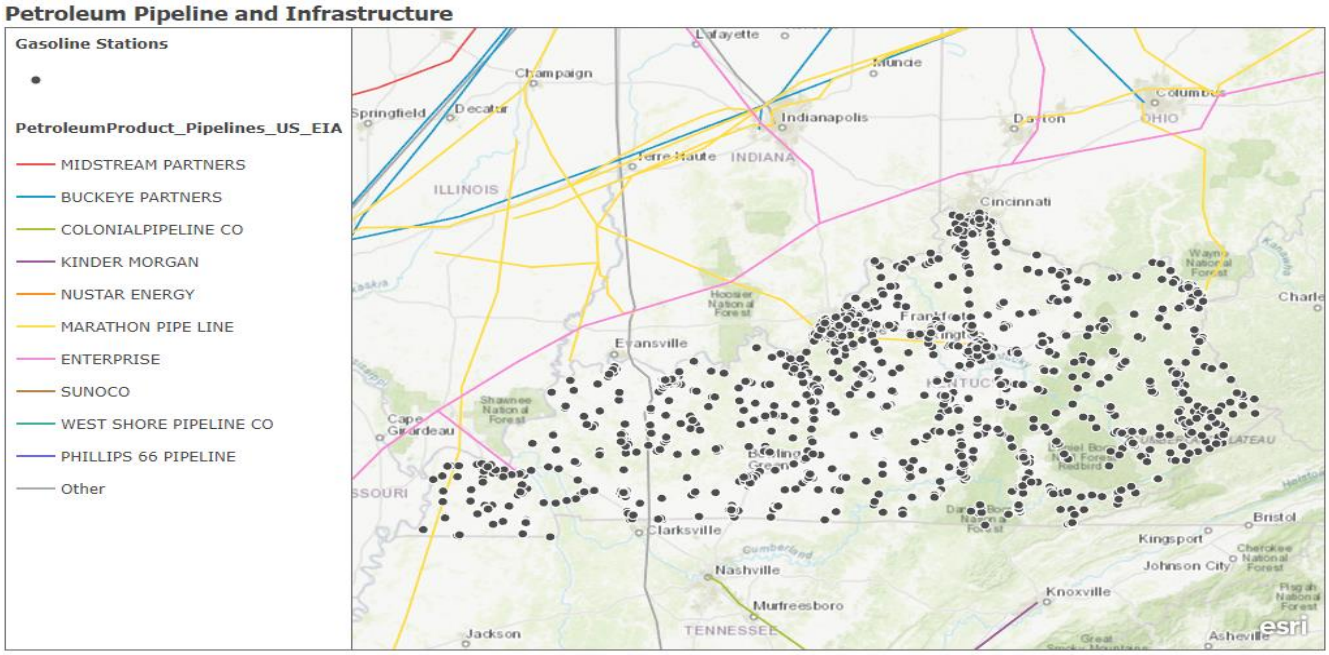


Figure 10: Gas Station locations

See ESP Appendix C attachment 3 for the Master Petroleum Infrastructure contacts and location.

Alternative Fuel Locations

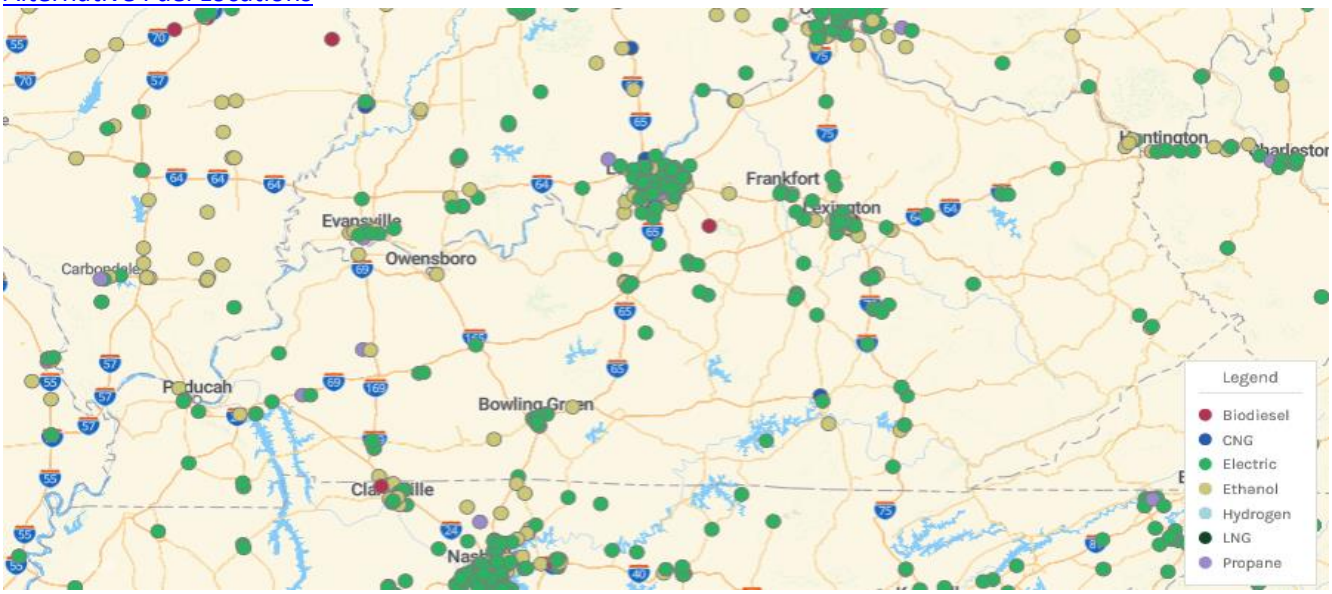


Figure 11: Alternative Fuel Locations

See ESP Appendix C attachment a for the Alternative Fuel Locations list.

2.1.2 Reformulated Gasoline

The U.S. Environmental Protection Agency (U.S. EPA) requires the sale of reformulated gasoline (RFG) in select urban areas in order to reduce smog-forming emissions. RFG is finished motor gasoline that meets the composition and properties for RFG under the Clean Air Act, including standards for benzene content and oxygen content. RFG must be blended with an additive to raise its oxygen content, a characteristic that reduces the emissions of ozone-forming volatile organic compounds during vehicle operation. The most common oxygenate additive is ethanol. Finished RFG is produced by refineries and blenders only when ethanol is added to gasoline; however, ethanol is not normally shipped with gasoline in pipelines due to both the corrosive nature of ethanol and its chemical affinity for entrained water. As a result, refineries produce and ship an unfinished blendstock product—reformulated blendstock for gasoline blending (RBOB)—to distribution terminals in end-user markets. At the terminals, ethanol is blended with RBOB during the loading of tanker trucks, either in out-loading pipelines as they move to the trucks (inline blending) or in the truck itself (splash blending).

As mentioned, only one area in Kentucky utilizes reformulated gasoline and that is the Louisville area. In urban areas that are not required to use RFG, U.S. EPA regulates the volatility of conventional gasoline during the summer ozone season. Gasoline volatility is commonly measured by RVP, which is measured in pounds per square inch (psi) when ambient temperature is 100°F. A higher RVP indicates higher evaporative characteristics of the gasoline blendstock. Depending upon the state and month, U.S. EPA limits gasoline RVP to 9.0 psi or 7.8 psi, and provides a 1.0-psi RVP allowance for conventional gasoline that is blended with ethanol at 9% to 10% by volume. A 9.0-psi RVP limit is in place for all states in PADDs 2 and 4, although several metropolitan areas observe stricter limits during the summer months. A 7.8-psi RVP limit is observed in the metropolitan areas

surrounding Memphis and Nashville, Tennessee; Cincinnati, Ohio; and the Indiana portion of the Louisville, Kentucky, metropolitan area in PADD 2, and the Denver, Colorado, and Salt Lake City, Utah, metropolitan areas in PADD 4; while a 7.0-psi RVP limit is observed in the Detroit, Michigan, metropolitan area and the Missouri portion of the Kansas City, Missouri, metropolitan area in PADD 2.

In addition to limiting evaporative emissions, low-RVP gasoline is important for avoiding engine vapor lock in hot climates. Refineries produce low-RVP gasoline by including less butane (a lighter, more volatile hydrocarbon component of gasoline) in conventional gasoline blends. During the winter months, conventional gasoline RVP is allowed to be as high as 15.0 psi in some areas. Refineries typically switch production from winter-grade to summer-grade gasoline in the spring, and switch from summer-grade to winter-grade gasoline in the early fall. The inclusion of butane in gasoline in the winter increases gasoline refinery yields by as much as 4–5%.

2.1.3 Distillate Fuel Oil

Distillate fuel oil is Kentucky's second largest consumed petroleum product. Distillate fuel oil is a general classification for one of the petroleum fractions produced in conventional distillation operations. It includes diesel fuels and fuel oils. Products known as No. 1, No. 2, and No. 4 diesel fuel are used in highway diesel engines, such as those in trucks and automobiles, as well as off-highway engines, such as those in railroad locomotives and agricultural machinery. Products known as No. 1, No. 2, and No. 4 fuel oils are used primarily for space heating and electric power generation.

Heating oil accounts for 0.7% of Kentucky household heating. Only 0.1% of Kentucky net electricity generation is attributable to petroleum products but it does serve as a secondary fuel for some generation capacity when the primary fuel is unavailable or uneconomical.

2.1.4 Jet Fuel

Kentucky's third largest petroleum product consumed is jet fuel. With three major airport hubs, aviation logistics hubs, and military operations at Ft. Knox, Ft. Campbell, and the Kentucky National Guard, jet fuel is a critical fuel for national security. In general, jet fuel is a refined petroleum product used in jet aircraft engines. It includes kerosene-type jet fuel and naphtha-type jet fuel.

2.1.5 Ethanol

Ethanol, which is used as an oxygenate, is blended with either reformulated or conventional gasoline blendstocks (RBOB or CBOB) to produce finished motor gasoline. Ethanol can also be blended with finished gasoline that is not specifically designed for oxygenate blending. According to the U.S. Department of Energy's Alternative Fuels Data Center (AFDC), approximately 97% of the gasoline sold in the United States contains some amount of ethanol. The most common blend is E10 (10% ethanol and 90% gasoline blendstock). Higher ethanol blends include E15, which contains between 10.5% and 15% ethanol, and E85 (also known as "flex fuel"), which contains between 51% and 83% ethanol. The U.S. EPA has approved the use of E15 in light-duty conventional vehicles of model year 2001 and newer; however, the fuel is not widely distributed. Both E15 and E85 sales are largely concentrated in PADD 2.

Kentucky hosts two ethanol productions facilities. Parallel Products, Inc. near Louisville, KY and Commonwealth Agri-Energy in western Kentucky.

2.1.6 Biodiesel

Biodiesel is typically blended with conventional diesel at concentrations of 2% (B2), 5% (B5), or 20% (B20). Like ethanol, biodiesel production plants and capacity are heavily concentrated in PADD 2. In Kentucky, two biodiesel production plants are currently operating: Owensboro Grain and Darling Ingredients Inc. However, Continental Refining is slated to begin biodiesel production.

2.2 Interconnectivity cross geographic regions

Kentucky is considered to be part of PADD 2. The Petroleum Administration for Defense Districts (PADDs) are geographic aggregations of the 50 States and the District of Columbia into five districts: PADD 1 is the East Coast, PADD 2 the Midwest, PADD 3 the Gulf Coast, PADD 4 the Rocky Mountain Region, and PADD 5 the West Coast.

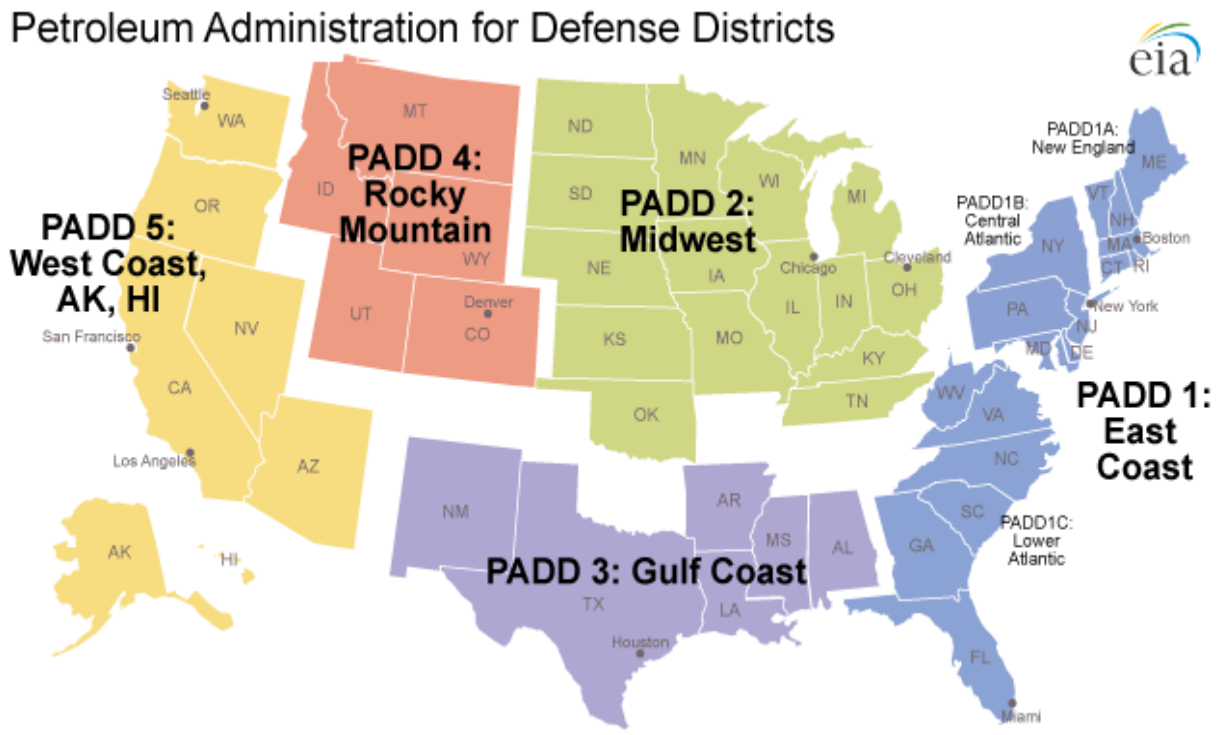


Figure 12: PADD

Kentucky does not operate on an island and is interconnected across several geographic regions, illustrated below. What happens in one region directly and indirectly affects the other regions.

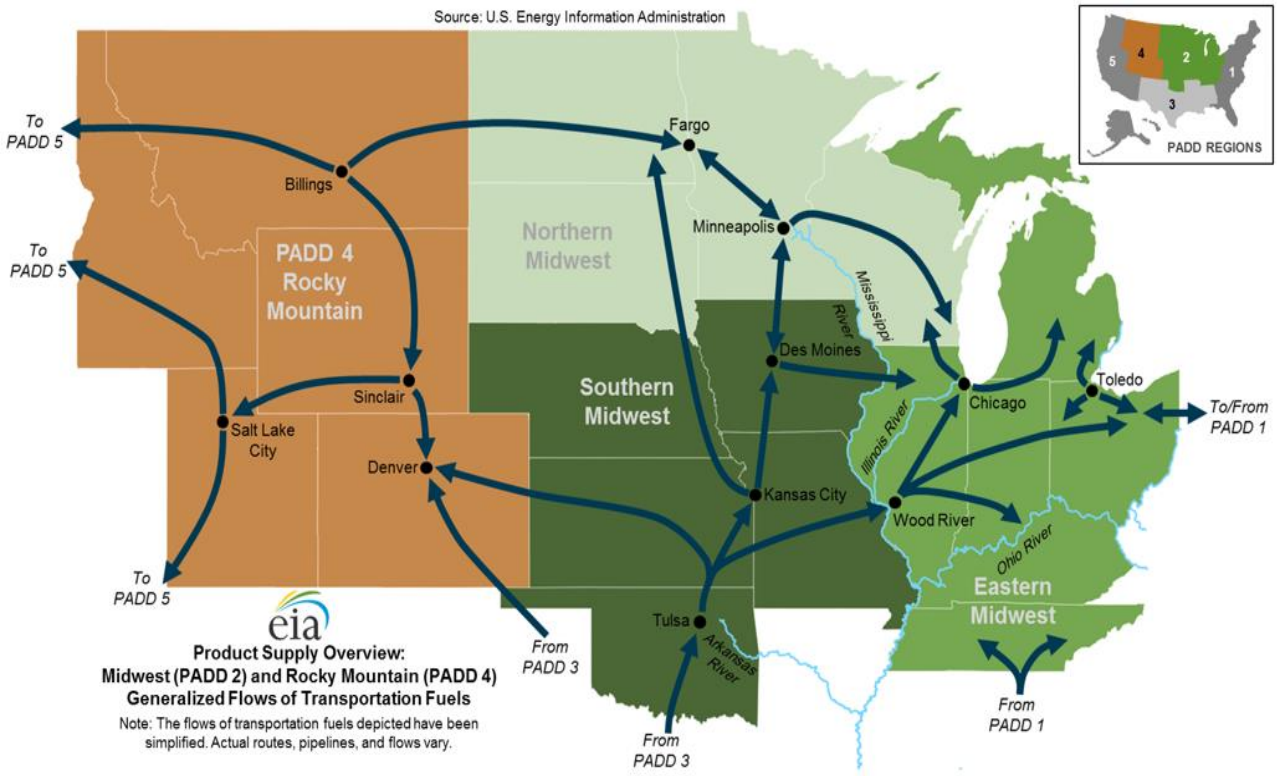


Figure 13: PADD

More specifically, the petroleum infrastructure spans across the geographies. Note: the graphic below, Continental Refining in Kentucky has shifted operations to biodiesel and soybean fuels since publication of this graphic by EIA

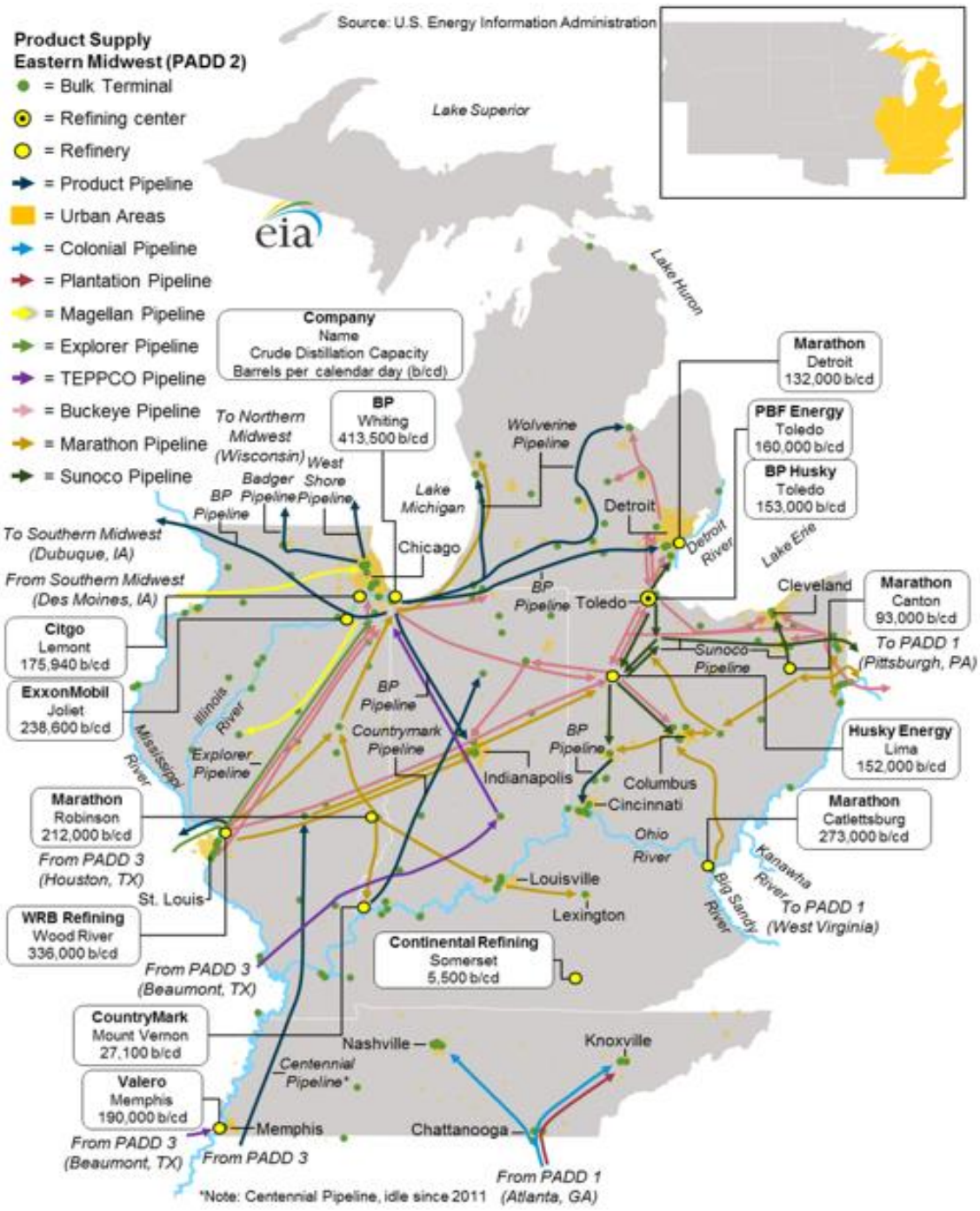


Figure 14: Petroleum Market Flow

2.3 Petroleum Sector Interdependencies

The ability of the Commonwealth to restore the petroleum system to normal is very dependent on the ability to restore critical sectors to normal operational level. This is illustrated below from "A Review of Climate Change Impacts to Oil Sector Critical Services and Suggested Recommendations for Industry Uptake".

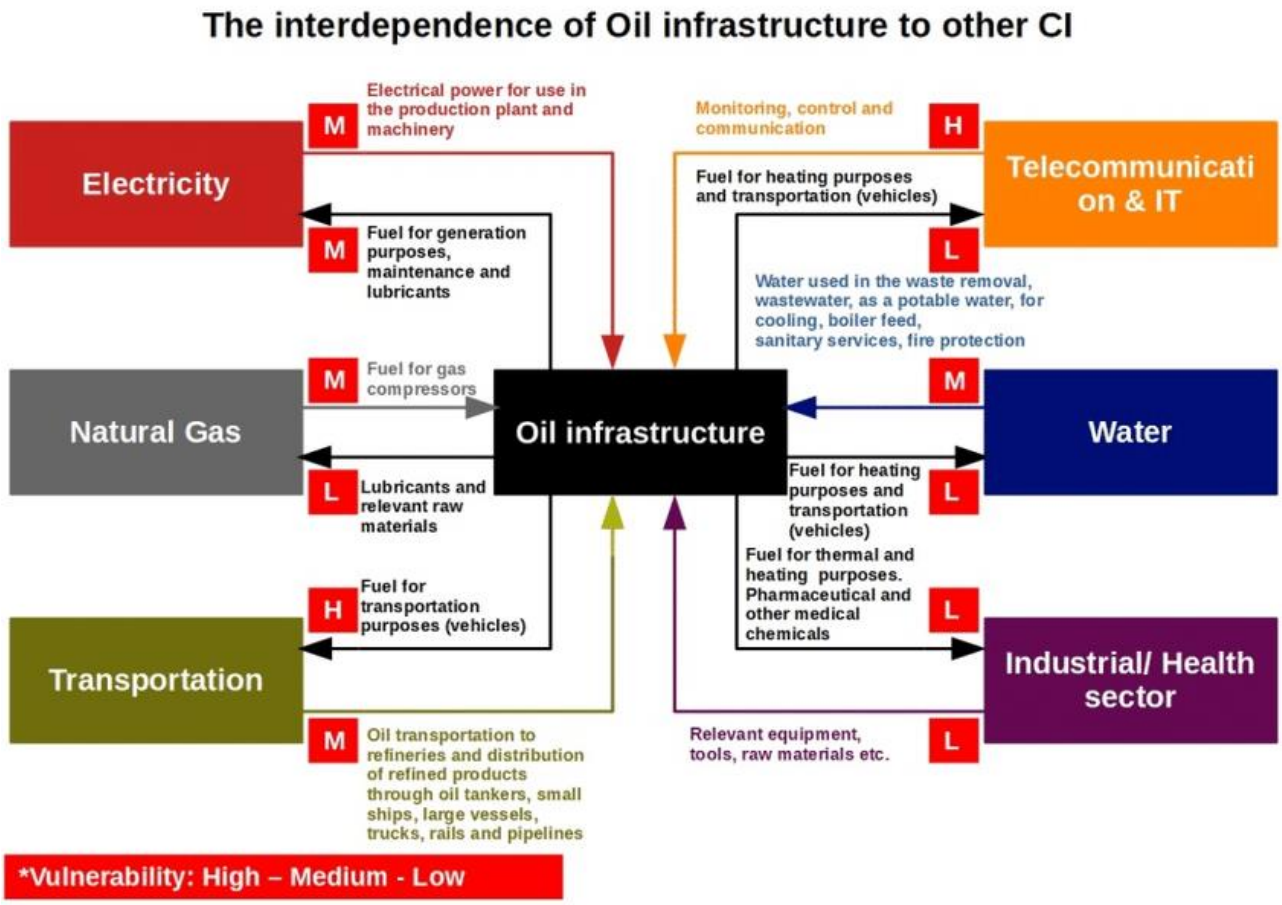


Figure 15: Oil Infrastructure Interdependencies

These sectors of interdependence fall under three major emergency support functions: transportation, communication and energy. Each of these sectors are represented by the Emergency Support Functions below and each ESF is responsible for maintaining situational awareness across the spectrum of their responsibilities:

2.3.1 ESF 1-Transportation

This ESF includes all navigable waterways, highways, roads and bridges which are critical to assuring fuel is able to reach those users considered to be the priority needs.

2.3.2 ESF 2-Communications

This ESF is critical to assure the ability to:

- assess potential or real impacts to the petroleum supply and distribution system,
- share essential information regarding emergency information and instructions related to fuel conservation expectations and needs to the media and general public, necessary

to assure emergency fuel requests and deliveries to emergency and critical agencies across the state,
- assure the connection to the U.S. Department of Energy and petroleum industry to maintain efforts to bring fuel into the state to resupply emergency needs,
- Liaison with telecommunications and internet providers and the Cybersecurity and Infrastructure Security Agency (CISA).

2.3.3 ESF 12-Energy (Electricity)

Electrical power is essential to:

- The need/expectation to complete damage/needs assessment across the Commonwealth
- the transfer of fuel from storage vehicles/facilities to transportation vehicles, to the designated points of distribution and emergency fueling sites for emergency responders and critical users to obtain fuel across the state
- assure operation of pipelines, terminals, and refineries.

2.4 Threats and Vulnerabilities

All energy emergencies are defined as energy imbalances; the supply of energy is temporarily unable to keep pace with the demand. These situations can occur at any time with or without warning. They may be the result of natural events or, at times, artificially induced by human events. Upon becoming an emergency, the energy system can move from the normal balance, to a shortage, to a crisis; or from the normal balance directly to a crisis. These factors may include:

- Natural Disasters (earthquakes, floods, wildfires),
- Severe Weather Occurrences (tornados, snow and ice storms, hurricanes, wind),
- Artificial Pricing (embargos, collusion),
- Human Proceedings (labor disputes, strikes, cyber incidents),
- Government Activities (political instability, environmental regulation), and
- Terrorism (direct physical or cyber).

Any of the factors listed above can solely, or in combination, be responsible for a brief energy disruption or a more prolonged crisis. The difference between general disruption and crisis is one of magnitude and duration. The systems (stakeholders) ability to respond to a disruption can determine the extent of the crisis. Issues that must be considered by the Annex in limiting the scope of or managing an emergency are:

- Intensity or Magnitude
- Cause or causes,
- Geographical Distribution,
- Duration,
- Commodities Effected,
- Time of Year,

- Public Reaction; and,
- System's Ability to Respond and Recover

Due to the significant volumes of transportation fuels that are shipped by barge into, out of, and within the Eastern Midwest along the region's waterways, including the Illinois and Mississippi rivers, the Ohio and Big Sandy rivers, the Tennessee and Cumberland rivers, and the Great Lakes, any disruption that impairs waterway traffic presents significant threat to petroleum supply chain. Markets along the Ohio River corridor—Cincinnati, Louisville, and Lexington—are vulnerable to supply disruptions. This supply chain can be impacted by river flooding, which can make some barge terminals unavailable to load or discharge products. Despite this vulnerability, Ohio River markets have access to alternative supply sources, including Marathon's 92,000 b/d pipeline running from Robinson, Illinois to Louisville and Lexington and a BP pipeline providing supply into the Cincinnati area from Dayton, Ohio. Even so, it can be challenging for Ohio River markets to compensate for unplanned outages at the Catlettsburg refinery or when barge traffic along the Ohio River is disrupted.

Many terminals on the Mississippi and Ohio rivers are also dependent upon ethanol delivered by barge via the Mississippi River. As a result, flooding on the Mississippi River and occasional wintertime freezing on the northern portions of the river can impact ethanol supply and thus finished gasoline supply to these terminals. Severe snow storms can also impact movements of ethanol by rail, truck, and barge.

The energy sector is uniquely critical because all of the other critical infrastructure sectors depend on power and fuel to operate. Unfortunately, this makes the Nation's energy infrastructure an attractive target for cyber-attacks. All energy systems have vulnerabilities to cyber threats, 100% security is not possible. Understanding the current and evolving threat landscape as well as possible consequences of a cyber-physical event can help state officials and energy owners and operators understand risks. Knowledge about risks can then be used to prioritize investments, such as purchases, staff resources, and training, based on the kinds of threats and vulnerabilities that pose the greatest risks to an organization.

Because of the dependence of energy through all areas of society, it is difficult to envision and plan for every possible energy emergency. Each situation may be unique and requires a specialized plan for correction.

The Annex recognizes this potential situational distinctiveness and relies on information, preparation, and cooperation to address each problem specifically. This requires that the Annex be dynamic. Confidence is vested in knowledge of the system through data collection and the working relationships of individuals through a defined structure of operation. See appendix E of the ES Plan for the KY Risk Profile.

2.5 Industry Response and Capabilities

2.5.1 Marathon Petroleum

Based on information from EIA, the following details Marathon Petroleum's infrastructure and capabilities. Marathon Petroleum Corp. operates an extensive network of pipelines that distribute fuel from its Eastern Midwest refineries and support its terminals across the region. Systems operated by Marathon include the Robinson Products system, the Wabash Pipeline system, the Ohio River Pipe Line (ORPL) Products system, and the Louisville Airport Products system. These systems collectively shipped nearly 445,000 b/d of transportation fuels in 2015, according to Federal Energy Regulatory Commission (FERC) filings. In addition, Marathon also operates the Muskegon Pipeline through a business agreement with Buckeye Partners.

The Robinson Products and Wabash Products systems channel supply from the Marathon Robinson refinery and the Wood River supply center to Chicago and Indianapolis, and to marine terminals along the Ohio River. From the Robinson refinery, two segments flow south toward the Ohio River: a 43,000 b/d segment runs south to Marathon's Mount Vernon marine loading terminal and a 92,000 b/d segment ships supply to terminals in the Louisville area, including marine loading terminals. From Louisville, supply also continues to Lexington via a 36,000 b/d segment that Marathon jointly owns with another party. In addition, Marathon operates the 29,000 b/d Louisville Airport Products system, which delivers jet fuel to the Louisville International Airport. Marathon's Robinson Products system also ships products from Robinson to Indianapolis and Muncie via a 51,000 b/d segment, which also delivers liquefied petroleum gas (LPG) and light petroleum-based feedstocks further east to the Lima, Ohio refining hub. A separate 48,000 b/d Marathon line from Wood River ships products to Clermont in the Indianapolis area. The line has a bidirectional connection to the Robinson refinery via breakout tankage in Martinsville, Illinois. Marathon's Wabash Pipeline system, which is part of the company's Robinson Products system, consists of three interconnected segments that move products from the Robinson and Wood River hubs north to terminals in the Chicago metropolitan area. A 99,000 b/d segment from Robinson and a 71,000 b/d segment from Wood River converge at a junction point in Champaign, Illinois where an 85,000 b/d segment extends north, terminating at Marathon's Griffith and Hammond, Indiana terminals in the Chicago area. Between Griffith and Hammond, the Wabash system connects to other Chicago area pipelines and terminals through a portion of the system known as the "Wabash Loop."

Through a business agreement with Buckeye Partners, Marathon operates the Muskegon Pipeline system, which originates at Marathon's Griffith terminal and extends along the eastern coastline of Lake Michigan to North Muskegon, Michigan. In 2015, Muskegon Pipeline shipped approximately 27,000 b/d of transportation fuels, according to FERC filings. The ORPL Products system is a network of one-way and bidirectional pipelines that connect Marathon's Canton and Catlettsburg refineries to terminals in Ohio and western Pennsylvania. The ORPL system shipped approximately 159,000 b/d of transportation fuels in 2015, according to FERC filings. The East Sparta and Heath junctions are key logistical points in the ORPL system. East Sparta serves as breakout tankage for the Canton refinery, receiving transportation fuels from the Canton refinery through two dedicated product pipelines with a combined capacity of 73,000 b/d. From East Sparta, product is shipped east via a 32,000 b/d bidirectional pipeline to Midland, Pennsylvania, which interconnects with

Buckeye's 717 pipeline supplying terminals in the Pittsburgh, Pennsylvania metropolitan area, and west via a 29,000 b/d bidirectional line to the Heath Junction in central Ohio. 58 From Heath, product connects via an 18,000 b/d line to Findlay in northwestern Ohio and via a 24,000 b/d line to Columbus and Dayton in central and southwestern Ohio. Marathon's Catlettsburg refinery in northeastern Kentucky feeds products into the ORPL system from the refinery's breakout tankage in Kenova, West Virginia, which is located just across the Big Sandy River from the refinery. From Kenova, a 68,000 b/d segment known as the Cardinal Pipeline channels supply north to terminals in the Columbus area. This segment shipped nearly 44,000 b/d of transportation fuels in 2015, according to FERC filings. From Columbus, products from Catlettsburg can be shipped either west to Dayton or east to Heath via the Heath-to-Dayton segment, which is bidirectional between Heath and Columbus.

Marathon's multimodal supply and logistics system, which includes the company's refineries, pipelines, and barge loading/unloading terminals on the Ohio River, enables the company to adjust product movements in response to planned or unplanned production or transportation outages. Key swing points in the Marathon system include Louisville, which can receive product by pipeline from the Robinson refinery and can both receive and load out product by barge; Lima, Findlay, and Detroit, which are located in the Lima-Detroit refinery corridor; and the Pittsburgh market, which can be fed from the west from Marathon's Eastern Midwest refineries, or from the east via Buckeye's Laurel Pipeline from East Coast supply centers. The Marathon system can also tap into supplemental supplies from the Gulf Coast via interconnections with the Explorer Pipeline system in Wood River and Chicago, and through its barge fleet bringing fuel up the Mississippi River.

2.5.2 BP Pipelines North America

BP Pipelines North America ships fuel within the Eastern Midwest region, and also supplies fuel into adjacent regions within PADD 2. The largest group of BP pipelines originates at BP's 413,500 b/cd Whiting, Indiana refinery, the largest refinery in PADD 2. Several significant pipelines extend from Whiting: a westward line connects the refinery to Dubuque, Iowa, the origin of Buckeye's Lower V system in the Southern Midwest, and further to Minneapolis, Minnesota; an eastward segment connects Whiting to markets in southern Michigan before terminating at River Rouge in the Detroit area; and a southbound segment moves fuel south to Wilmington, Illinois where an interconnection with the Magellan Pipeline system provides access to the markets in central Illinois. According to FERC filings, approximately 196,000 b/d of transportation fuels originated on BP lines in Whiting, Indiana in 2015, equal to nearly half of the refinery's crude distillation capacity. Of those shipments, approximately 53,000 b/d were delivered into the Detroit market. Other BP lines in the Eastern Midwest include a line extending west from the Wood River hub to an interconnection with Buckeye's Lower V system in Milan, Missouri; and a line extending south from Dayton, Ohio to BP owned terminals in the Cincinnati metropolitan area. In 2015, shipments on the Wood River to the Milan line averaged 24,000 b/d, while shipments on BP's Dayton-to-Cincinnati system averaged 27,000 b/d, with half of this supply originating at pipeline interconnections in Ohio and the other half originating from barge receipts at BP's Bromley, Kentucky terminal.

2.5.3 Other Petroleum Infrastructure

The following represents additional infrastructure in proximity to Kentucky that can impact petroleum consumption and pricing.

The Enterprise TEPPCO pipeline system is a 3,396-mile pipeline system that carries transportation fuels, propane, and diluent from the Gulf Coast (PADD 3) to destination points across the Midwest (PADD 2) and East Coast (PADD 1).

The Colonial and Plantation pipeline systems transport refined products from Gulf Coast refining centers up the Eastern Seaboard to markets as far north as the New York City area. In the Eastern Midwest, the Colonial and Plantation pipeline systems supply products into eastern and central Tennessee via spur pipelines that originate near Atlanta, Georgia in PADD 1.

Other internal pipelines in the Eastern Midwest include systems operated by Phillips 66, Valero Energy Partners, and CountryMark. Valero's Memphis Products system is the primary distribution outlet for transportation fuels produced at Valero's 190,000 b/cd Memphis, Tennessee refinery.

2.5.4 Kentucky Petroleum Marketers Association

The Kentucky Petroleum Marketers Association (KPMA) is a statewide, nonprofit trade association founded in 1926. It is made up of representatives of all segments of the petroleum industry to promote the interest and goodwill of everyone engaged in the marketing and distribution of petroleum products in Kentucky. KPMA works with ESF-12 collaboratively during energy disruption events for real time situational awareness and response.

2.5.5 American Petroleum Institute

The American Petroleum Institute (API) was formed in 1919 as a standards-setting organization and has developed more than 800 standards to enhance operational and environmental safety, efficiency and sustainability. API's Kentucky Chapter works in collaboration with ESF-12 regarding regulatory and policy issues during disruption events.

API has developed an online training portal free of charge for first responders possibly responding to a pipeline emergency, Oil Spill and Emergency Preparedness and Response. The portal provides first responders with access to relevant information about what to expect in a pipeline emergency and how to effectively respond. The portal offers introductory, intermediate and advanced classes on safely responding to a pipeline emergency, managing a pipeline emergency response and providing tactical response guidelines for hazardous materials technicians. The portal also hosts issue-based training on liquefied natural gas incidents, fire incident data and safety layering. Portal courses are free of charge, accessible anywhere and can be started and resumed at any point. Learn more about the vital partnership between industry and first responders to promote effective responses to pipeline incidents here.

API is committed to ensuring that all responders to oil and gas emergencies are prepared and have the information they need should an event occur. All of API guidance regarding oil spill response can be found on www.oilspillprevention.org and it's Response Library, which includes guidance such as API Technical Report 1254, In-situ Burning Guidance for Safety Officers and Safety and

Health professionals, and links to other guidance such as API Recommend Practice 98, Personal Protective Equipment Selection for Oil Spill Responders. API is committed to ensuring that health and safety guidance relevant to emergencies is consolidated and available for those who need it.

In addition to oil spill guidance, API also has created guidance for management of member company onshore emergency response management systems. For more information on this initiative, please visit our website here.

API created the Oil and Natural Gas Industry Preparedness Handbook, with support from members and associations throughout the industry, to illustrate how local responses can be aided by local, State and regional associations, established relationships with governments and communities, and how corporate and federal capabilities can facilitate efficient response and recovery at the local level.

2.5.6 Department of Homeland Security

ESF-12 works with the DHS Cybersecurity and Infrastructure Security Agency (CISA) through their programs including the Regional Resiliency Assessment Program (RRAP) which is a voluntary, cooperative assessment of specific critical infrastructure that identifies a range of security and resilience issues that could have regionally or nationally significant consequences.

The U.S. Department of Homeland Security also has established the Critical Infrastructure Partnership Advisory Council (CIPAC) to facilitate interaction between governmental entities and representatives from the community of critical infrastructure owners and operators. The Energy Sector operates and Oil and Natural Gas Subsector workgroup of the CIPAC.

2.5.7 ESF-10 Hazardous Materials

ESF-12 works collaboratively on petroleum releases with ESF-10, specifically when those releases threaten the overall balance of petroleum supplies. ESF-10 is staffed through the Kentucky Department for Environmental Protection's Environmental Response Team and helps coordinate response, clean-up and recovery when there are petroleum releases into the environment.

3.0 Data and Methods for Monitoring Petroleum Supply and Conservation Measures

3.1 Monitoring Petroleum Supply

Estimating the severity of a petroleum shortage can be challenging. However, it can be estimated by reference to various indicators such as state petroleum demand levels, refinery production, state and regional inventories, supply arrangements, distribution systems, local consumption patterns and wholesale and retail prices, all relative to past supply conditions. A basic understanding of market conditions and changes, along with an understanding of the operation of the petroleum infrastructure, are vital to quantifying the impacts of potential petroleum supply disruptions. This involves tracking time series data where departures from normal ranges can be market signals of the potential for possible supply shortfalls.

One of the most complete sources of public energy data and markets is the U.S. Energy Information Administration (EIA). Not only are supply and price data available on the website, but there is often information about energy markets that can assist in analyzing and quantifying the market data. The SEO-EEC monitors the Energy Situational Awareness Report, a compilation of EIA resources for situational awareness regarding energy resources to update the KY Energy Situation Report, detailing daily energy prices, to the Emergency Response Team (ERT) of the EEC. This covers crude oil, coal, propane, natural gas, gasoline and diesel. The SEO-EEC will contact energy partners if market indicators reflect significant changes in price. The SEO-EEC also utilizes Gasbuddy to explore real time gas prices in specific areas and identify which gas stations are operational during the time of an event.

The SEO-EEC participates in the State Heating Oil and Propane Program (SHOPP), a cooperative data collection effort between the EIA and state energy offices. The SEO collects weekly prices from providers of residential heating oil and propane during the heating season, October through March. Data is used by EIA for statistical purposes only and is confidential by law. Respondent companies participating in the SHOPP weekly survey are provided to the SEO by EIA and represent a state-wide random selection.

When there is a market disruption or supply and price volatility in heating fuel markets, the SHOPP data provides an objective measure of market conditions at the state level to facilitate communication between heating fuel marketers and the government. Aggregated data (averages across all responding companies) will be published weekly on the Heating Oil and Propane Update page and the Winter Heating Fuels page on EIA's website at.

The SEO-EEC includes data from EIA Prime Supplier Report on companies reporting sales on EIA 782C as an appendix to the Kentucky Energy Security Plan. The Prime Supplier Report presents data collected on Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption. These data measure primary petroleum product deliveries into the States where they are locally marketed and consumed. The EIA-782C consist of approximately 191 prime suppliers representing producers, importers, and interstate resellers and retailers. Each month, companies report their aggregated sales volumes (combined wholesale and retail) made during the reference month to local distributors, local retailers, and end users in each state where the product was delivered.

The SEO-EEC participates in the National Association of State Energy Officials' (NASEO) Energy Security Committee monthly meetings. This committee provides a forum for State Energy Officials to discuss, learn, and collaborate on energy emergencies, and leverages its network to assist states in carrying out their responsibilities as state energy data repositories, by providing technical assistance to other state government agencies, and conducting energy assurance planning and preparedness activities.

Establishing and maintaining situational awareness of Kentucky's energy supply is critical to identifying when petroleum shortage or electric outage conditions exist or are likely to develop. Understanding these conditions will help responders make informed decision on any actions that may be needed.

Information and Resources

U.S. Energy Information Administration

Short Term Energy Outlook (https://www.eia.gov/outlooks/steo/)

Forecast of energy supply, demand, and prices.

Weekly Petroleum Status Report (https://www.eia.gov/petroleum/supply/weekly/)

Information on U.S. petroleum balances, inputs and production and stocks by Petroleum Administration for Defense Districts.

Global Liquid Fuels (https://www.eia.gov/outlooks/steo/report/global_oil.cfm)

Petroleum and other liquid fuels production and consumption forecasts.

U.S. Movements of Crude Oil by Rail (https://www.eia.gov/petroleum/transportation/)

Information on movements of crude and select products by Petroleum Administration for Defense Districts.

Refinery Outages (https://www.eia.gov/petroleum/refinery/outage/)

Examines planned U.S. refinery outages and the implications for available refinery production capacity, petroleum product markets, and the supply of gasoline, diesel fuel, and jet fuel.

Petroleum Supply Monthly (https://www.eia.gov/petroleum/supply/monthly/)

Supply and disposition of crude oil and petroleum products on a national and regional level.

Petroleum Marketing Monthly (https://www.eia.gov/petroleum/marketing/monthly/)

Monthly price and volume statistics on crude oil and petroleum products at a national, regional and state level. Refinery Capacity Report (https://www.eia.gov/petroleum/refinerycapacity/)

Fuel, electricity, and steam purchased for consumption at the refinery; refinery receipts of crude oil by method of transportation; and current and projected atmospheric crude oil distillation, downstream charge, and production capacities.

Refinery, Bulk Terminal, and Natural Gas Plant Stocks by State (https://www.eia.gov/dnav/pet/pet_stoc_st_dc_SIN_mbbl_m.htm)

Gasoline and Diesel Fuel Prices Weekly Update (https://www.eia.gov/petroleum/gasdiesel/)

Working and Net Available Shell Storage Capacity (https://www.eia.gov/petroleum/storagecapacity/)

Shows data for crude oil, petroleum products, and selected biofuels working and net available shell storage capacity by type of facility, product, and Petroleum Administration for Defense District.

NATIONAL ASSOCIATION OF STATE ENERGY OFFICIALS

U.S. Weekly Product Supplied (https://www.eia.gov/dnav/pet/pet_cons_wpsup_k_w.htm)

Historical for petroleum and other liquid fuels in the U.S.

Prime Supplier Volume Sales (https://www.eia.gov/dnav/pet/pet_cons_prim_dcu_nus_m.htm)

Historical trend for deliveries of petroleum products into states for final consumption.
Weekly Heating Oil and Propane Prices for October – March
(https://www.eia.gov/dnav/pet/pet_pri_wfr_dcus_SNJ_w.htm)

States that participate in the State Heating Oil and Propane Price survey can find state and regional residential and wholesale propane and heating oil prices found at:
https://www.osti.gov/biblio/5678136-state-heating-oil-propane-price-shopp-survey

Other Federal Resources
National Oceanic and Atmospheric Administration Climate Outlooks
(https://www.cpc.ncep.noaa.gov/products/forecasts/) The Climate Prediction Center issues seasonal climate outlook maps for one to 13 months in
the future.
National Oceanic and Atmospheric Administration Degree Days Statistics
(https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/)
Population weighted heating and cooling degree-days by state.
National Oceanic and Atmospheric Administration Space Weather Prediction Center
(https://www.swpc.noaa.gov/)
Real time monitoring of solar conditions and forecasts.
National Oceanic and Atmospheric Administration Space Weather Scales
(https://www.swpc.noaa.gov/noaa-scales-explanation)
Used to communicate current and future space weather conditions and their possible effects on people and systems to the public.

Federal Energy Regulatory Commission Seasonal Market Assessments Electricity and Natural Gas
(https://www.ferc.gov/reports-analyses)
Seasonal reports and analysis of electricity and natural gas markets.

Cybersecurity and Infrastructure Security Agency (CISA).
https://www.cisa.gov/uscert/ncas/alerts

Department of Energy EAGLE-I
https://eagle-i.doe.gov/login

Other Resources
OPIS Alerts (https://www.opisnet.com/product/news/)

Subscription service for oil market news alerts and reports overview.
AAA Retail Gasoline Price Data (https://gasprices.aaa.com)

Fuel Gauge Report by state and major cities.
Gas Buddy (https://www.gasbuddy.com/GasPriceMap?z=4)

Ability to zoom down to individual retail gas stations.
International Energy Agency Oil Market Report (https://www.iea.org/oilmarketreport/omrpublic/)

NATIONAL ASSOCIATION OF STATE ENERGY OFFICIALS
Sperry-Piltz Ice Accumulation Index (https://www.spia-index.com/)

3.2 Emergency Orders, Waivers and Conservation Measures

This Annex lays out the potential actions the Commonwealth of Kentucky will likely activate as a response to events causing petroleum shortage. These actions are designed to respond to specific circumstances and consequences that can occur in fuel shortages. The following State/Federal programs and measures would only be used by the Commonwealth during extreme and long-lasting events. Possible programs and measures that the state could consider are the following;

3.2.1 Waivers -Federal Motor Carrier Safety Administration (FMCSA) Safety Regulations

Emergency action under the Federal Motor Carrier Safety Regulations (FMCSR) is automatically triggered under a declared state emergency. This waives the FMCSA safety rules which include limits on the number of hours a driver can operate. This allows drivers to make more fuel deliveries and fuel can be transported over longer distances to help elevate the shortage.

DRAFT WAIVER OF SELECT MOTOR CARRIER SAFETY REGULATIONS

Executive Order [insert number and year]

State of [Energy] Emergency [or Disaster]

Waiver of Select Regulations Covering Motor Carriers and Drivers

Transporting [insert fuels covered by the order, e.g., gasoline, diesel fuel, propane, Number 2 home heating oil, etc.]

WHEREAS, [insert citation to legal authorities that give the governor the authority to take the actions contained in the order];

WHEREAS, [insert a brief description of the event(s) that have required this action]; and

WHEREAS, [insert a brief description of the consequences and impacts of the event(s)]; and

WHEREAS, it is in the best interests of the State of [insert name] to provide for the safe transportation of petroleum products within this State, and to assure that petroleum product supplies will remain sufficient to protect the health, safety, and economic well-being of the State's residents and visitors; and

WHEREAS, this declaration of emergency [disaster] is recognized by the Federal Motor Carrier Safety Administration (FMCSA) to cause and to place into immediate effect relief from Federal Motor Carrier Safety Regulations contained in 49 CFR Parts 390-399; and [if applicable, insert any corresponding or equivalent reference in state law].

WHEREAS, all of the safety regulations contained in 49 CFR Parts 390-399 are waived, including Driver Hours of Service; however, motor carriers are encouraged to comply with the safety regulations that do not otherwise restrict or impede their ability to assist in the recovery effort in the area for which an emergency has been declared.

NOW, THEREFORE, I, [insert governor's name], Governor of the State of [insert state name], by virtue of the power and authority vested in the Governor by [insert legal reference to authorities], order the following:

A State of [Energy] Emergency [Disaster] is declared in the State of [insert state name] for [insert the names of the counties in which this declaration applies or specify that it is a statewide declaration].
Relief from Federal Motor Carrier Safety Regulations contained in 49 CFR Parts 390-399; and [if applicable, insert any corresponding or equivalent reference in state law as may be needed].

This order applies only to [insert fuels to be covered by this order, e.g., gasoline, diesel fuel, Number 2 home heating oil, propane, biofuels, etc.]. No other petroleum products or other fuels are covered by the exemption and suspension under this Order.

The relief from these regulations shall remain in effect for the duration of the emergency or thirty (30) days, whichever is less. Only the FMCSA Field Administrator can extend the thirty (30) day limit for an extension of relief from the federal safety regulations.

Nothing in this Order shall be construed as an exemption from applicable controlled substances and alcohol use and testing requirements (49 CFR Part 382 and [insert applicable state statute, order, and/or rule]), the commercial driver's license requirements (49 CFR Part 383 and [insert applicable state statute, order, and/or rule]), the financial responsibility requirements (49 CFR Part 387 and [insert applicable state statute, order, and/or rule]), applicable size and weight requirements, or any portion of federal and State regulations not specifically identified.

Motor carriers or drivers currently subject to an out-of-service order are not eligible for the exemption and suspension until the out-of-service order expires or the conditions for rescission have been satisfied.

Governor: _____

Dated: _____ [Insert location]

File with [insert name of the state office, department, or legislative body with which the order may need to be filed]

3.2.2 Waivers of Environmental Fuel Specifications

The U.S. Environmental Protection Agency (EPA) and most states have requirements on gasoline and diesel fuel specifications that are designed to limit emissions. Waving certain fuel specifications can increase overall supply and will allow supplies to be distributed in areas where the product may not normally be used.

DRAFT WAIVER OF TEMPORARY SUSPENSION OF FUEL SPECIFICATIONS

State of [Energy] Emergency [or Disaster]

Waiver of Temporary Suspension of Fuel Specifications [or insert name of specification being waived, e.g., RFG, RVP, etc.]

WHEREAS, [insert citation to legal authorities that give the governor the authority to take the actions contained in the order];

WHEREAS, [insert a brief description of the event(s) that have required this action]; and

WHEREAS, [insert a brief description of the consequences and impacts of the event(s)]; and

WHEREAS, it is in the best interests of the State of [insert state name] to provide for temporary waivers of state and federal fuels specifications; and

WHEREAS, appropriate measures must be taken in response to the energy emergency to ensure that gasoline [and/or diesel fuel] supplies will remain sufficient and to assure the health, safety, and welfare of residents and visitors;

NOW, THEREFORE, I, [insert governor's name], Governor of the State of [insert state name], by virtue of the power and authority vested in the Governor by [insert legal reference to authorities], order the following:

[Insert the information on the specific waivers granted by the Environmental Protection Agency. If the fuel specifications that have been waived have been adopted as part of the state implementation program and adopted under rule or law, the governor will need to at this point include references to those specific rules or laws and also waive those provisions for the same duration as approved by Environmental Protection Agency.]

Duration of Order

This order shall remain in effect for [insert number of] days from its effective date unless amended, superseded, or rescinded by further Executive Order [or proclamation]. It shall expire in [insert number of] days after the proclamation of a state of emergency unless extended as provided for in [insert reference to the statute under which this action is based. Alternatively, it could say until such time as supply conditions improve and the plan is no longer needed, and the governor issues an order rescinding the plan.]

Governor: _____

Dated: _____ [insert location]

File with [insert the name of the state office, department, or legislative body with which the order may need to be filed]

3.2.3 Petroleum Priorities for Essential Services Programs Petroleum Priority Users Program for Bulk Purchasers

This program currently does not exist and any consideration of tis mitigation action would require private sector engagement and support and the Energy Assurance Advisory Group (EAAG) review. This priority end-user program would require all primary petroleum suppliers to make available sufficient liquid fuels to meet the needs of critical end-users such as first responders: law enforcement, fire, and emergency medical services, and any other essential service providers determined by the state or other legal authorities. This would only be used in the more serious longer-term shortages. The Priority users will be categorized by the Commonwealth of Kentucky. This program may be instituted during periods of severe anticipated shortages, such as during periods of major supply interruptions. This program would likely be implemented prior to the Petroleum Set-Aside Program. The End/Users program will require petroleum suppliers provide critical (priority) end users with all necessary fuels to maintain operations to assure the public safety and well-being.

DRAFT EXECUTIVE ORDER FOR IMPLEMENTATION OF PRIORITIES FOR ESSENTIAL SERVICES

Executive Order [insert number and year]

State of [Energy] Emergency [or Disaster]

Implementation of Priorities for Essential Services

WHEREAS, [insert citation to legal authorities that establish the governor's ability to take the actions contained in the order];

WHEREAS, [insert brief description of the event(s) that have required this action]; and

WHEREAS, [insert brief description of the consequences and impacts of the event(s)]; and

WHEREAS, it is in the best interests of the State of [insert name] to provide priority to emergency responders for petroleum product supplies needed to protect the health, safety, and economic well-being of the state's residents and visitors; and

NOW, THEREFORE, I, [insert governor's name] Governor of the State of [insert name], by virtue of the power and authority vested in the Governor by [cite statute] upon declaration of a state of emergency in the Executive Proclamation [insert number] under this act, I, [insert governor's name], Governor, hereby implement a Priority End-User Program, [statewide, in the state of, or to become effective in the counties of] as set forth below on [insert time, month, day, year].

Priority End Users (language subject to review and change if executed)

Petroleum suppliers shall supply a percent of the current fuel requirements to emergency responders (law enforcement, firefighting units, and emergency medical services) upon certification. This certification, to be submitted from a priority end-user to their supplier, shall contain:

Statement of the most recent 12 months of purchases in gallons.
Anticipated requirements for each of the next 12 months.
Written justification explaining the need for any volumes in excess of historical or contractual purchases.
A sworn statement by the responsible party that the information contained in the certification is true and accurate and that the petroleum product to be provided will only be used for priority use as indicated by the emergency responders.

Suppliers will have ten (10) work days to begin supplying a priority account with the current requirements upon submission of the certificate of need.

I hereby designate the [insert state agency name], as the state office responsible for the administration of this program. As such, the [insert state agency name] shall provide for a mechanism that will allow for the resolution of any dispute arising out of the imposition of the Priority End-User Program.

Violation of Order (Example language subject to review)

Any person who knowingly violates this directive is guilty of a [insert any penalties that may be provided by state law. For example, this might be "a misdemeanor punishable by a fine of not more than [insert number of dollars].] Each day a violation continues is a separate offense. The Attorney General or a Prosecuting Attorney of a county may bring an action in a court of competent jurisdiction to prevent a violation of this order or to compel a person to perform a duty imposed on the person under this Executive Order.

Duration of Order

This order shall remain in effect for [insert number of] days from its effective date unless amended, superseded, or rescinded by further Executive Order [or Proclamation]. It shall expire in [insert number of] days after the proclamation of a state of emergency unless extended as provided for in [insert reference to the statute under which this action is based. Alternatively, it could say until such time as supply conditions improve and the plan is no longer needed, and the governor issues an order rescinding the plan.].

Governor: _____

Dated: _____ [insert location]

File with [insert name of the state officer, department, or legislative body with which the order may need to be filed]

3.2.4 Minimum Purchase and Odd-Even Purchase Programs

A minimum purchase plan is designed to help reduce long lines at retail gas stations, and typically involve requiring motorists to purchase a minimum amount of gasoline or diesel. This can be done either as a voluntary or mandatory measure. It can also be done as an alternative or in addition to an odd-even plan where motorists can purchase gas every other day depending on their license plate numbers. Instituting an Odd/Even program will allow motorists with license plates ending in numerically even number to purchase fuel on even calendar number days and those ending in numerically odd numbers to purchase on the odd number days. These measures will limit the total number of vehicles refueling on any given day. This will reduce the wait time at the fuel pumps as well. The Governor may exempt some categories of vehicles.

DRAFT EXECUTIVE ORDER FOR ODD-EVEN PURCHASE PLAN

Executive Order [insert number and year]

State of [Energy] Emergency [or Disaster]

Implementation of Odd-Even Purchase Plan

WHEREAS, [insert citation to legal authorities that give the governor the authority to take the actions contained in the order];

WHEREAS, [insert a brief description of the event(s) that have required this action]; and

WHEREAS, [insert a brief description of the consequences and impacts of the event(s)]; and

WHEREAS, it is in the best interests of the State of [insert state name], to provide priority to emergency responders for petroleum product supplies needed to protect the health, safety, and economic well-being of the State's residents and visitors.

NOW, THEREFORE, I, [insert governor's name], Governor of the State of [insert state name], by virtue of the power and authority vested in the Governor by [cite statute] upon declaration of a state of emergency in the Executive Proclamation [insert number] under this act, I, [insert state name] Governor, hereby implement an Odd-Even Purchase Plan, [statewide or in the state of or to become effective in the counties of] as set forth below on [insert time, month, day, year].

Odd-Even Gasoline Purchase Requirements

If a state has other unique means used in license plate identification, the following should be adapted to be consistent with the plate numbering and lettering used in the state.

At the retail level, gasoline (and/or) diesel fuel shall be dispensed into vehicles with a license plate ending in an odd number (1, 3, 5, 7 and 9) only on odd numbered days of the month (first, third, fifth, seventh, and ninth). Personalized license plates and any other license plates without numbers shall be defined as odd. Examples of odd day license plates are: BBB 1333, KBC 475, and BERTHA.

At the retail level, gasoline (and/or) diesel fuel shall be dispensed into vehicles with a license plate ending in zero or an even number (0, 2, 4, 6 and 8) only on even numbered days of the month (second, fourth, sixth, eighth, and tenth (zero)). Examples of even day license plates are: BBB 020, RMP 768, and KBC 776.
If a vehicle license plate contains both letters and numbers and the last digit is a letter, the last or only number digit will determine whether sale of gasoline is eligible on an odd or even day. Examples of license plates containing letters as last digits are 123 FT (odd day), 764 NT (even day), and 468 GN (even day).
For any calendar month in which there are 31 days, and in February of a leap year, sales shall be made on the last day of the month without regard to the digits of the license plates.

Exemptions

Retailers must exempt the following types of motor vehicles from these regulations:

Police, fire, ambulance, or other emergency vehicles.
Buses, taxis, vanpools, or other commercial passenger carriers.
U.S. Postal Service vehicles.
Motorcycles or mopeds, and similar two-wheel vehicles.
Vehicles bearing out-of-state license plates.
Vehicles registered or operated by a person with a current valid driver's license from outside the area under the odd-even purchase plan.
Local, county, state, and federal government vehicles that provide essential services for the health, safety, and well-being of citizens.
Vehicles operating in an unusual emergency situation in the judgment of retailers.
Vehicles with license plates with handicap designation.

Violation of Order (example subject to review)

Any person who knowingly violates this directive is guilty of [insert any penalties that may be provided by state law. For example, this might be something like a misdemeanor punishable by a fine of not more than [insert number of dollars].] Each day a violation continues is a separate offense. The Attorney General or a Prosecuting Attorney of a county may bring an action in a court of competent jurisdiction to prevent a violation of this order or to compel a person to perform a duty imposed on the person under this Executive Order.

Duration of Order

This order shall remain in effect for [insert number of] days from its effective date unless amended, superseded, or rescinded by further Executive Order. It shall expire [insert number of] days after the proclamation of a state of energy emergency unless extended as provided for in [insert reference to the statute under which this action is based. Alternatively, it could say until such time as supply conditions improve and the plan is no longer needed and the governor issues an order rescinding the plan.].

Governor: _____

Dated: _____ [insert location]

File with [insert name of the department or legislative body with which the order may need to be filed]

3.2.5 Use of Alternative Fuel Vehicles Programs

States and local governments that have a significant number of alternative fuel vehicles (AFVs) in their fleets may have an opportunity to maximize the use of these vehicles during shortages of gasoline and diesel fuel. States could consider a number of options around prioritizing AFV usage and alternative fuel procurement during petroleum shortages.

3.2.6 Commonwealth of Kentucky Petroleum Set-Aside Program

Tis program currently does not exist and would require significant public and private partnership in executing this program. This option would be applicable only for extreme pro-longed petroleum disruption. This program is initiated by an Executive Order from the Governor after declaring a state of emergency. This program will be facilitated by the State Energy Office. Each major oil company operating in the Commonwealth of Kentucky would be required to set aside up to three (3) percent of the total anticipated supply of gasoline and diesel fuel, propane and heating oil each month. Kentucky Emergency Management (KYEM) would be given the authority to direct the sale of this set-aside product to perform essential public services. This program will allow for the maintenance of those essential services such as:

- Agricultural producers/distributors of perishable food
- Critical Communications Resources
- Emergency medical services
- Energy suppliers
- Firefighting resources
- Law Enforcement
- Residential and Commercial heating
- Sanitation services
- Snow removal resources
- Public mass transportation (i.e.; school buses)
- Utility crews
- Water/Waste Water supply and treatment resources

DRAFT APPLICATION FOR STATE SET-ASIDE

DEPARTMENT OF [Insert Name] [*Insert Agency Name*] [*Insert Agency Address*] **STATE SET-ASIDE APPLICATION CERTIFICATION OF PETROLEUM PRODUCT HARDSHIP**	**FOR STATE USE ONLY:** Received: _____ Code Reviewed: _____ By Approval: _____ Date: _____ Notify: App. Supplier • Denial Date: Notify •

Applicant Identification Information:	
Applicant Name	Business Phone (Include Area Code)
Street/Box/RFD	Home Phone (Optional)
City, State, Zip Code	Individual to Contact
County	Months for Which Applicant is Seeking Assistance?
Location for Delivery of Product if Different from Above:	
Street/Box/RFD	City, State, Zip Code

Applicant's Classification:	**Product Requested:** (Submit *one* application for *each* product requested)
Wholesale Purchaser-Distributer (Jobber) Wholesale Purchaser-Retailer (Gas Station) End-User	• Gasoline Number 1 Fuel Oil • Diesel Number 2 Fuel Oil • Propane

Supplier(s). Name of the prime supplier (major oil company) that is ultimate supplier *(If supplied by a jobber or distributer, indicate their name **and** the name of their supplier)*:	
My existing supplier(s), named below is unable to supply the quantity requested. I do not have a supplier. The two suppliers named below have been contacted and could not supply the product requested.	
Supplier Name	Supplier Name
Street/Box/RFD	Street/Box/RFD
City, State, Zip Code	City, State, Zip Code
Contact Name	Contact Name
Contact Phone (Include Area Code)	Contact Phone (Include Area Code)
Check One Existing Supplier Potential Supplier	Check One Existing Supplier Potential Supplier

-

Indicate total amount of product received each month from supplier(s) for the base year (Month/Year) through (Month/Year).

Base Period of Supply Volume by Month in Gallons (Indicate the year next to the month)

Month	Year	Supply Volume	Month	Year	Supply Volume
January			July		
February			August		
March			September		
April			October		
May			November		
June			December		

Total Base Period Supply Volume	

Does this base period supply volume agree with your supplier? Check Y No

The following question is for motor fuel requests only:

Indicate your purchases (gallons) in:

October (Year)		November (Year)		December (Year)	
January (Year)		February (Year)		**Five Month Average**	

Did you overdraw on your allocation last month? Yes

By how much (gallons)?

If yes, please provide explanation for the overdrawn allocation:

Describe the type of customers you are requesting product for, the nature of the business, and amount of product requested for each. *Attach additional sheets as necessary.*

Business Name and Phone Number	**Type of Business**	**Fuel Requirement Amount Requested (Gallons)**

Describe in complete detail the reason or your hardship. Please be specific. Explain all circumstances and situations related to hardship request. This information will be investigated and will act as the principal basis for evaluation of the request. For each of the customers listed above, indicate the nature of the supply problems. *Attach additional sheets as necessary.*

Certification (Please remember to sign).
I certify that all of the above information is true and accurate and that any quantity granted will be used for purposes herein described and will not be diverted to other uses. I further certify that I have an energy conservation program in effect.

Name and Title **Signature** **Date**

[Cite law and penalties that might be imposed under state laws for providing false or misleading information]
If different than above
Prepared by: _____

3.2.7 State Weight Limit Waivers for Petroleum Tanker Trucks

The maximum gross weight limit that states must enforce on the federal Interstate Highway System is 80,000 pounds, unless a lower weight is derived from the bridge formula, or a higher weight is grandfathered. However, governors under emergency declaration may have the authority to waive weight limits for petroleum tanker trucks. Such measures would only apply on a state by-state basis and should trucks have to go out of state for fuel supplies, they would be subject to weight limits in the states through which they would need to pass.

3.2.8 Retail Gas Station Priorities for Essential Services

In recent years some state and local governments have become more reliant, or entirely reliant, on retail gas stations to meet their needs. Prioritizing gas station supplies for essential services may help ensure that essential public service needs supplied by retail gas stations can be met during a serious fuel shortage.

3.2.9 Emergency Generators and Transfer Switches for Retail Gas Stations

Several states have implemented programs for ensuring there is adequate gasoline supply along evacuation routes and for response and recovery from power outages. The options typically address either prewiring gas stations to be able to accept generators if there is a power outage or programs that would install on-site generators or provide a cache of generators to deploy to select retail locations.

3.2.10 Contractual Provisions for Fuel Supplies in an Emergency

Prior to any disruption, Kentucky may wish to consider training critical user organizations about the issues and techniques related to balancing price and secured contracting, since some organizations opt to reduce the price of fuel through spot contracts instead of relying on a contract, which may leave them vulnerable during shortages when spot-contract vendors are unable to acquire fuel in the market. Kentucky may also want to explore developing contracts that have provisions for additional emergency fuel supplies emergencies during a fuel shortage.

3.2.11 Expanded State Fuel Storage and Strategic Reviews

A number of states have bulk fuel storage locations that are used to refuel state vehicles. Kentucky may wish to consider creating bulk storage locations for petroleum-based fuels or expanding capacity at existing storage locations to have additional fuel available in case of a shortage.

3.2.12 Public Information Campaign to Reduce Consumption

When the state experiences a petroleum shortage the SEO-EEC and KYEM's PIO will begin a public information campaign to encourage the public to institute conservation measures to try to curtail any potential shortages.

When there is a declared state emergency and the state emergency operations center is activated a Joint Information Center (JIC) will be established and public information will be disseminated from the JIC.

3.2.13 State and Local government Employee Conservation Measures

When petroleum shortages dictate, additional measures may be required to reduce the overall shortage. The Governor or their designee may institute measures to compress the work week for certain state and local employees. Reducing the total work week by one or more days to conserve fuel may be necessary through an emergency Executive Declaration. The governor may also institute through an Executive Declaration for a variable week which could reduce traffic at peak traffic times, thereby slowing fuel consumption or perhaps even a telework policy to alleviate the total consumption of fuel. These measures will typically be initiated during moderate to severe shortages.

3.2.14 Critical Issues Related to Generators and Fuels

During periods of declared emergencies and statewide disasters where there typically is a loss of electrical power, numerous generators that require diesel fuel, propane or natural gas will present a logistical problem. There will likely be numerous emergency generators placed into service, as well as, increased need for emergency generators. Critical emergency generators may serve hospitals, emergency operations centers, emergency shelters, nursing homes, water and waste water treatment facilities and other similar critical service entities.

Most requests for emergency generator needs will go through the local/county emergency operations centers and perhaps onto the SEOC. Fuel needs to sustain these emergency generators during times of declared emergencies will likely fall under the purview of ESF-12 at the state level.

Awareness of where these needs are likely to arise throughout the state is a critical issue to acquire prior to a critical event. The generator locations, critical service provided by each generator, fuel types and amounts required to sustain these generators. The local, county and state or tribal governments will provide priorities relative to life health and safety implications for each of these generators. Health safety, economic and environmental consequences must be considered for each emergency generator.

3.3 Fuel for Critical Service Vehicles

3.3.1 Points of Distribution for Fuel

These are predetermined sites where county and local critical service vehicles will be allowed to refuel when there are long term power outages or when fuel is in short supply. There are two types of fuel points of distribution:

- **Fixed Facility:** A predetermined permanent site.
- **Mobile:** These might be trucks/vehicle with pumps and metering capacity that could be brought to a designated site. County EM's will identify several but no less than one fixed distribution site for fuel.

3.3.2 Federal Fuel Support

A Federally Declared Emergency (Major disaster declaration) to a state that allows Direct Federal Assistance, opens the door to greater state funding from the federal government. The states then may request fuel from FEMA. The fuel expected to be necessary to protect life and property in the state. These may include:

- Local, county and state law enforcement
- Emergency medical responders
- Firefighting response
- Non-government organizations and private commercial entities supporting emergency response operations.

FEMA's distribution to the state is typically divided into bulk or retail fuel operations. The four types of fuel support from FEMA include:

- Bulk Fuel Support
- Retail Support
- Bulk Fuel only to authorized recipients in the state
- Retail Fuel only to authorized recipients of the state

3.3.3 Bulk Fuel

Bulk Fuel may be requested from FEMA to fill large tanks owned by the state or local government where further distribution may occur at the state or local government's discretion.

3.3.4 Retail Fuel Support

The state may request retail fuel support be provided by FEMA at fueling locations. This type fuel support typically involves the federal government setting up a retail fueling stations which are normally equipped with trucks capable of dispersing fuel directly into vehicles previously identified by the state.

3.3.5 Bulk Fuel to Authorized Recipients of the Commonwealth of Kentucky

The state may request bulk fuel support to commercial gas stations which have not been able to obtain fuel from their normal private distribution sources.

3.3.6 Retail Fuel Support to Authorized Recipients of the Commonwealth of Kentucky

FEMA may authorize retail fuel to the general public from FEMA fueling locations. This assistance will be on a cost share basis if it is requested by the state. The state must demonstrate how such a distribution of fuel will result in the saving of lives and or protection of property.

4.0 Figures

APPENDIX I:

Cyber Security PSC Order 2012-00428

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE IMPLEMENTATION
OF SMART GRID AND SMART METER
TECHNOLOGIES Case No. 2012-00428

Cybersecurity-

In the Executive Summary of the Report, the Joint Utilities state that all stakeholders' interests are aligned and that utilities should take reasonable measures to prevent cyber-attacks. However, they state that existing mandatory and voluntary cybersecurity standards, frameworks, and guidelines are sufficient, and that adding regulations or rules serves to weaken utilities' ability to thwart cyber-attacks. They state that the focus should be on the ability to evolve with emerging threats and not on compliance with cybersecurity standards. They believe an effective cybersecurity process is one that is continuously evolving based on emerging threat intelligence. As a result, they assert that additional requirements at the state level are not necessary or advisable.[83]

As the Joint Utilities note, some members are subject to mandatory cybersecurity standards to protect the Bulk Electric System.

These include the Critical Infrastructure ("CIP") Standards developed by the North American Electric Reliability Corporation ("NERC"), approved by the Federal Energy Regulatory Commission ("FERC"). and administered and enforced by NERC and its regional entities, including the SERC Reliability Corporation ("SERC") .[84] [85]

85. SERC has jurisdiction over all of Kentucky except the easternmost portion, which is under the jurisdiction of the Reliability First Corporation.

The Joint Utilities cite and discuss the eight CIP standards that apply to cybersecurity,[86] as well as the voluntary cybersecurity guidelines developed by the National Institute of Standards and Technology.[87]

The Joint Utilities also provide a discussion of the tools that comprise the "Guide to Developing a Cyber Security and Risk Mitigation Plan ," developed by the National Rural Electric Cooperatives Association and the Cooperative Research Network ("CRN"). The purpose of the CRN guide is to enable cooperatives to strengthen their security posture and allow for continuous improvement.[88]

Finally, the Joint Utilities cite the "Cyber Security Risk Assessment and Risk Mitigation Plan Review for the Kentucky Public Service Commission" ("Guernsey Report") that shows that oversight activities are being conducted for utilities not subject to mandatory requirements.[89]

The Guernsey Report offered a focused assessment and general guidance on areas of utility operations that may be susceptible to cyber threats for Kentucky's smaller electric cooperatives and other similarly situated entities. Although participation in the Guernsey cybersecurity assessment was voluntary and limited to only six electric cooperatives, the intent was to develop a document that could be a starting point for further evaluation and improvement of utility operations. Twenty one topical areas were identified in the Guernsey Report for the purpose of evaluating the general effectiveness of utility operations and identifying opportunities for improvement in mitigating cyber risks. Since release of the Guernsey Report, the Kentucky Association of Electric Cooperatives has spearheaded a workgroup to further develop operating procedures and work practices to address cybersecurity threats for its membership.

The Joint Utilities state that none of its group takes cybersecurity lightly.[90] However, they argue that more requirements may be counterproductive because cyberattacks are constantly evolving and a focus on compliance could create a false sense of security. [91]

The AG recommends that the Commission require compliance with the mandatory and voluntary standards, guidelines and resources cited in the Report.[92]

The AG also recommends that the Joint Utilities use the best foreseeable measures possible to secure their cybersecurity.[93] To support its position, the AG cites comments from several cybersecurity experts and from a Chairman's forum on cybersecurity hosted by the Commission.[94] CAC states that utilities should work diligently to take reasonable measures to prevent and defeat cyber-attacks.[95]

The Commission agrees with the Joint Utilities that a mature, effective cybersecurity process is one that is continuously evolving to address new cyber threats. However, the Commission believes that each utility should have some form of cybersecurity plan in place beyond the FERC or NERC mandatory standards. Therefore, the Commission will require that the Joint Utilities develop internal procedures addressing cybersecurity.

Having met with representatives of each of Kentucky's major jurisdictional electric, gas, and water utilities to discuss cybersecurity, the Commission is generally aware of the effort the Joint Utilities have taken (and are taking) to address cyber threats.[96.] Each utility particularly cited the confidential and sensitive nature of their plans to address cyber issues. Given the sensitivity of cybersecurity concerns, the utilities

should be allowed to keep their procedures confidential. The Commission, therefore, will not require each utility's actual internal procedure be filed; rather each utility will be required to certify the development of cybersecurity procedures. The utilities will then be required to make a presentation describing their procedures to the Commission (and the AG, should he wish to attend).

In addition, the Joint Utilities will be required to continue to make cybersecurity presentations every two years to the Commission through the Track Meeting process.

All utilities are advised to develop, maintain and enforce a management approved written cybersecurity policy that addresses known and reasonably foreseeable cybersecurity risks. The pol icy and any subsequent procedures developed should incorporate essential elements of each utility's system that may be susceptible to cyber threats in conjunction with plans for hazard mitigation, emergency response and recovery and other relevant continuity of service arrangements.

96 The AG was invited and participated in person or by phone in each meeting.

APPENDIX J:

Natural Gas Transmission Capacity

APPENDIX K:

Natural Gas Transmission Utilities

APPENDIX L:

Prime Supplies Contacts

APPENDIX M:

Motor Fuels Retailers

APPENDIX N:

Aviation Fuel Distributors

APPENDIX O:

Propane Distributors

APPENDIX P:

Hazardous Material Pipeline Disruption

Hazardous Material Pipeline Disruption
Response Protocol

Concept of Operations:

This protocol has been developed to address how the Energy and Environment Cabinet (EEC) and the Division of Emergency Management (KYEM) will respond to hazardous materials pipeline disruption.

Response

In the event of a hazardous materials pipeline disruption, (explosion, break, rupture, etc.), the EEC's Environmental Protection Division, (KDEP) Environmental Response Team (ERT) is the primary entity for coordinating state agency activities and response to oil and hazardous materials incident under Emergency Support Function 10 (ESF-10).

KDEP carries out the ESF 10 responsibilities under the KY Emergency Operation plan (EOP) to coordinate, integrate, and manage overall efforts to detect, identify, contain, clean up, dispose of, or minimize releases of oil or hazardous materials, and prevent, mitigate, or minimize the threat of potential releases, in accordance with existing delegations of authority.

KDEP will assign an ESF 10 representative to the State Emergency Operations Center (SEOC) who will work in conjunction with Kentucky Division of Emergency Management (KYEM), and other state and federal agencies on hazardous materials incidents.

Kentucky Division of Emergency Management (KYEM), in conjunction with local authorities, coordinates resources for all ESFs. Such functions include security of the area, monitoring, shelter measures, coordination of evacuation efforts, public information, warning statements, and logistic requirements. KYEM will also contact the affected Emergency Management Area Managers and local government officials and the Federal Emergency Management Agency (FEMA) as appropriate.

The ESF-12 served by the EEC's State Energy Office (SEO) and the Public Service Commission (PSC) will be activated either remotely or to the SEOC during times of energy emergencies. The SEO is the primary body responsible for facilitating the flow of information among and between states, federal, and non-governmental agencies during an energy emergency and has direct responsibility for the coordination of petroleum fuels – propane, heating oil, kerosene, gasoline and diesel fuels. The ESF 12 role is one of facilitator, channeling and sharing current energy emergency data within the Commonwealth and among all providers. This free exchange of information will aid in helping all participants maintain perspective on the energy situation and ongoing restoration efforts.

Impact Assessment

If the disruption involves a natural gas pipeline the PSC shall coordinate with the appropriate members of the Gas and Electric partners of the Energy Assurance Advisory Group (EAAG) established in ESF - 12 of the Kentucky Emergency Operations Plan (EOP). If the disruption involves a petroleum pipeline (crude oil, refine petroleum product or LPG), the SEO shall coordinate with the EAAG Petroleum partners.

The SEO-EEC will alert and coordinate with the Department of Energy – Office of Energy Assurance on all energy-related pipeline disruptions regardless of product. The SEO-EEC will keep the EEC Secretary, apprised of the situation. The SEO-EEC and the PSC, as appropriate, will also notify their counterparts in surrounding states if the pipeline disruption could affect energy supplies in those states.

HAZARDOUS MATERIALS PIPELINE DISRUPTION PROTOCOL CONTACT LIST

Energy and Environment Cabinet-

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800.282.0868

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