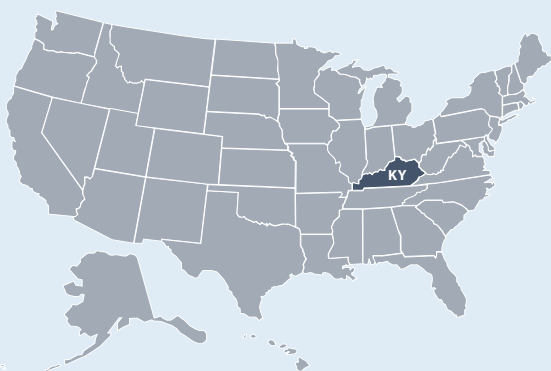




State of Kentucky ENERGY SECTOR RISK PROFILE



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 Mbbbl
DISTILLATE FUEL: 22,700 Mbbbl

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 Mbbbl
ETHANOL: 900 Mbbbl

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.

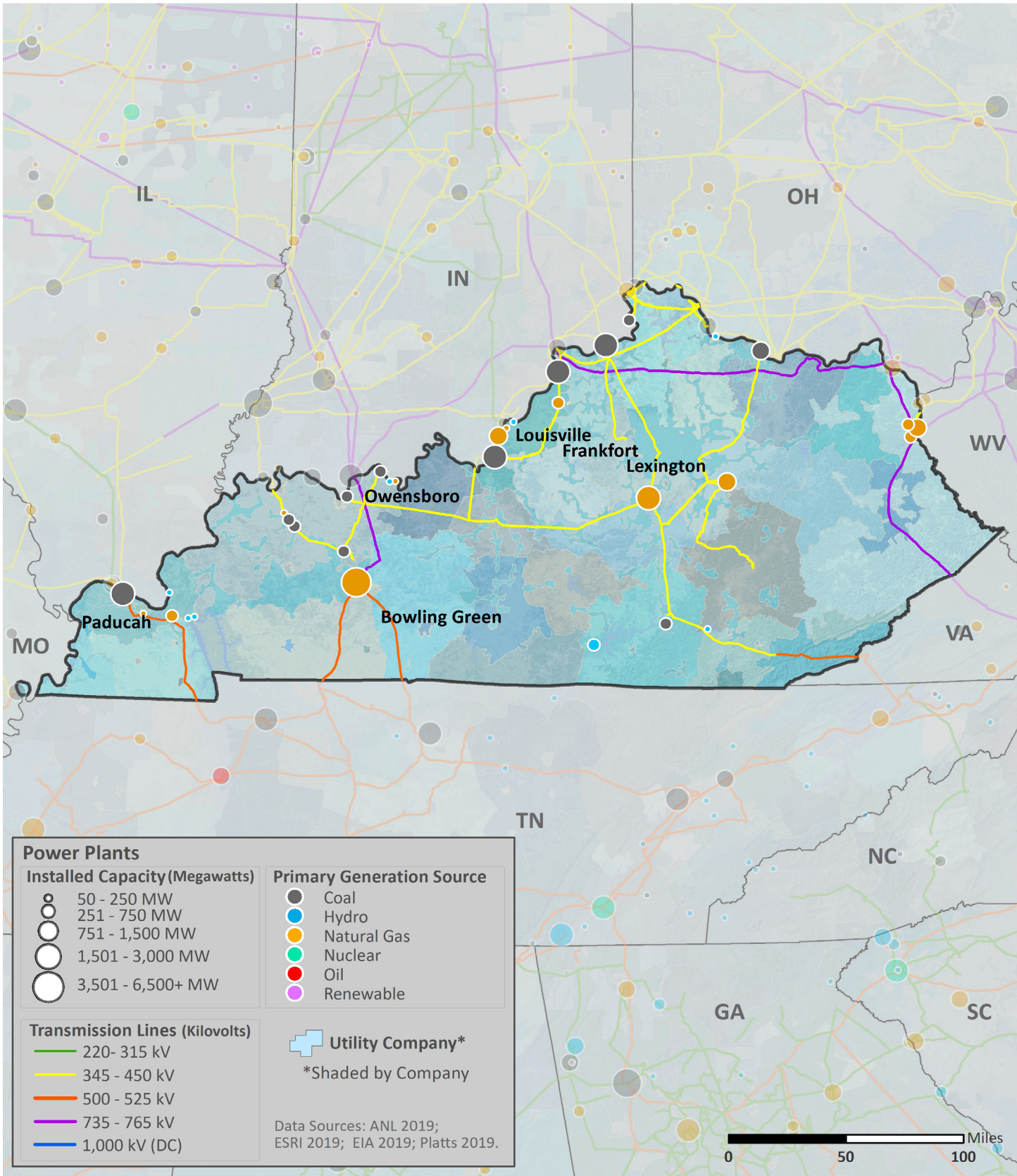
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009–2019

	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









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.

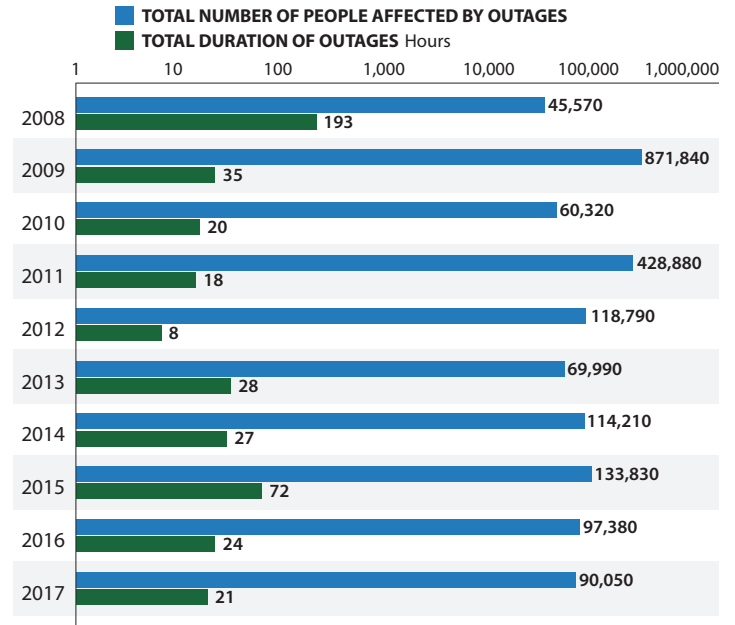
- In 2018, the average Kentucky electric customer experienced 1.8 service interruptions that lasted an average of 6.8 hours.
- In Kentucky, between 2008 and 2017:
 - The greatest number of electric outages occurred in **January** (6th for outages nationwide)
 - The leading cause of electric outages was **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%

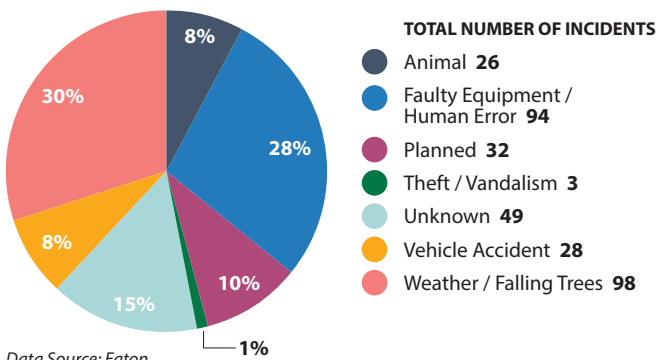
Data Source: EIA

Electric Utility Outage Data, 2008 – 2017



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

Electric Utility-Reported Outages by Cause, 2008 – 2017

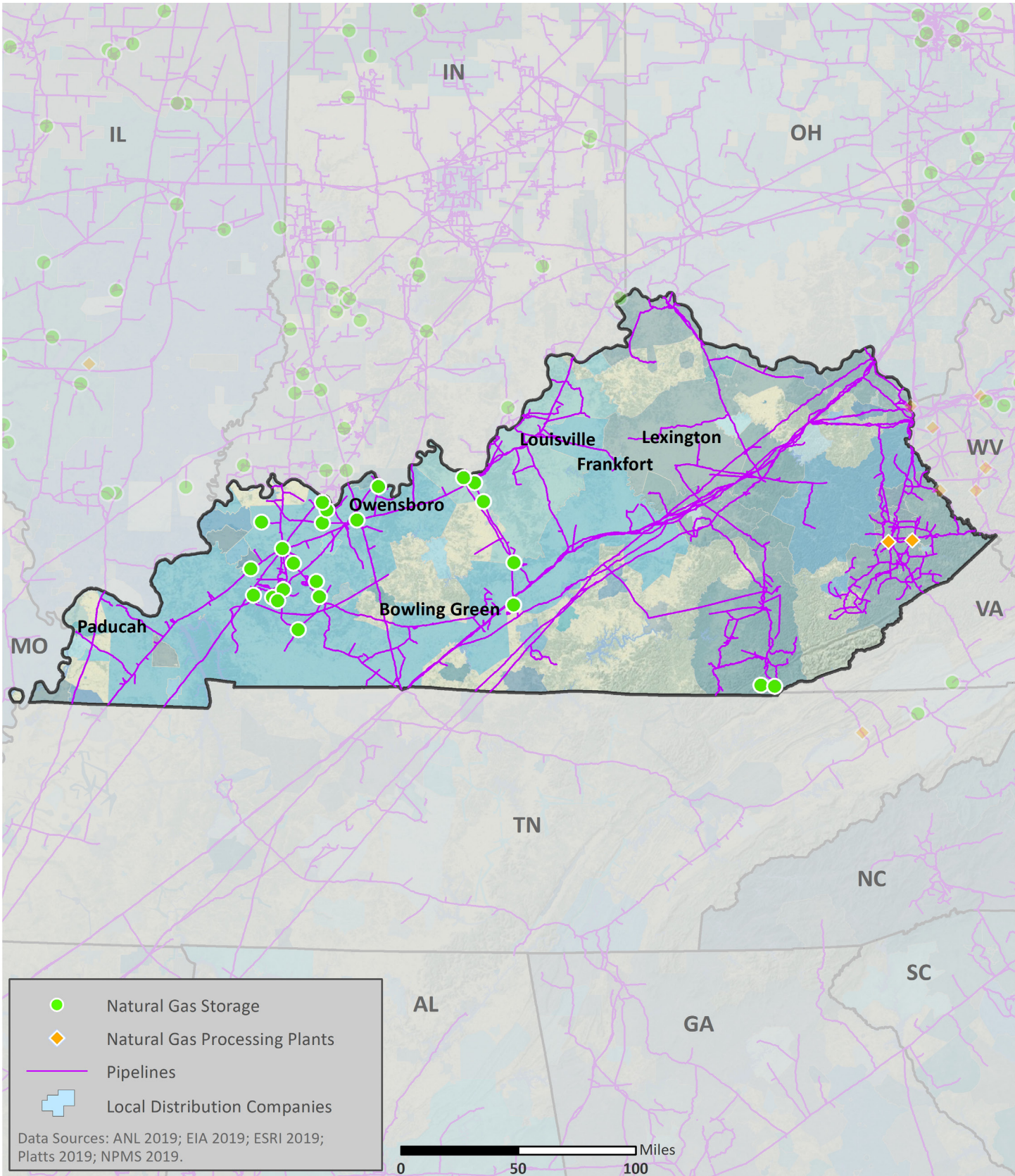


Data Source: Eaton



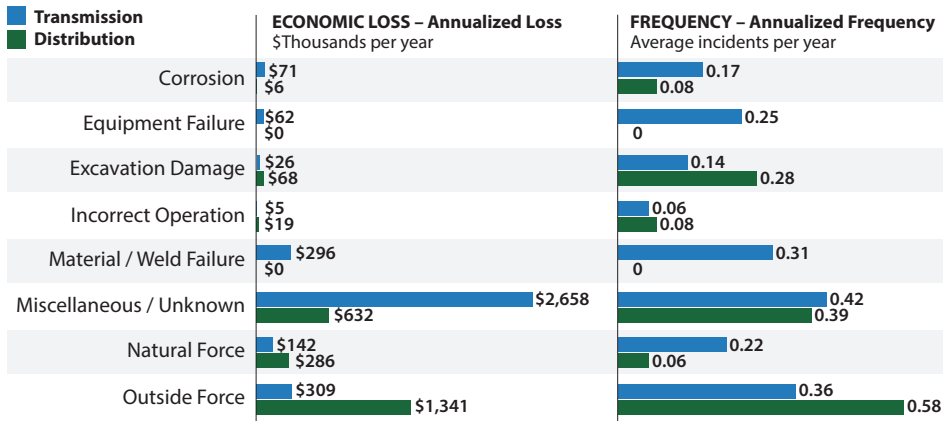


NATURAL GAS



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%

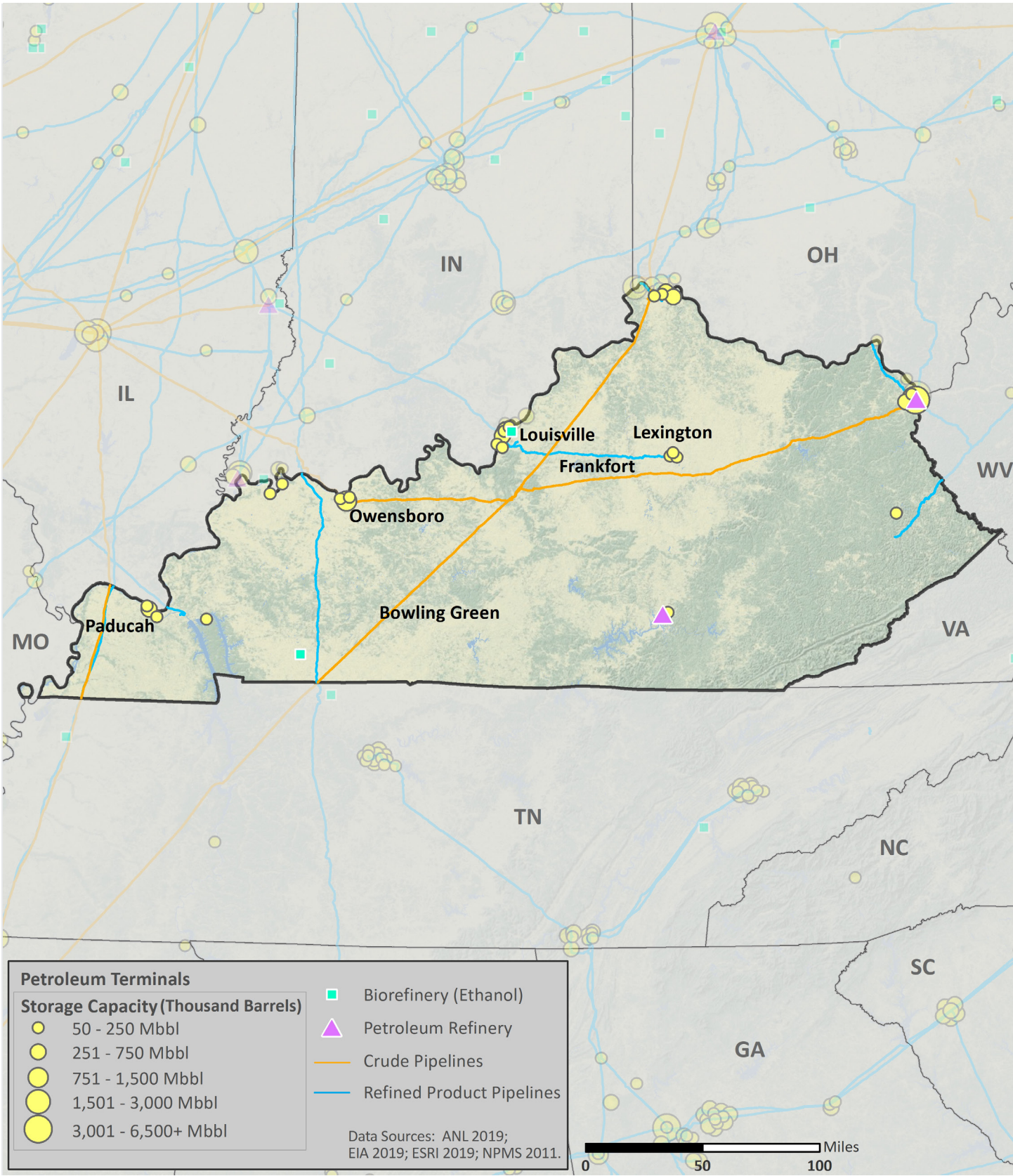
- Kentucky has 2 natural gas processing facilities with a total capacity of 365 MMcf/d.
- Kentucky has 0 liquefied natural gas (LNG) facilities.

Data Source: EIA



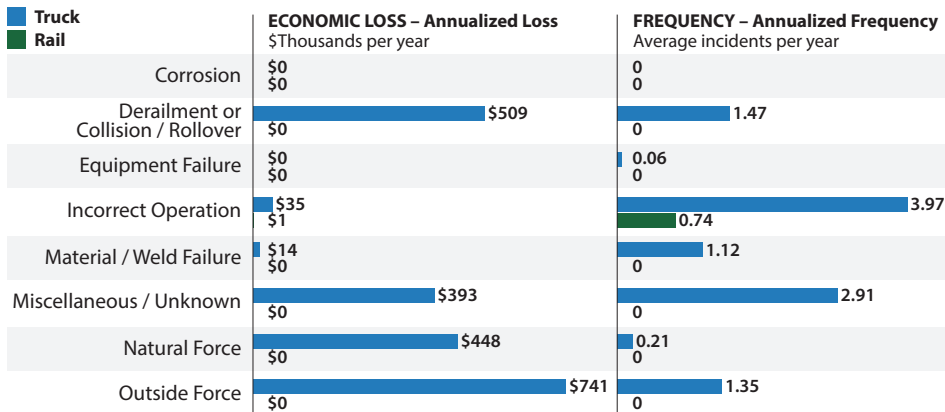


PETROLEUM



Petroleum Transport

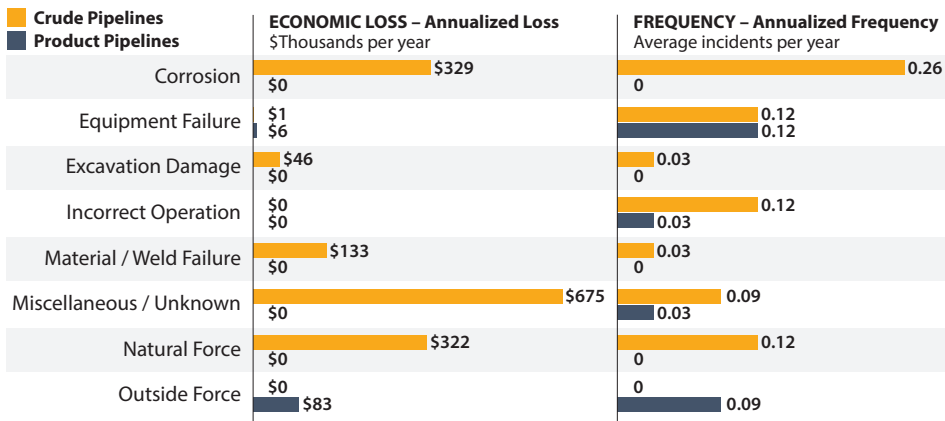
Top Events Affecting Petroleum Transport by Truck and Rail, 1986 – 2019



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.

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

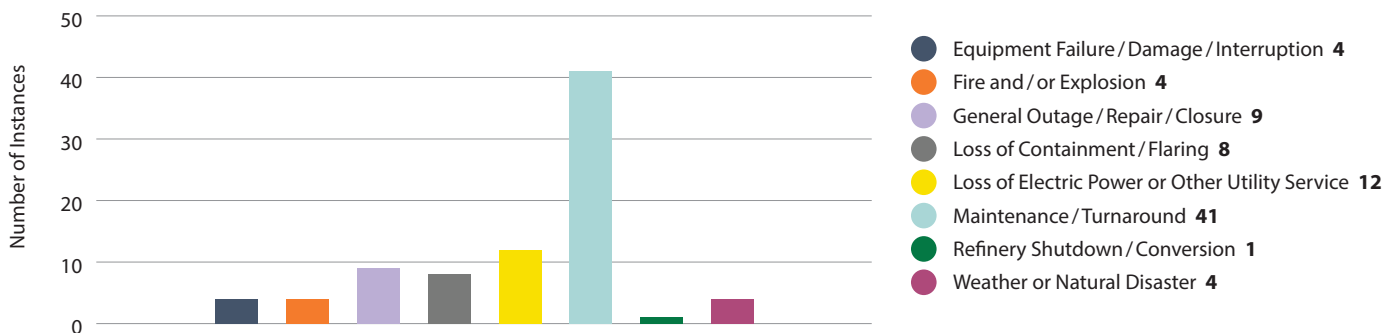


Data Source: DOT PHMSA

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