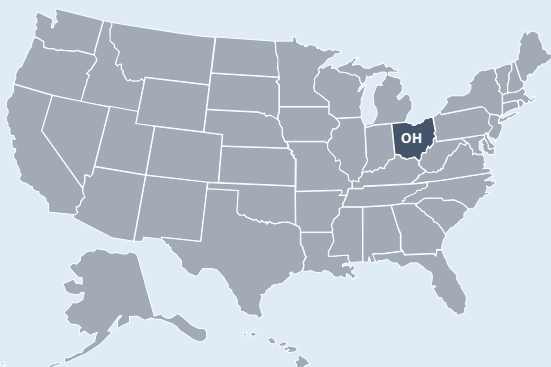




State of Ohio

ENERGY SECTOR RISK PROFILE



Ohio State Facts



POPULATION

11.69 M



HOUSING
UNITS
5.22 M



BUSINESS
ESTABLISHMENTS
0.25 M

ENERGY EMPLOYMENT: 97,983 jobs

PUBLIC UTILITY COMMISSION: Public Utilities Commission of Ohio
STATE ENERGY OFFICE: Ohio Development Services Agency,
Office of Community Assistance, Energy Section

EMERGENCY MANAGEMENT AGENCY: Ohio Emergency
Management Agency

AVERAGE ELECTRICITY TARIFF: 9.94 cents/kWh

ENERGY EXPENDITURES: \$3,461/capita

ENERGY CONSUMPTION PER CAPITA: 312 MMBtu
(23rd highest out of 50 states and Washington, D.C.)

GDP: \$675.9 billion

Data from 2020 or most recent year available.

For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 259,000 GWh

COAL: 29,100 MSTN

NATURAL GAS: 1,128 Bcf

MOTOR GASOLINE: 117,600 Mbbl

DISTILLATE FUEL: 50,500 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 191 plants, 120.0 TWh,
31.4 GW total capacity

Coal: 12 plants, 46.8 TWh, 12.2 GW total capacity

Hydro: 5 plants, 0.4 TWh, 0.1 GW total capacity

Natural Gas: 48 plants, 51.3 TWh, 14.8 GW total capacity

Nuclear: 2 plants, 17.0 TWh, 2.2 GW total capacity

Petroleum: 50 plants, 0.8 TWh, 0.7 GW total capacity

Wind & Solar: 47 plants, 2.2 TWh, 0.8 GW total capacity

Other sources: 27 plants, 1.5 TWh, 0.4 GW total capacity

COAL: 9,500 MSTN

NATURAL GAS: 2,650 Bcf

CRUDE OIL: 28,000 Mbbl

ETHANOL: 13,200 Mbbl

Data from EIA (2018, 2019).

This State Energy Risk Profile examines the relative magnitude of the risks that the state of Ohio'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.

Ohio Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Tornadoes** at \$73 million per year (4th leading cause nationwide at \$2 billion per year).
- Ohio had 57 Major Disaster Declarations, 0 Emergency Declarations, and 0 Fire Management Assistance Declarations for 4 events between 2013 and 2019.
- Ohio registered 13% fewer Heating Degree Days and 32% greater Cooling Degree Days than average in 2019.
- There are 3 Fusion Centers in Ohio. The Primary Fusion Center is located in Columbus.

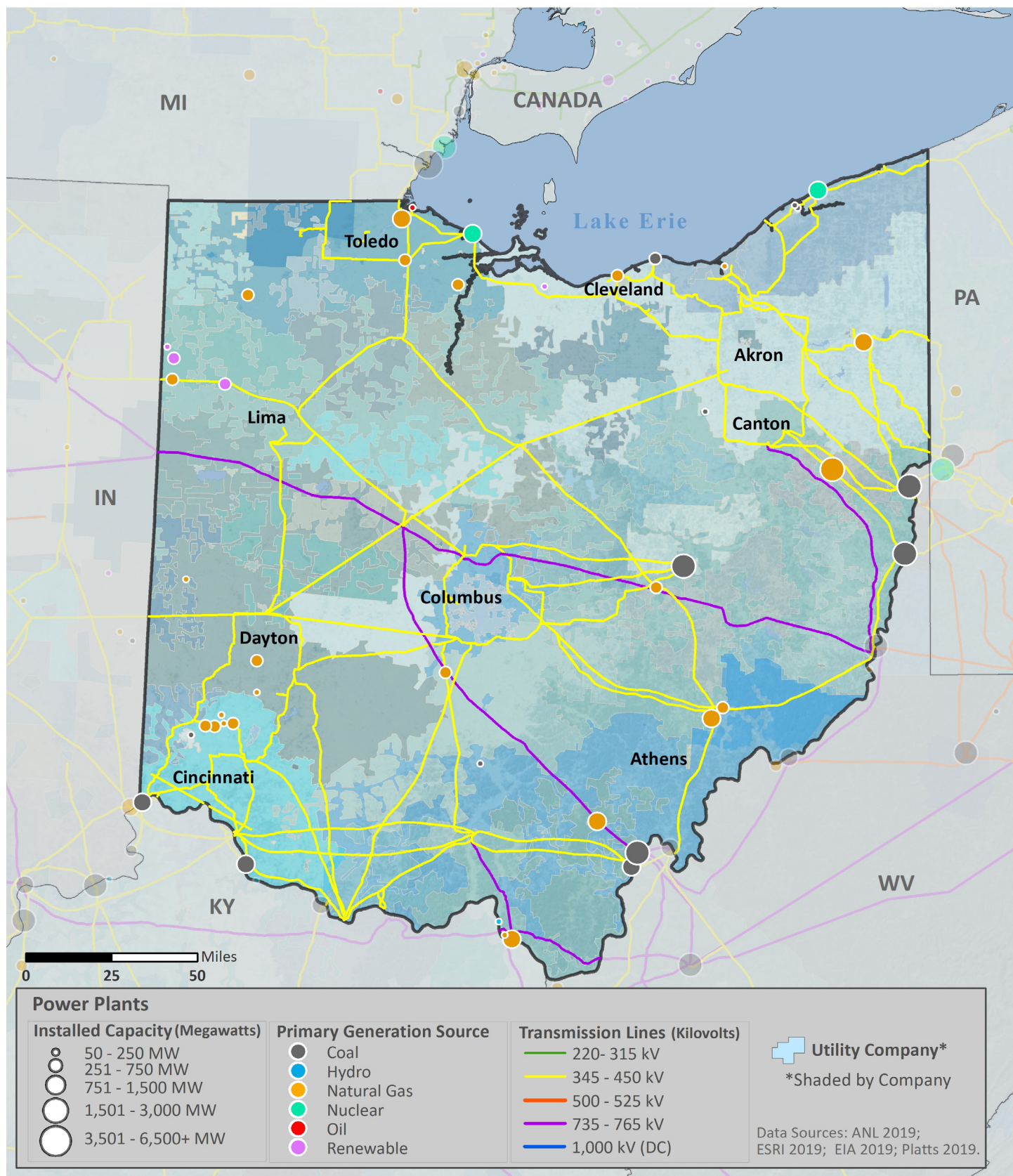
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	0	\$0
Earthquake (≥ 3.5 M)	<1	\$0
Extreme Heat	1	\$0
Flood	48	\$31
Hurricane	0	\$0
Landslide	<1	\$0
Thunderstorm & Lightning	122	\$35
Tornado	14	\$73
Wildfire	0	\$0
Winter Storm & Extreme Cold	32	\$12

Data Sources: NOAA and USGS



ELECTRIC



Electric Infrastructure

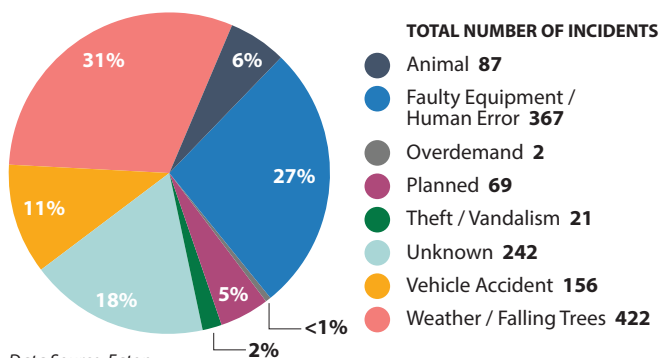
- Ohio has 136 electric utilities:
 - 18 Investor owned
 - 25 Cooperative
 - 83 Municipal
 - 10 Other utilities
- Plant retirements scheduled by 2025: 11 electric generating units totaling 3,451 MW of installed capacity.

Electric Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	88%	35%
Commercial 	11%	31%
Industrial 	<1%	34%
Transportation 	<1%	<1%

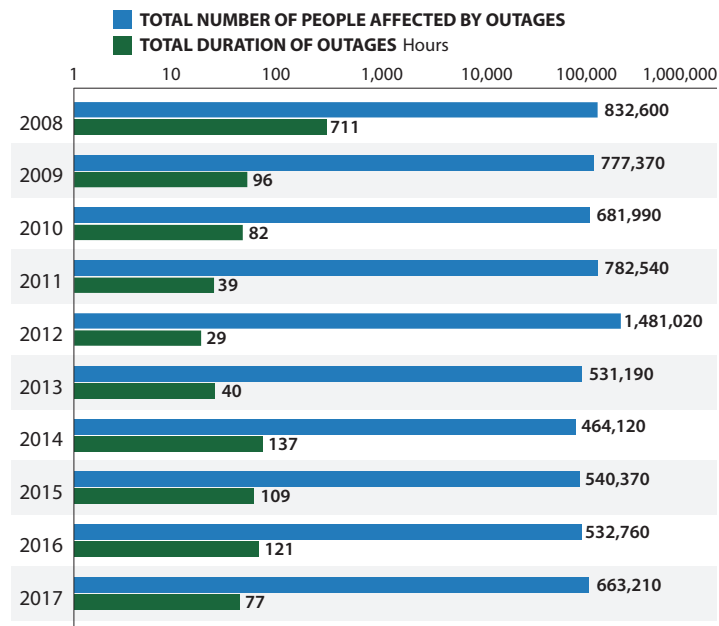
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



- In 2018, the average Ohio electric customer experienced 1.4 service interruptions that lasted an average of 4 hours.
- In Ohio, between 2008 and 2017:
 - The greatest number of electric outages occurred in **September** (8th for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 728,717 customers on average

Electric Utility Outage Data, 2008 – 2017

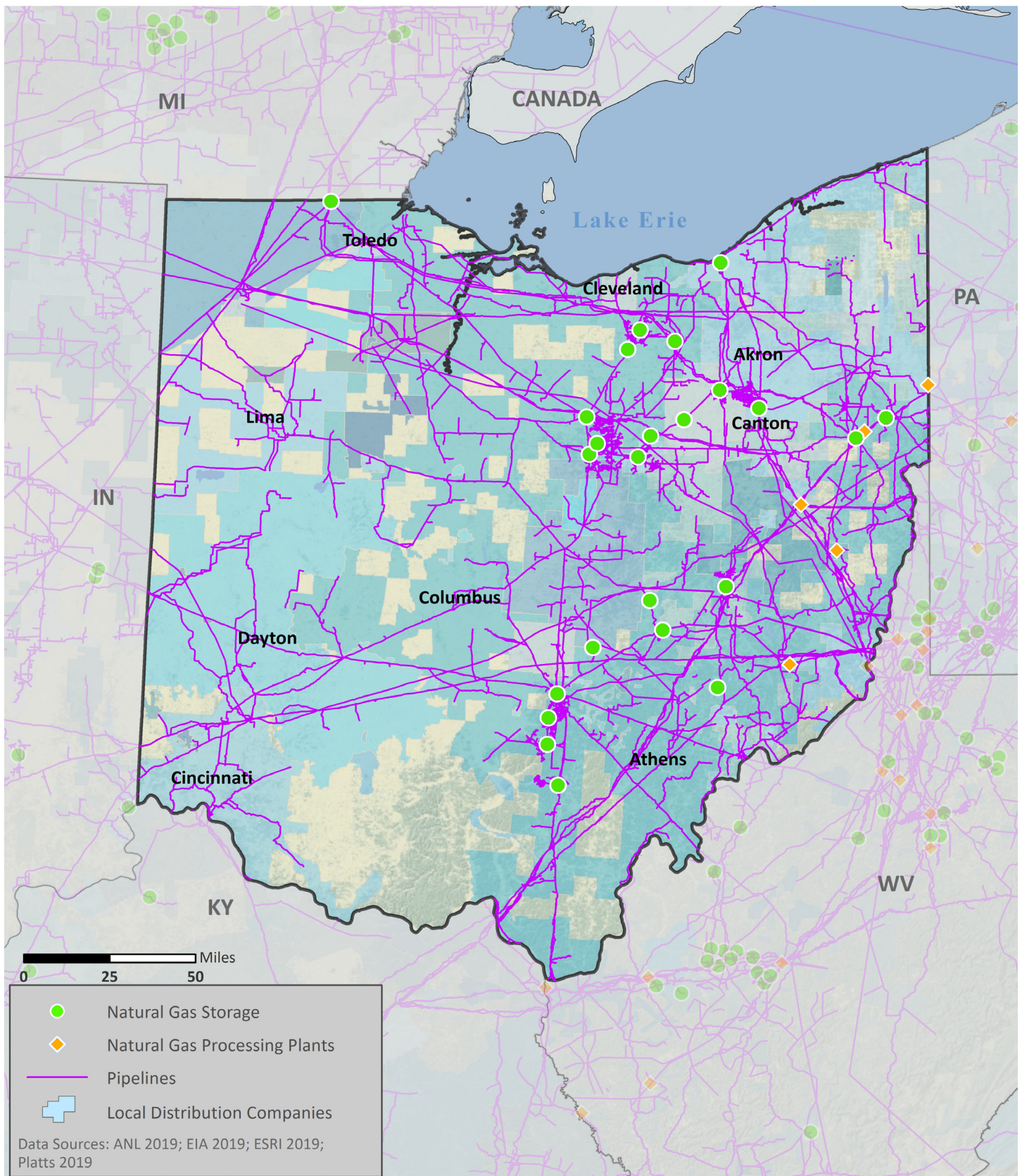


Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton



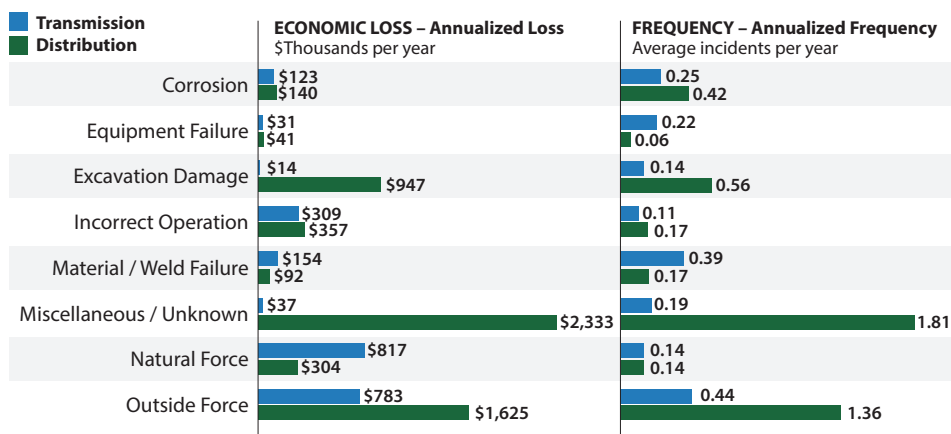


NATURAL GAS



Natural Gas Transport

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



Data Source: DOT PHMSA

- As of 2018, Ohio had:
 - 10,599 miles of natural gas transmission pipelines
 - 58,770 miles of natural gas distribution pipelines
- 63% of Ohio's natural gas transmission system and 32% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Ohio's natural gas supply was most impacted by:
 - **Natural Forces** when transported by transmission pipelines (2nd leading cause nationwide at \$25.17M per year)
 - **Miscellaneous or Unknown** events when transported by distribution pipelines (2nd leading cause nationwide at \$67.89M per year)

Natural Gas Processing and Liquefied Natural Gas

Natural Gas Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	92%	27%
Commercial 	7%	16%
Industrial 	<1%	26%
Transportation 	<1%	<1%
Electric Power 	<1%	30%
Other	<1%	<1%

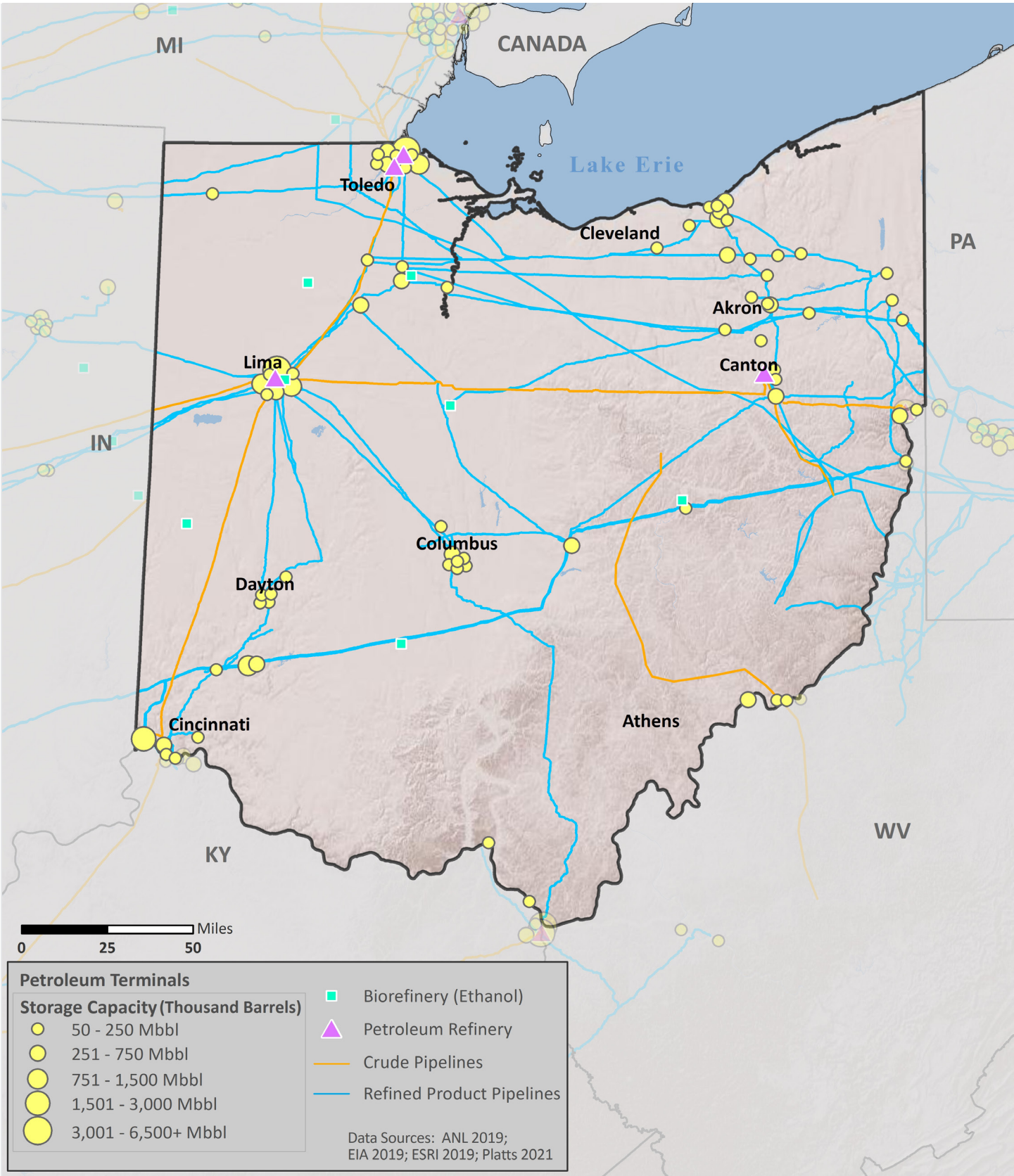
Data Source: EIA

- Ohio has 5 natural gas processing facilities with a total capacity of 2,165 MMcf/d.
- Ohio has 0 liquefied natural gas (LNG) facilities.



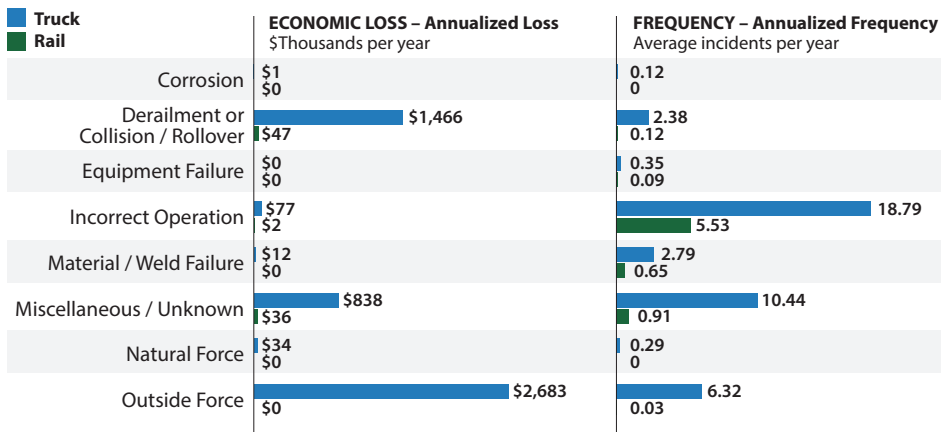


PETROLEUM



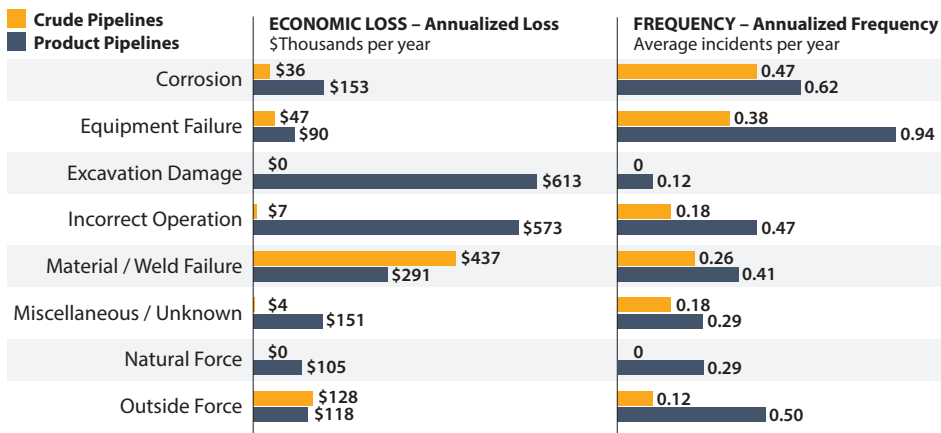
Petroleum Transport

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, Ohio had:

- 605 miles of crude oil pipelines
- 2,885 miles of refined product pipelines
- 0 miles of biofuels pipelines

- 64% of Ohio's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.

- Between 1986 and 2019, Ohio's petroleum supply was most impacted by:

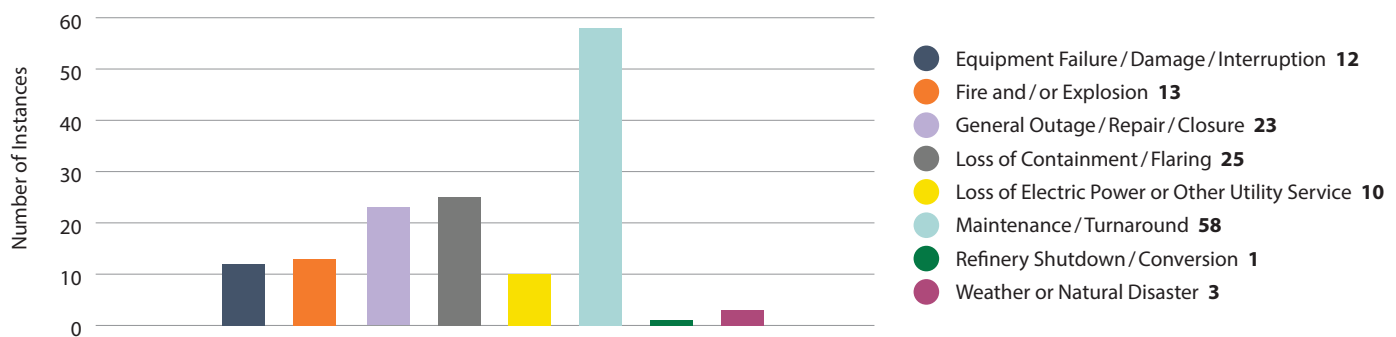
- **Outside Forces** when transported by truck (2nd leading cause nationwide at \$60.45M per year)
- **Derailments, Collisions, or Rollovers** when transported by rail (leading cause nationwide at \$19.71M per year)
- **Material Failures** when transported by crude pipelines (leading cause nationwide at \$41.36M per year)
- **Excavation Damage** when transported by product pipelines (5th leading cause nationwide at \$5.74M per year)

- Disruptions in other states may impact supply.

Petroleum Refineries

- Ohio has 4 petroleum refineries with a total operable capacity of 597.8 Mb/d.
- Between 2009 and 2019, the leading cause of petroleum refinery disruptions in Ohio was:
 - **Maintenance** (2nd leading cause nationwide)

Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing