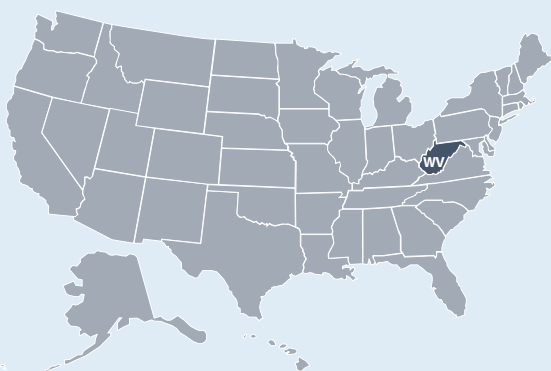




State of West Virginia

ENERGY SECTOR RISK PROFILE



West Virginia State Facts



POPULATION

1.81 M



HOUSING
UNITS

0.89 M



BUSINESS
ESTABLISHMENTS

0.04 M

ENERGY EMPLOYMENT: 49,539 jobs

PUBLIC UTILITY COMMISSION: Public Service Commission of West Virginia

STATE ENERGY OFFICE: West Virginia Office of Energy

EMERGENCY MANAGEMENT AGENCY: West Virginia Division of Emergency Management

AVERAGE ELECTRICITY TARIFF: 8.72 cents/kWh

ENERGY EXPENDITURES: \$4,111/capita

ENERGY CONSUMPTION PER CAPITA: 416 MMBtu
(10th highest out of 50 states and Washington, D.C.)

GDP: \$77.4 billion

Data from 2020 or most recent year available.

For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 33,650 GWh

COAL: 26,800 MSTN

NATURAL GAS: 99 Bcf

MOTOR GASOLINE: 16,700 Mbbl

DISTILLATE FUEL: 11,700 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 37 plants, 63.9 TWh,
15.5 GW total capacity

Coal: 10 plants, 58.2 TWh, 13.1 GW total capacity

Hydro: 12 plants, 1.7 TWh, 0.4 GW total capacity

Natural Gas: 4 plants, 2.2 TWh, 1.3 GW total capacity

Nuclear: 0 plants

Petroleum: 1 plant, 0.1 TWh, 0.0 GW total capacity

Wind & Solar: 6 plants, 1.6 TWh, 0.7 GW total capacity

Other sources: 4 plants, 0.0 TWh, 0.1 GW total capacity

COAL: 92,800 MSTN

NATURAL GAS: 2,160 Bcf

CRUDE OIL: 16,700 Mbbl

ETHANOL: 0 Mbbl

Data from EIA (2018, 2019).

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

West Virginia Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at \$28 million per year (leading cause nationwide at \$12 billion per year).
- West Virginia had 133 Major Disaster Declarations, 9 Emergency Declarations, and 0 Fire Management Assistance Declarations for 13 events between 2013 and 2019.
- West Virginia registered 15% fewer Heating Degree Days and 36% greater Cooling Degree Days than average in 2019.
- There is 1 Fusion Center located in Charleston.

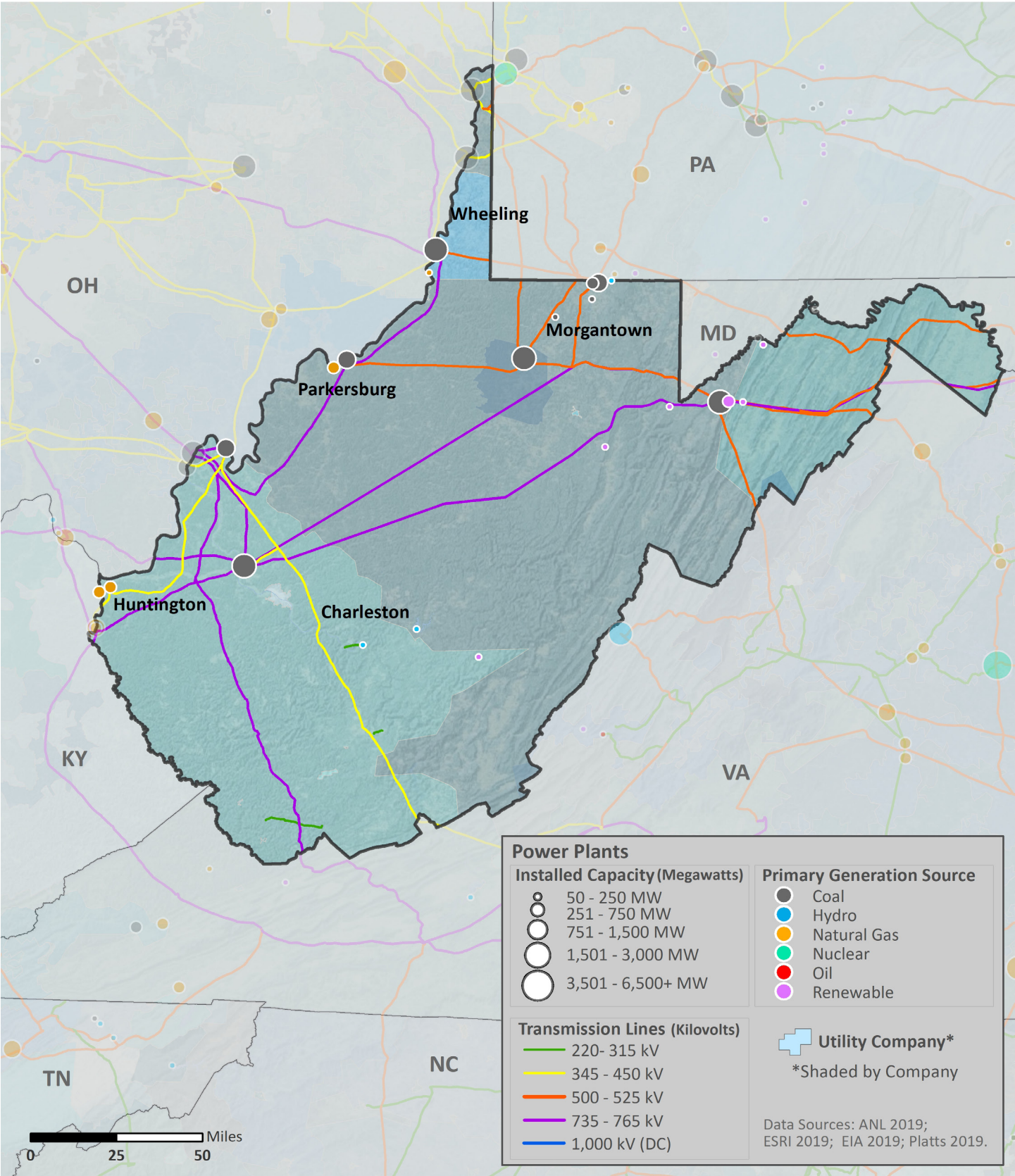
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	0	\$0
Earthquake (≥ 3.5 M)	0	\$0
Extreme Heat	2	\$0
Flood	36	\$28
Hurricane	0	\$0
Landslide	1	\$0
Thunderstorm & Lightning	75	\$9
Tornado	2	\$1
Wildfire	<1	\$0
Winter Storm & Extreme Cold	53	\$4

Data Sources: NOAA and USGS



ELECTRIC



Electric Infrastructure

- West Virginia has 4 electric utilities:
 - 1 Investor owned
 - 1 Cooperative
 - 2 Municipal
 - 0 Other utilities
- Plant retirements scheduled by 2025: None.

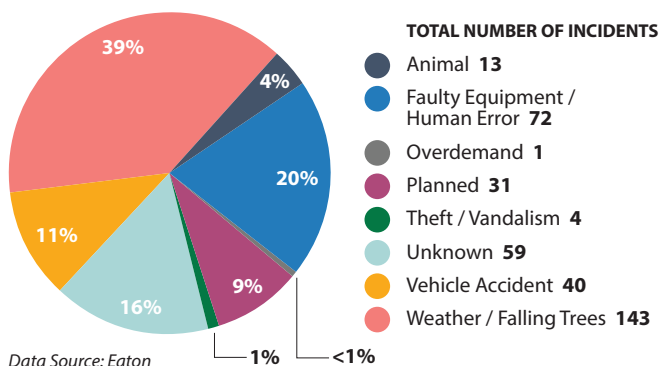
- In 2018, the average West Virginia electric customer experienced 2.6 service interruptions that lasted an average of 12.3 hours.
- In West Virginia, between 2008 and 2017:
 - The greatest number of electric outages occurred in **August** (3rd for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 241,107 customers on average

Electric Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	85%	35%
Commercial 	14%	23%
Industrial 	1%	42%
Transportation 	<1%	<1%

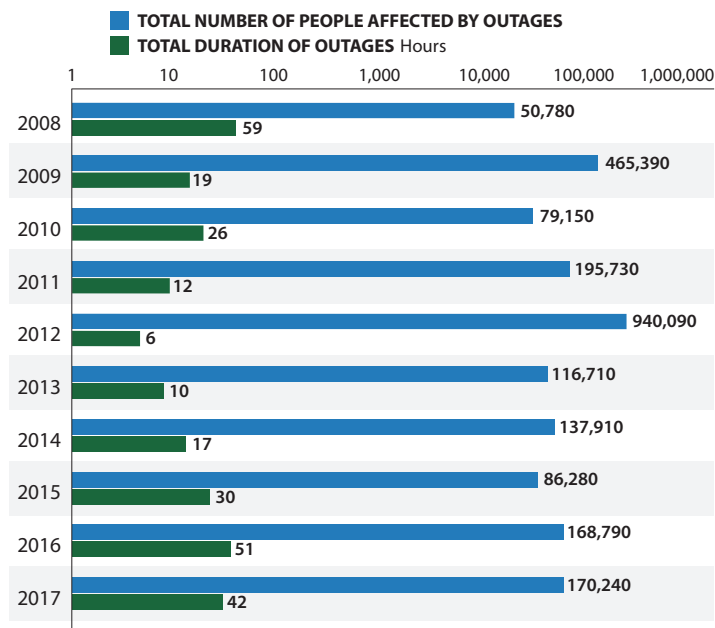
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017



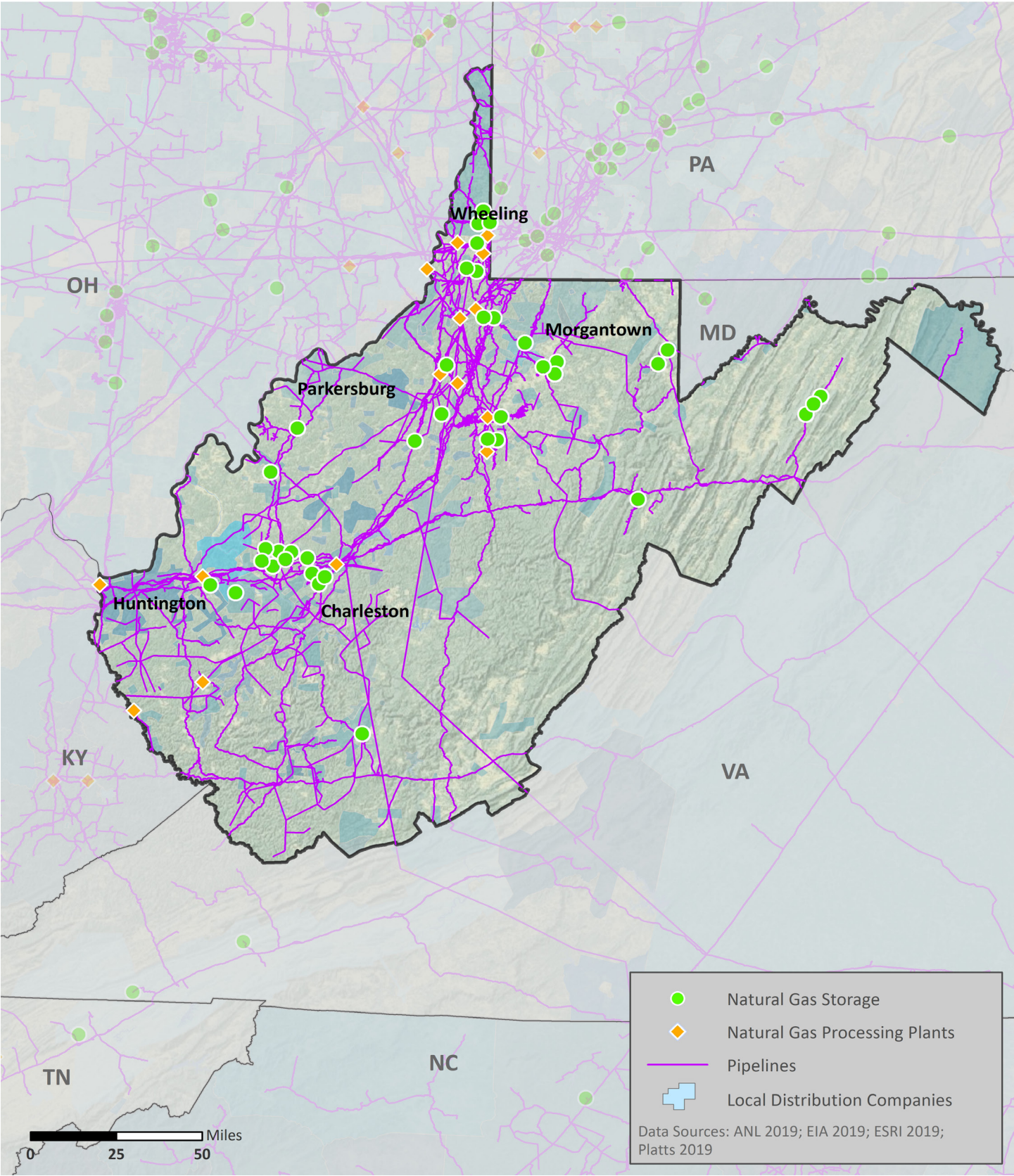
Note: This chart uses a logarithmic scale to display a very wide range of values.

Data Source: Eaton



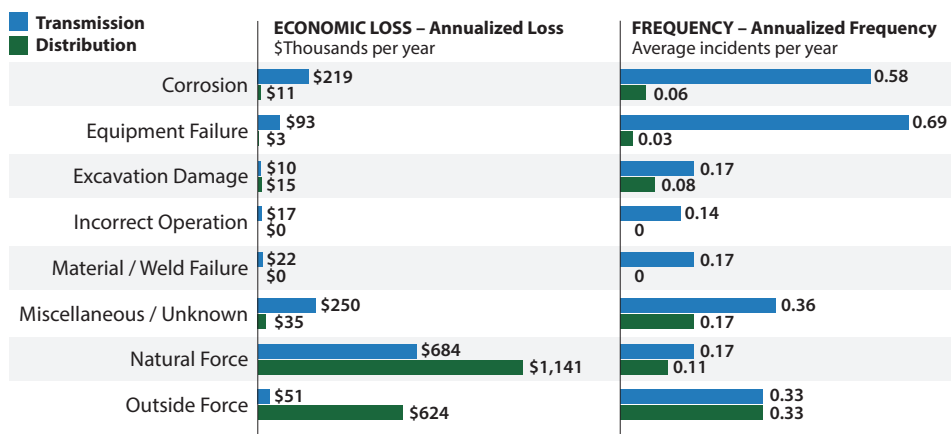


NATURAL GAS



Natural Gas Transport

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



Data Source: DOT PHMSA

- As of 2018, West Virginia had:
 - 3,560 miles of natural gas transmission pipelines
 - 10,969 miles of natural gas distribution pipelines
- 43% of West Virginia's natural gas transmission system and 45% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, West Virginia's natural gas supply was most impacted by:
 - Natural Forces** when transported by transmission pipelines (2nd leading cause nationwide at \$25.17M per year)
 - Natural Forces** when transported by distribution pipelines (4th leading cause nationwide at \$26.42M per year)

Natural Gas Processing and Liquefied Natural Gas

Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential 	91%	25%
Commercial 	9%	24%
Industrial 	<1%	35%
Transportation 	<1%	<1%
Electric Power 	<1%	16%
Other	<1%	<1%

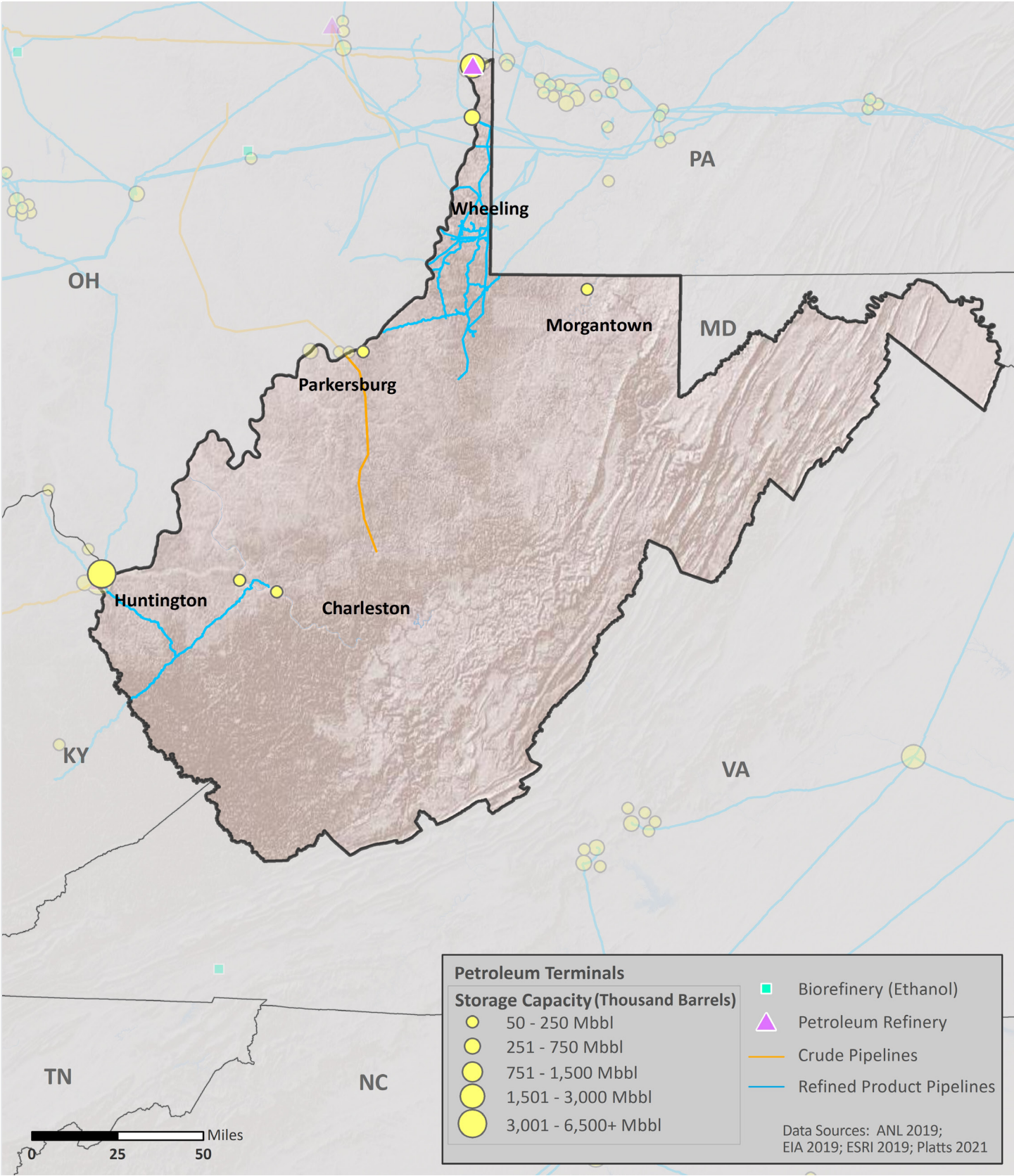
Data Source: EIA

- West Virginia has 15 natural gas processing facilities with a total capacity of 5,504 MMcf/d.
- West Virginia has 0 liquefied natural gas (LNG) facilities with a total storage capacity of 0 barrels.



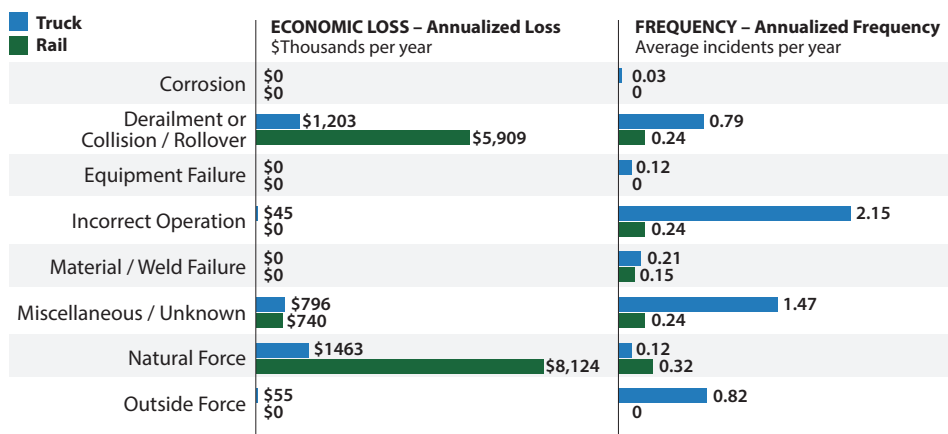


PETROLEUM



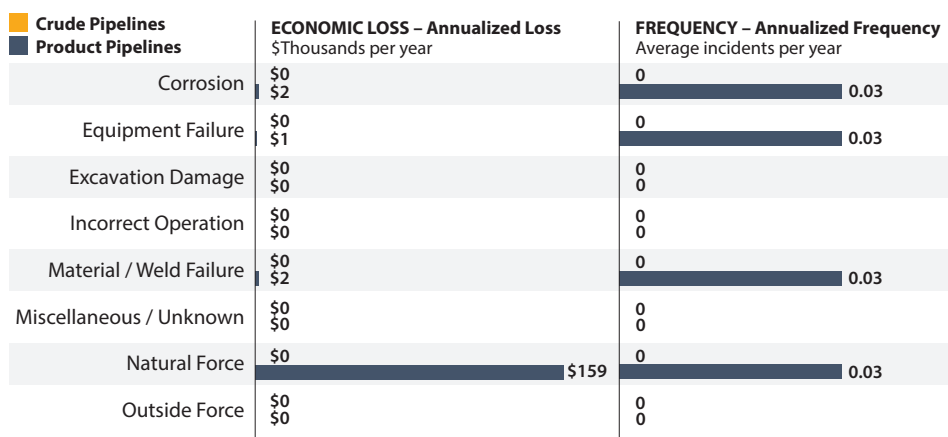
Petroleum Transport

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, West Virginia had:
 - 5 miles of crude oil pipelines
 - 41 miles of refined product pipelines
 - 0 miles of biofuels pipelines
- 14% of West Virginia's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, West Virginia's petroleum supply was most impacted by:
 - **Natural Forces** when transported by truck (4th leading cause nationwide at \$28.16M per year)
 - **Natural Forces** when transported by rail (2nd leading cause nationwide at \$9.17M per year)
 - **Natural Forces** when transported by product pipelines (8th leading cause nationwide at \$2.12M per year)
- Disruptions in other states may impact supply.

Petroleum Refineries

- West Virginia has 1 petroleum refinery with a total operable capacity of 22.3 Mb/d.
- Between 2009 and 2019, no petroleum refinery disruptions were recorded in West Virginia.

