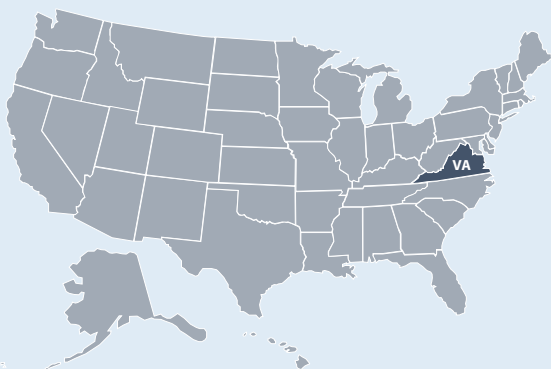




State of Virginia

ENERGY SECTOR RISK PROFILE



Virginia State Facts



POPULATION

8.52 M



HOUSING
UNITS

3.54 M



BUSINESS
ESTABLISHMENTS

0.20 M

ENERGY EMPLOYMENT: 55,305 jobs

PUBLIC UTILITY COMMISSION: Virginia State Corporation
Commission

STATE ENERGY OFFICE: Virginia Department of Mines, Minerals
and Energy – Division of Energy

EMERGENCY MANAGEMENT AGENCY: Virginia Department of
Emergency Management

AVERAGE ELECTRICITY TARIFF: 9.48 cents/kWh

ENERGY EXPENDITURES: \$3,215/capita

ENERGY CONSUMPTION PER CAPITA: 272 MMBtu
(32nd highest out of 50 states and Washington, D.C.)

GDP: \$532.9 billion

Data from 2020 or most recent year available.

For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 118,960 GWh

COAL: 6,500 MSTN

NATURAL GAS: 665 Bcf

MOTOR GASOLINE: 77,400 Mbbl

DISTILLATE FUEL: 33,100 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 162 plants, 96.8 TWh,
29.9 GW total capacity

Coal: 6 plants, 3.4 TWh, 3.0 GW total capacity

Hydro: 25 plants, 1.5 TWh, 0.8 GW total capacity

Natural Gas: 29 plants, 58.0 TWh, 14.9 GW total capacity

Nuclear: 2 plants, 29.5 TWh, 3.7 GW total capacity

Petroleum: 38 plants, 0.3 TWh, 2.7 GW total capacity

Wind & Solar: 27 plants, 0.9 TWh, 0.6 GW total capacity

Other sources: 35 plants, 3.2 TWh, 4.1 GW total capacity

COAL: 13,700 MSTN

NATURAL GAS: 110 Bcf

CRUDE OIL: 0 Mbbl

ETHANOL: 1,500 Mbbl

Data from EIA (2018, 2019).

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

Virginia Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at \$21 million per year (leading cause nationwide at \$12 billion per year).
- Virginia had 108 Major Disaster Declarations, 134 Emergency Declarations, and 0 Fire Management Assistance Declarations for 5 events between 2013 and 2019.
- Virginia registered 16% fewer Heating Degree Days and 40% greater Cooling Degree Days than average in 2019.
- There are 2 Fusion Centers in Virginia. The Primary Fusion Center is located in North Chesterfield.

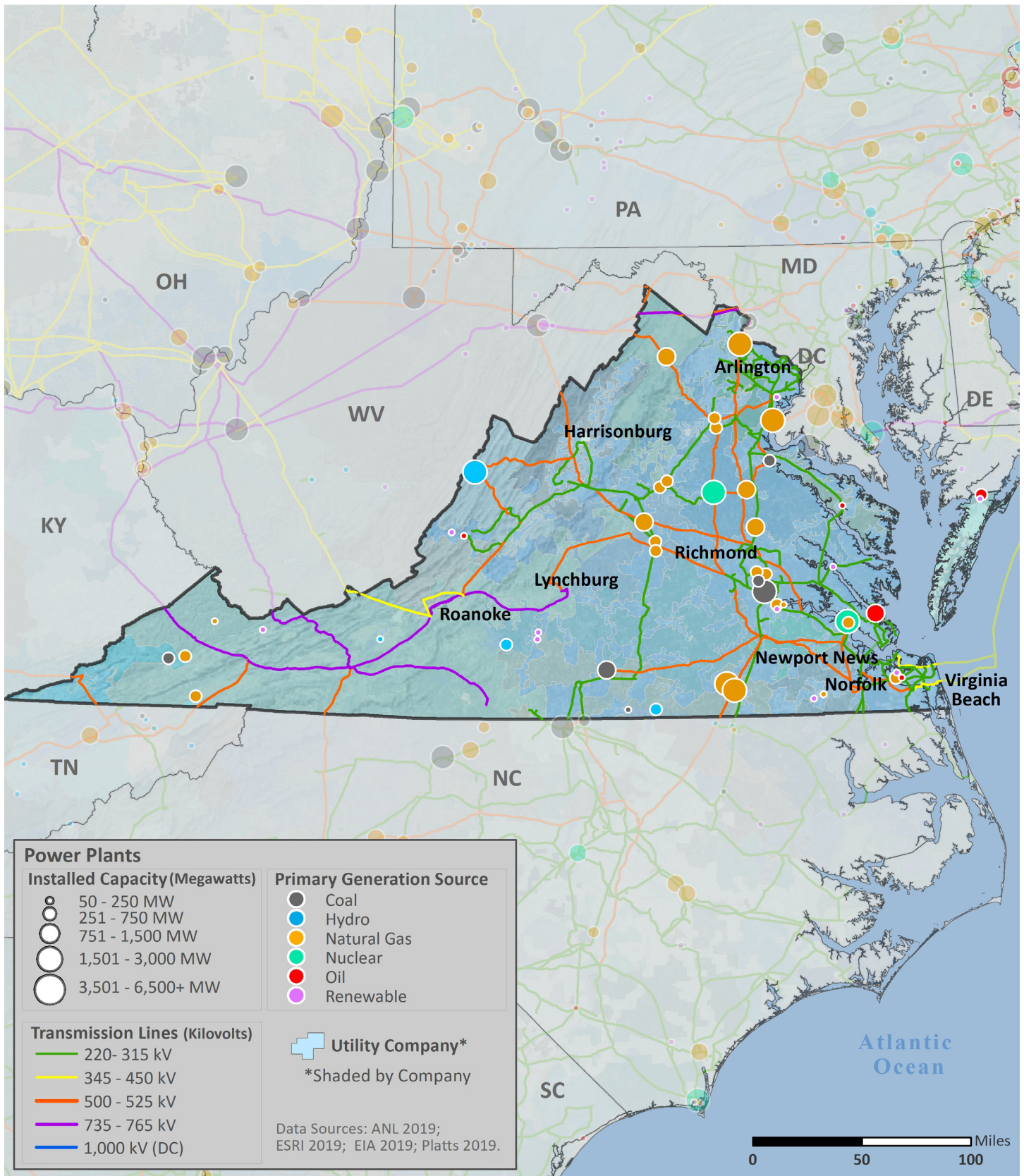
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	0	\$0
Earthquake (≥ 3.5 M)	<1	\$0
Extreme Heat	5	\$0
Flood	48	\$21
Hurricane	1	\$3
Landslide	1	\$0
Thunderstorm & Lightning	145	\$8
Tornado	10	\$10
Wildfire	1	\$1
Winter Storm & Extreme Cold	46	\$1

Data Sources: NOAA and USGS



ELECTRIC



Electric Infrastructure

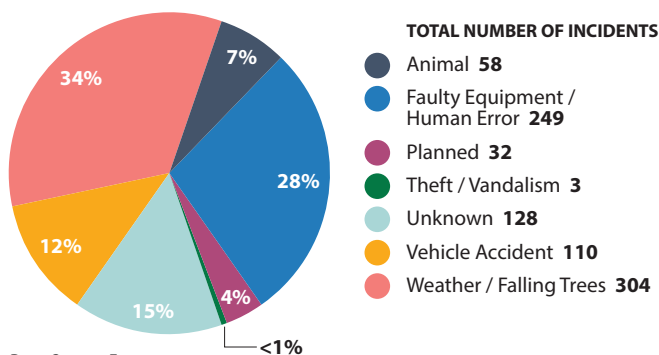
- Virginia has 35 electric utilities:
 - 1 Investor owned
 - 13 Cooperative
 - 15 Municipal
 - 6 Other utilities
- Plant retirements scheduled by 2025: 25 electric generating units totaling 2,078 MW of installed capacity.

Electric Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	89%	41%
Commercial 	11%	44%
Industrial 	<1%	15%
Transportation 	<1%	<1%

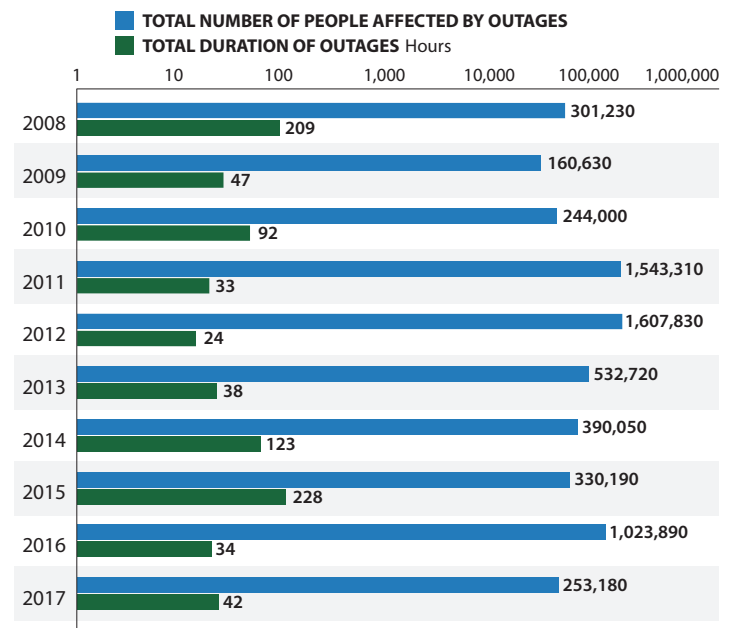
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



- In 2018, the average Virginia electric customer experienced 1.8 service interruptions that lasted an average of 8.5 hours.
- In Virginia, between 2008 and 2017:
 - The greatest number of electric outages occurred in **October** (5th for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 638,703 customers on average

Electric Utility Outage Data, 2008 – 2017

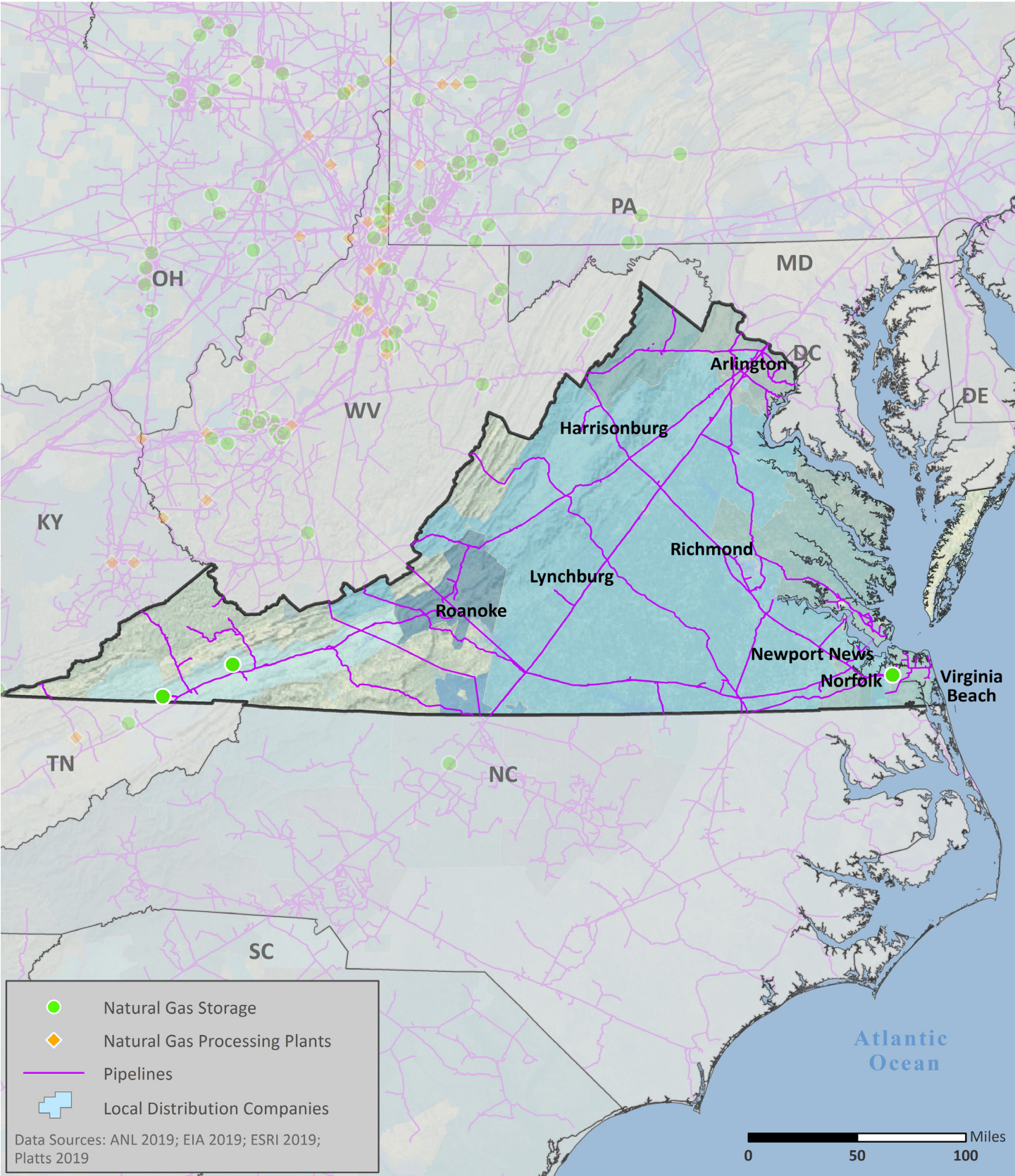


Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton





NATURAL GAS



Natural Gas Transport

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

	Transmission	Distribution	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion			\$213 \$34	0.08 0.11
Equipment Failure			\$8 \$0	0.06 0
Excavation Damage			\$6 \$47	0.03 0.36
Incorrect Operation			\$0 \$41	0 0.14
Material / Weld Failure			\$6 \$0	0.06 0
Miscellaneous / Unknown			\$36 \$1,647	0.11 0.67
Natural Force			\$3 \$118	0.03 0.22
Outside Force			\$26 \$925	0.14 1.42

Data Source: DOT PHMSA

- As of 2018, Virginia had:
 - 3,173 miles of natural gas transmission pipelines
 - 21,774 miles of natural gas distribution pipelines
- 58% of Virginia's natural gas transmission system and 27% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Virginia's natural gas supply was most impacted by:
 - Corrosion** when transported by transmission pipelines (4th leading cause nationwide at \$20.15M 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%	14%
Commercial 	8%	12%
Industrial 	<1%	16%
Transportation 	<1%	<1%
Electric Power 	<1%	58%
Other	<1%	<1%

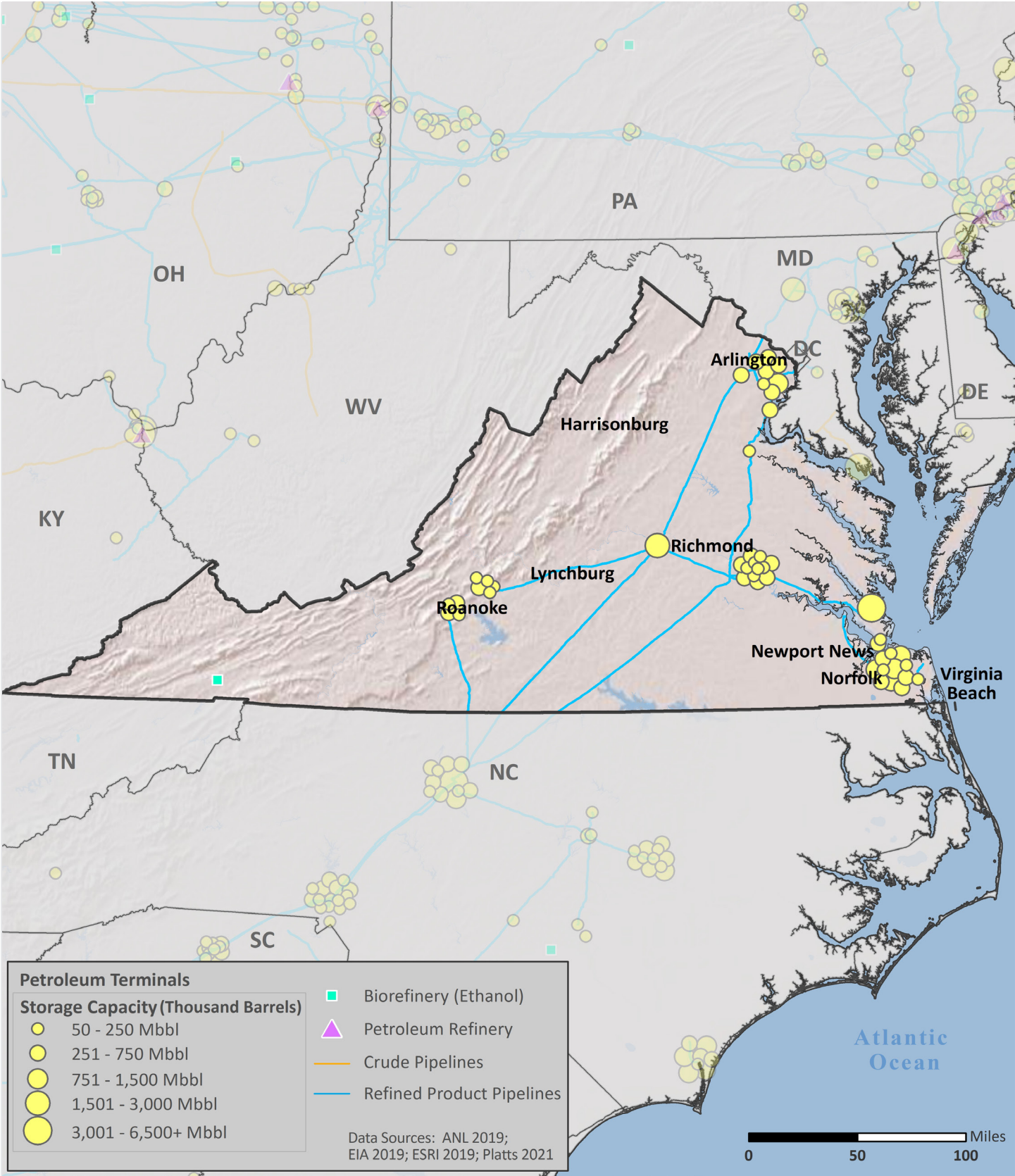
Data Source: EIA

- Virginia has 0 natural gas processing facilities.
- Virginia has 2 liquefied natural gas (LNG) facilities with a total storage capacity of 407,200 barrels.



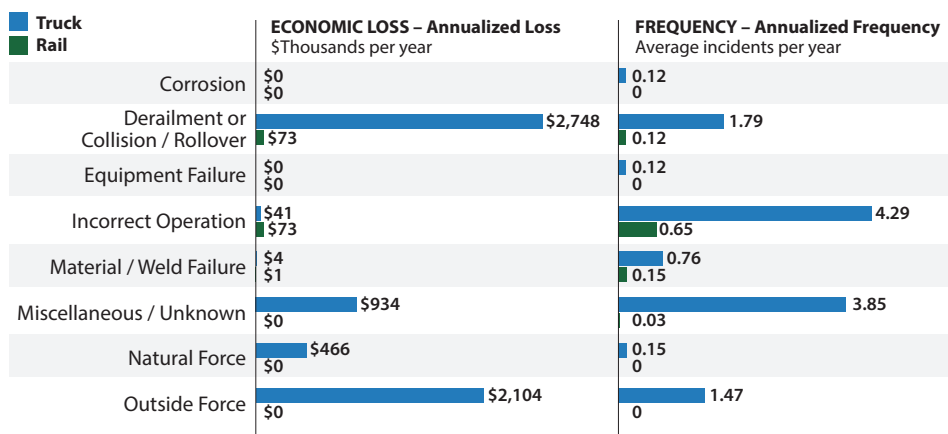


PETROLEUM



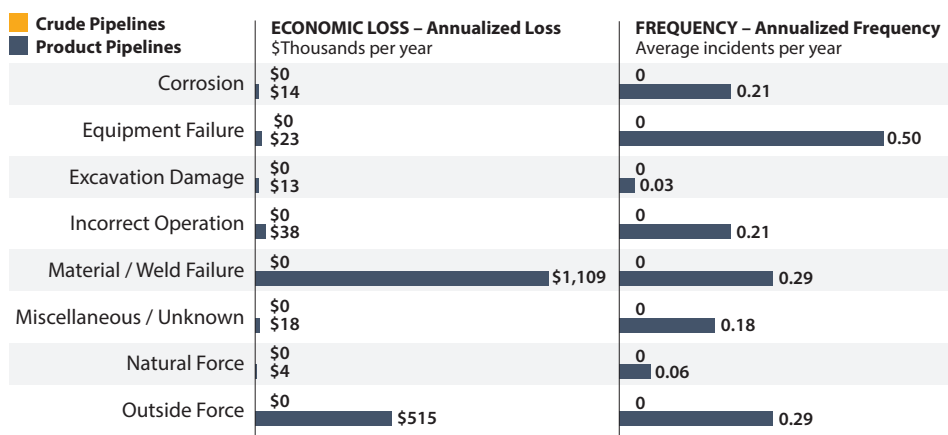
Petroleum Transport

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, Virginia had:
 - 0 miles of crude oil pipelines
 - 1,146 miles of refined product pipelines
 - 0 miles of biofuels pipelines
- 72% of Virginia's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Virginia's petroleum supply was most impacted by:
 - Derailments, Collision, or Rollovers** when transported by truck (8th leading cause nationwide at \$0.07M per year)
 - Incorrect Operations** when transported by rail (4th leading cause nationwide at \$2.02M per year)
 - Material Failures** when transported by product pipelines (4th leading cause nationwide at \$9.47M per year)
- Disruptions in other states may impact supply.

Petroleum Refineries

- There are no operating petroleum refineries in Virginia.

