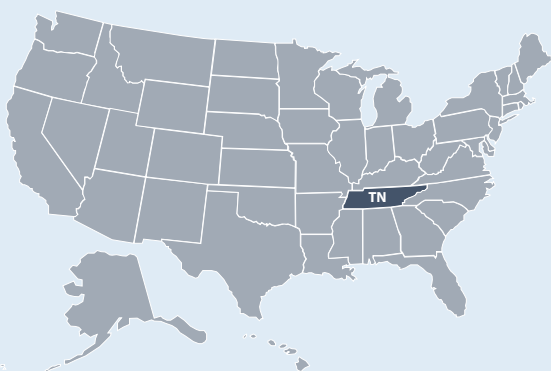




# State of Tennessee ENERGY SECTOR RISK PROFILE



## Tennessee State Facts



POPULATION

6.77 M



HOUSING UNITS

2.99 M



BUSINESS ESTABLISHMENTS

0.14 M

ENERGY EMPLOYMENT: 54,953 jobs

PUBLIC UTILITY COMMISSION: Tennessee Public Utility Commission

STATE ENERGY OFFICE: Tennessee Department of Environment and Conservation

EMERGENCY MANAGEMENT AGENCY: Tennessee Emergency Management Agency

AVERAGE ELECTRICITY TARIFF: 9.58 cents/kWh

ENERGY EXPENDITURES: \$3,591/capita

ENERGY CONSUMPTION PER CAPITA: 323 MMBtu (21st highest out of 50 states and Washington, D.C.)

GDP: \$364.1 billion

Data from 2020 or most recent year available.

For more information, see the Data Sources document.

## ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 102,910 GWh

COAL: 11,800 MSTN

NATURAL GAS: 391 Bcf

MOTOR GASOLINE: 82,000 Mbbl

DISTILLATE FUEL: 34,000 Mbbl

## ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 78 plants, 82.3 TWh, 24.0 GW total capacity

Coal: 5 plants, 18.7 TWh, 6.6 GW total capacity

Hydro: 28 plants, 10.1 TWh, 2.5 GW total capacity

Natural Gas: 14 plants, 17.0 TWh, 7.7 GW total capacity

Nuclear: 2 plants, 35.7 TWh, 5.0 GW total capacity

Petroleum: 3 plants, 0.1 TWh, 0.0 GW total capacity

Wind & Solar: 18 plants, 0.4 TWh, 0.2 GW total capacity

Other sources: 8 plants, 0.3 TWh, 1.9 GW total capacity

COAL: 400 MSTN

NATURAL GAS: 0 Bcf

CRUDE OIL: 300 Mbbl

ETHANOL: 5,400 Mbbl

Data from EIA (2018, 2019).

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

## Tennessee Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at \$481 million per year (leading cause nationwide at \$12 billion per year).
- Tennessee had 163 Major Disaster Declarations, 0 Emergency Declarations, and 6 Fire Management Assistance Declarations for 11 events between 2013 and 2019.
- Tennessee registered 15% fewer Heating Degree Days and 22% greater Cooling Degree Days than average in 2019.
- There is 1 Fusion Center located in Nashville.

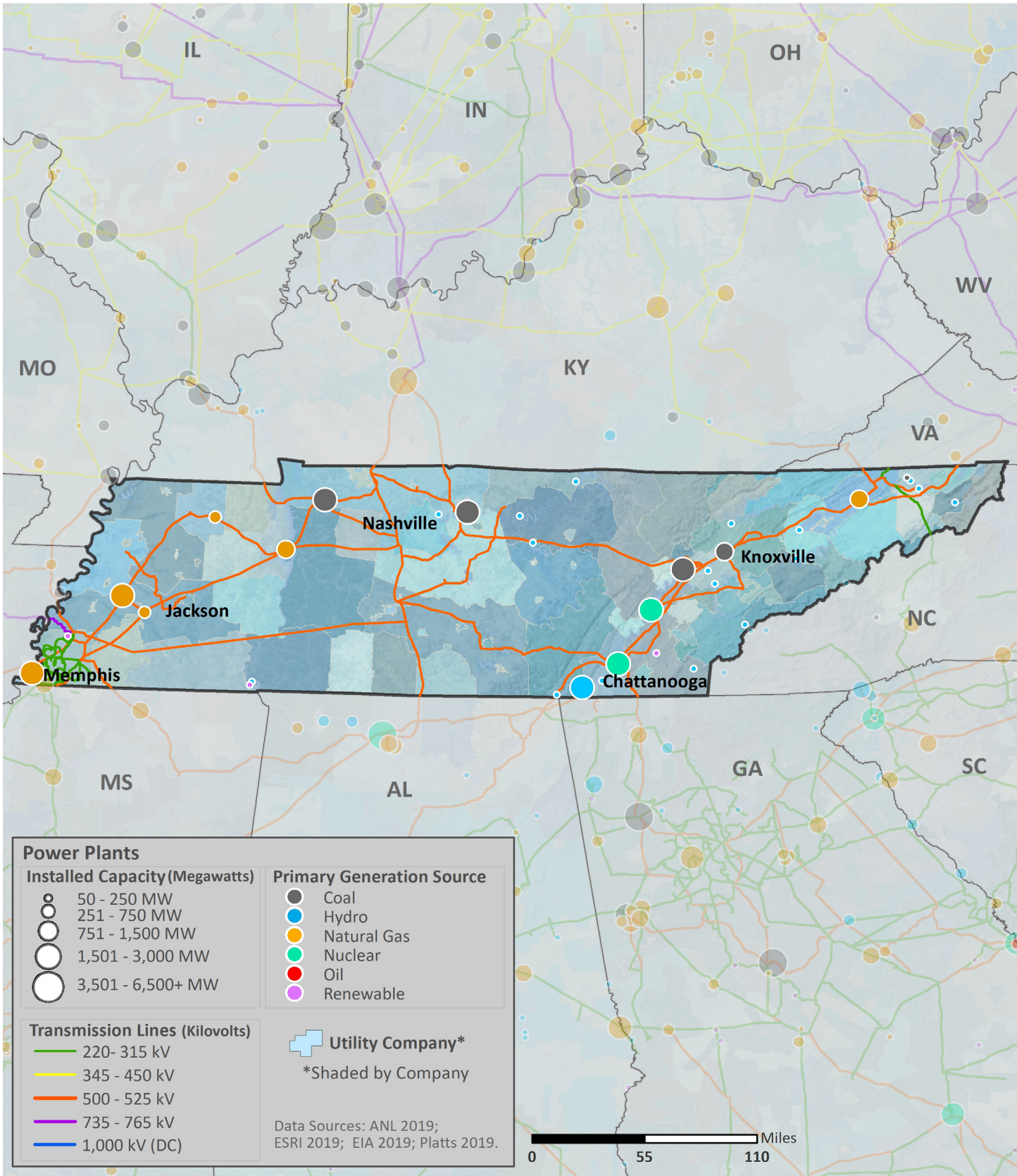
## Annualized Frequency of and Property Damage Due to Natural Hazards, 2009–2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	6	\$0
Earthquake (≥ 3.5 M)	<1	\$0
Extreme Heat	5	\$0
Flood	42	\$481
Hurricane	0	\$0
Landslide	<1	\$2
Thunderstorm & Lightning	123	\$13
Tornado	15	\$32
Wildfire	<1	\$0
Winter Storm & Extreme Cold	27	\$7

Data Sources: NOAA and USGS



# ELECTRIC











## Electric Infrastructure

- Tennessee has 83 electric utilities:
  - 0 Investor owned
  - 21 Cooperative
  - 61 Municipal
  - 1 Other utility
- Plant retirements scheduled by 2025: 1 electric generating unit totaling 889 MW of installed capacity.

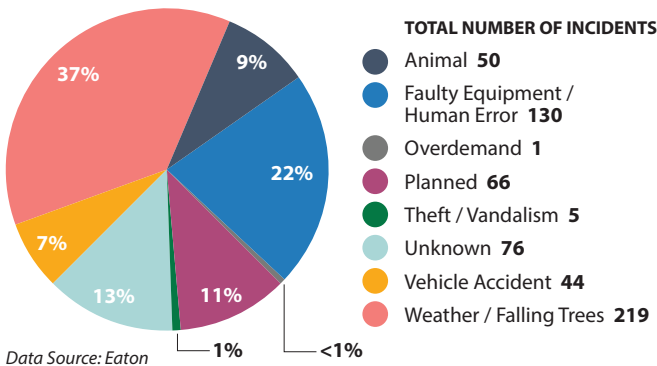
- In 2018, the average Tennessee electric customer experienced 1.8 service interruptions that lasted an average of 3.3 hours.
- In Tennessee, between 2008 and 2017:
  - The greatest number of electric outages occurred in **May** (9th for outages nationwide)
  - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
  - Electric outages affected 252,400 customers on average

### Electric Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	85%	43%
Commercial 	15%	36%
Industrial 	<1%	21%
Transportation 	<1%	<1%

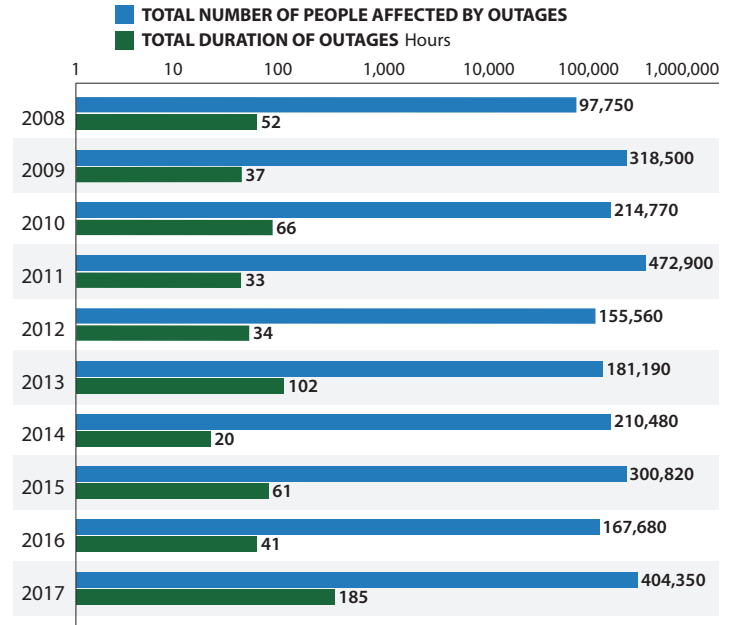
Data Source: EIA

### Electric Utility-Reported Outages by Cause, 2008 – 2017



Data Source: Eaton

### Electric Utility Outage Data, 2008 – 2017

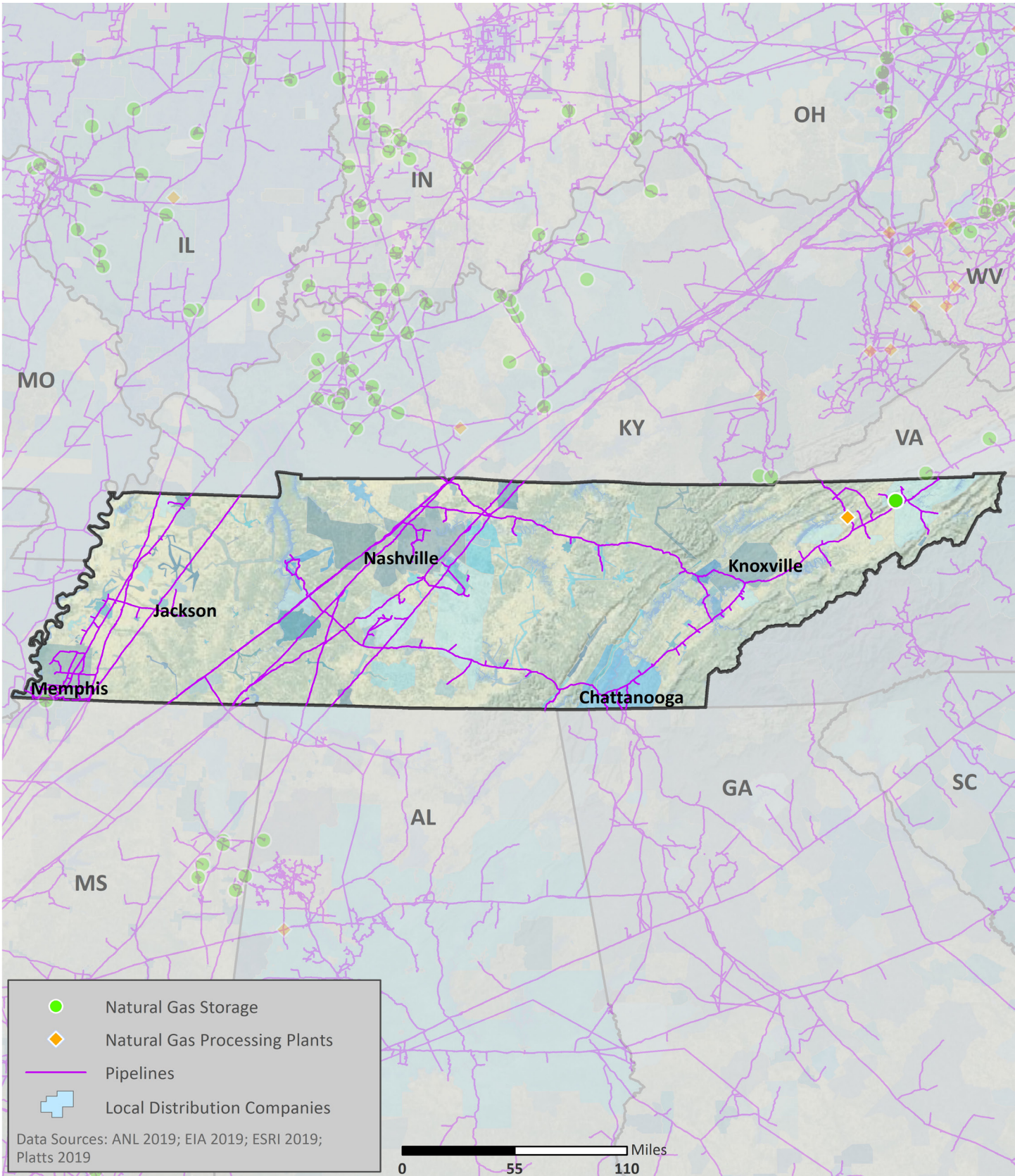


Note: This chart uses a logarithmic scale to display a very wide range of values.  
Data Source: Eaton





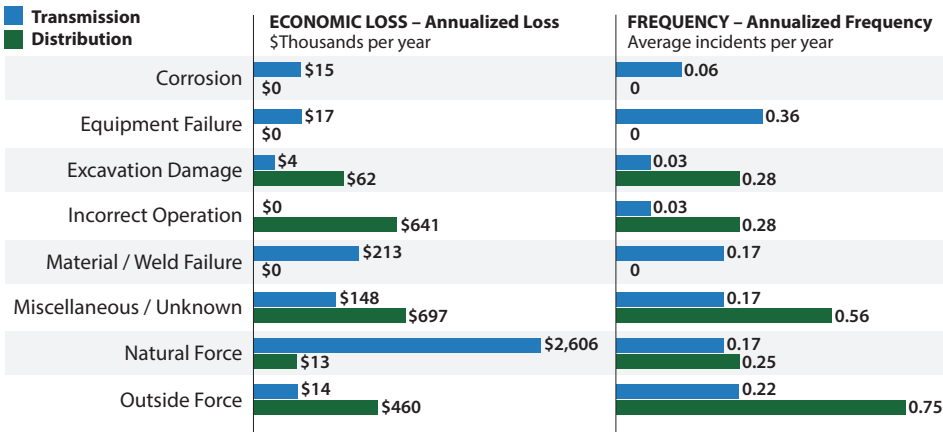
# NATURAL GAS





## Natural Gas Transport

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



Data Source: DOT PHMSA

- As of 2018, Tennessee had:
  - 4,937 miles of natural gas transmission pipelines
  - 40,327 miles of natural gas distribution pipelines
- 74% of Tennessee’s natural gas transmission system and 21% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Tennessee’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	89%	20%
Commercial	10%	16%
Industrial	<1%	40%
Transportation	<1%	<1%
Electric Power	<1%	24%
Other	<1%	<1%

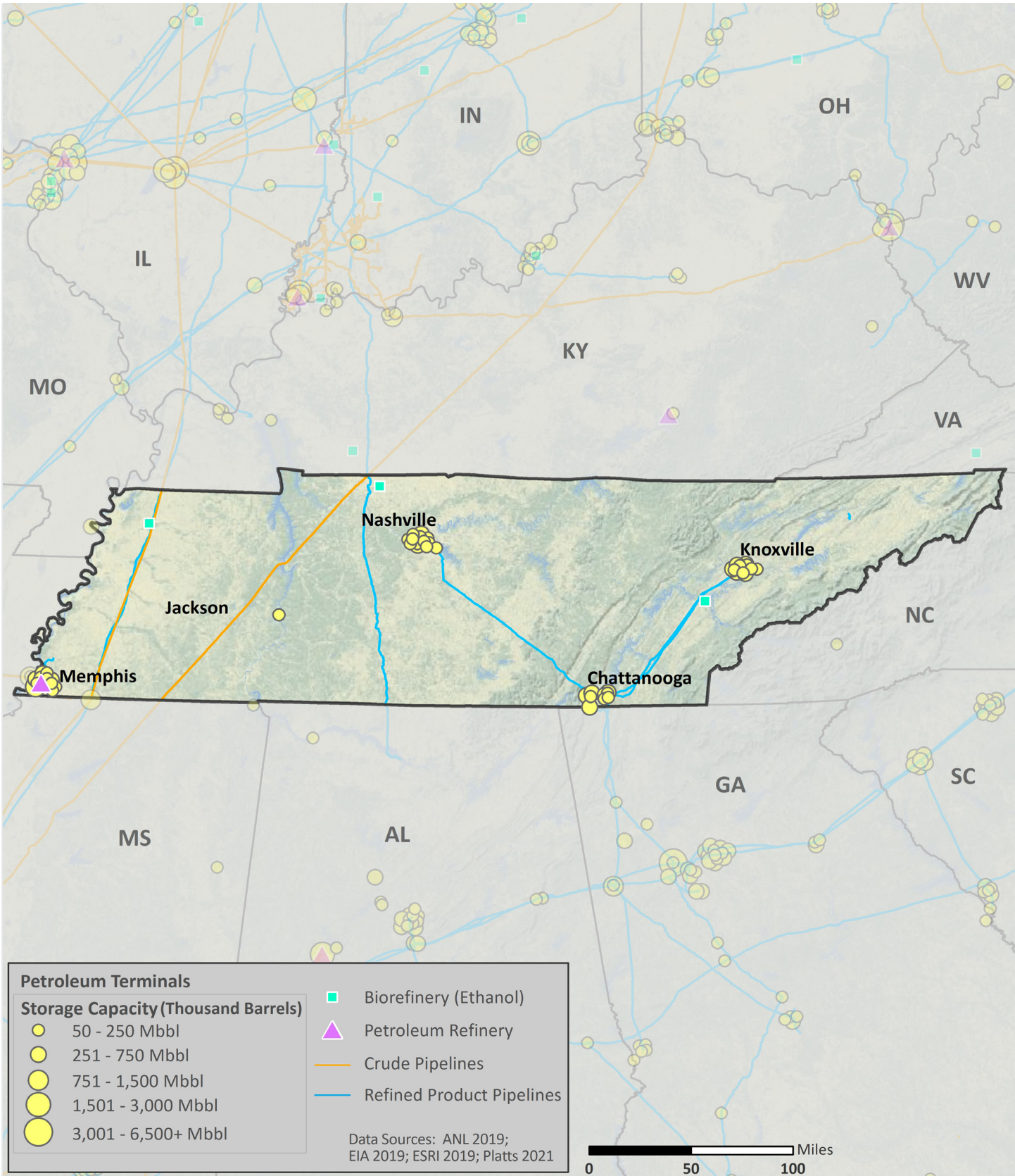
Data Source: EIA

- Tennessee has 1 natural gas processing facility with a total capacity of 25 MMcf/d.
- Tennessee has 5 liquefied natural gas (LNG) facilities with a total storage capacity of 1,276,000 barrels.



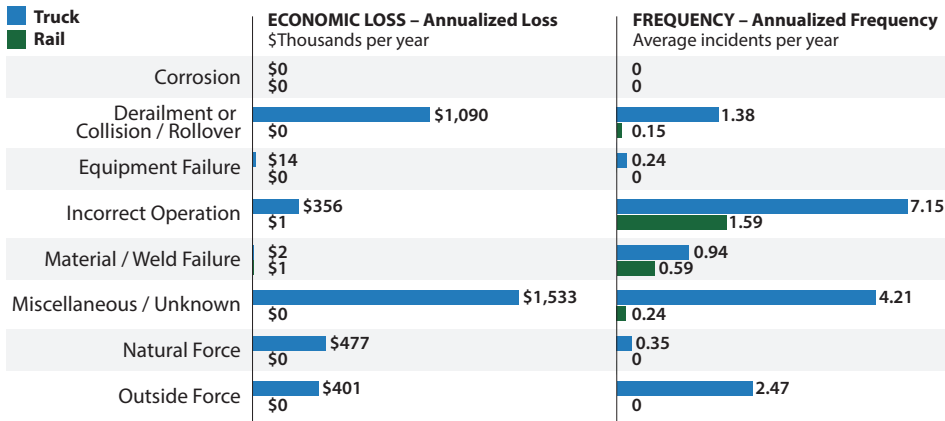


# PETROLEUM



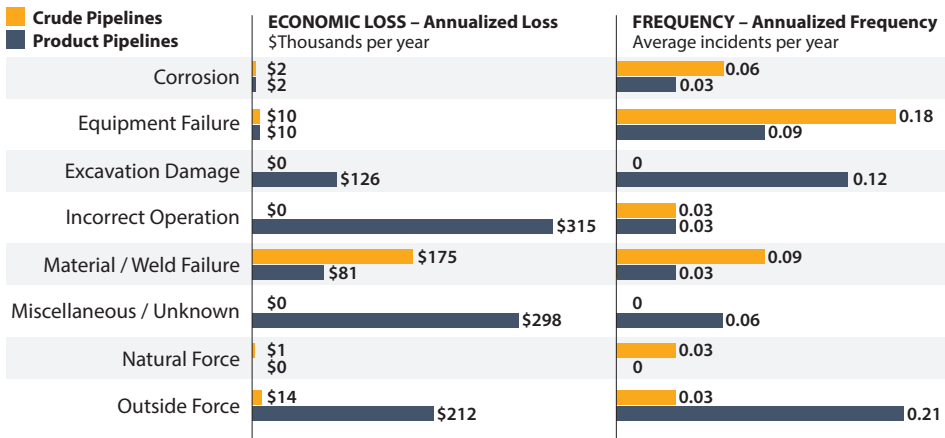
## Petroleum Transport

### 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



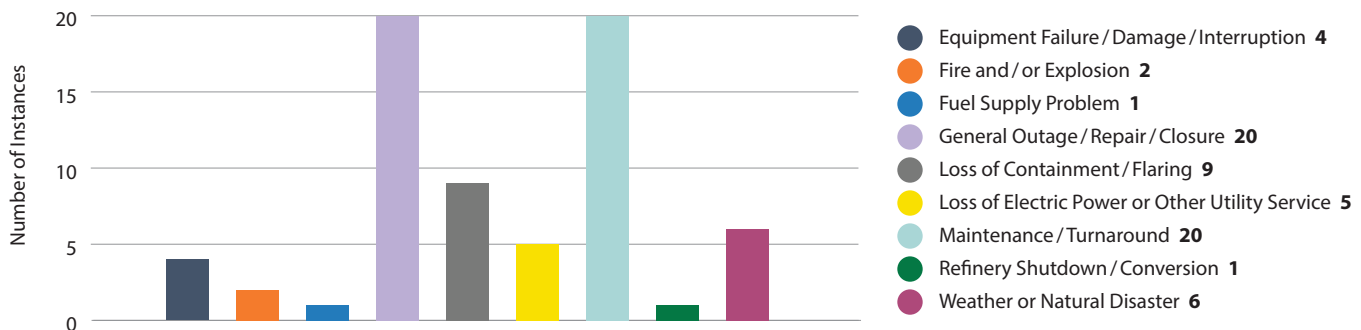
Data Source: DOT PHMSA

- As of 2018, Tennessee had:
  - 395 miles of crude oil pipelines
  - 869 miles of refined product pipelines
  - 0 miles of biofuels pipelines
- 65% of Tennessee’s petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Tennessee’s petroleum supply was most impacted by:
  - **Miscellaneous or Unknown events** when transported by truck (3rd leading cause nationwide at \$52.87M per year)
  - **Incorrect Operations** when transported by rail (4th leading cause nationwide at \$2.02M per year)
  - **Material Failures** when transported by crude pipelines (leading cause nationwide at \$41.36M per year)
  - **Incorrect Operations** when transported by product pipelines (7th leading cause nationwide at \$3.62M per year)
- Disruptions in other states may impact supply.

## Petroleum Refineries

- Tennessee has 1 petroleum refinery with a total operable capacity of 180 Mb/d.
- Between 2009 and 2019, the leading causes of petroleum refinery disruptions in Tennessee were:
  - **General Outages, Repairs, and/or Closures** (3rd leading cause nationwide)
  - **Maintenance** (2nd leading cause nationwide)

### Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing