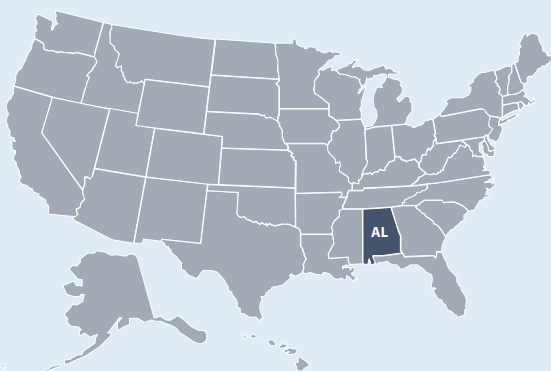




State of Alabama ENERGY SECTOR RISK PROFILE



Alabama State Facts



POPULATION

4.89 M



HOUSING UNITS

2.27 M



BUSINESS ESTABLISHMENTS

0.10 M

ENERGY EMPLOYMENT: 52,366 jobs
PUBLIC UTILITY COMMISSION: Alabama Public Service Commission

STATE ENERGY OFFICE: Department of Economic and Community Affairs, Energy Division

EMERGENCY MANAGEMENT AGENCY: Alabama Emergency Management Agency

AVERAGE ELECTRICITY TARIFF: 9.63 cents/kWh

ENERGY EXPENDITURES: \$4,192/capita

ENERGY CONSUMPTION PER CAPITA: 390 MMBtu (14th highest out of 50 states and Washington, D.C.)

GDP: \$221.7 billion

Data from 2020 or most recent year available. For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 90,290 GWh

COAL: 18,400 MSTN

NATURAL GAS: 693 Bcf

MOTOR GASOLINE: 61,100 Mbbl

DISTILLATE FUEL: 24,500 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 83 plants, 142.7 TWh, 25.0 GW total capacity

Coal: 4 plants, 26.7 TWh, 5.5 GW total capacity

Hydro: 23 plants, 11.4 TWh, 3.3 GW total capacity

Natural Gas: 27 plants, 57.2 TWh, 15.4 GW total capacity

Nuclear: 2 plants, 43.7 TWh, 5.3 GW total capacity

Petroleum: 4 plants, 0.0 TWh, 0.0 GW total capacity

Wind & Solar: 6 plants, 0.4 TWh, 0.2 GW total capacity

Other sources: 17 plants, 3.4 TWh, 0.7 GW total capacity

COAL: 12,900 MSTN

NATURAL GAS: 130 Bcf

CRUDE OIL: 4,900 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 Alabama’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.

Alabama Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Tornadoes** at \$458 million per year (4th leading cause nationwide at \$2 billion per year).
- Alabama had 90 Major Disaster Declarations, 126 Emergency Declarations, and 0 Fire Management Assistance Declarations for 10 events between 2013 and 2019.
- Alabama registered 18% fewer Heating Degree Days and 21% greater Cooling Degree Days than average in 2019.
- There is 1 Fusion Center located in Montgomery.

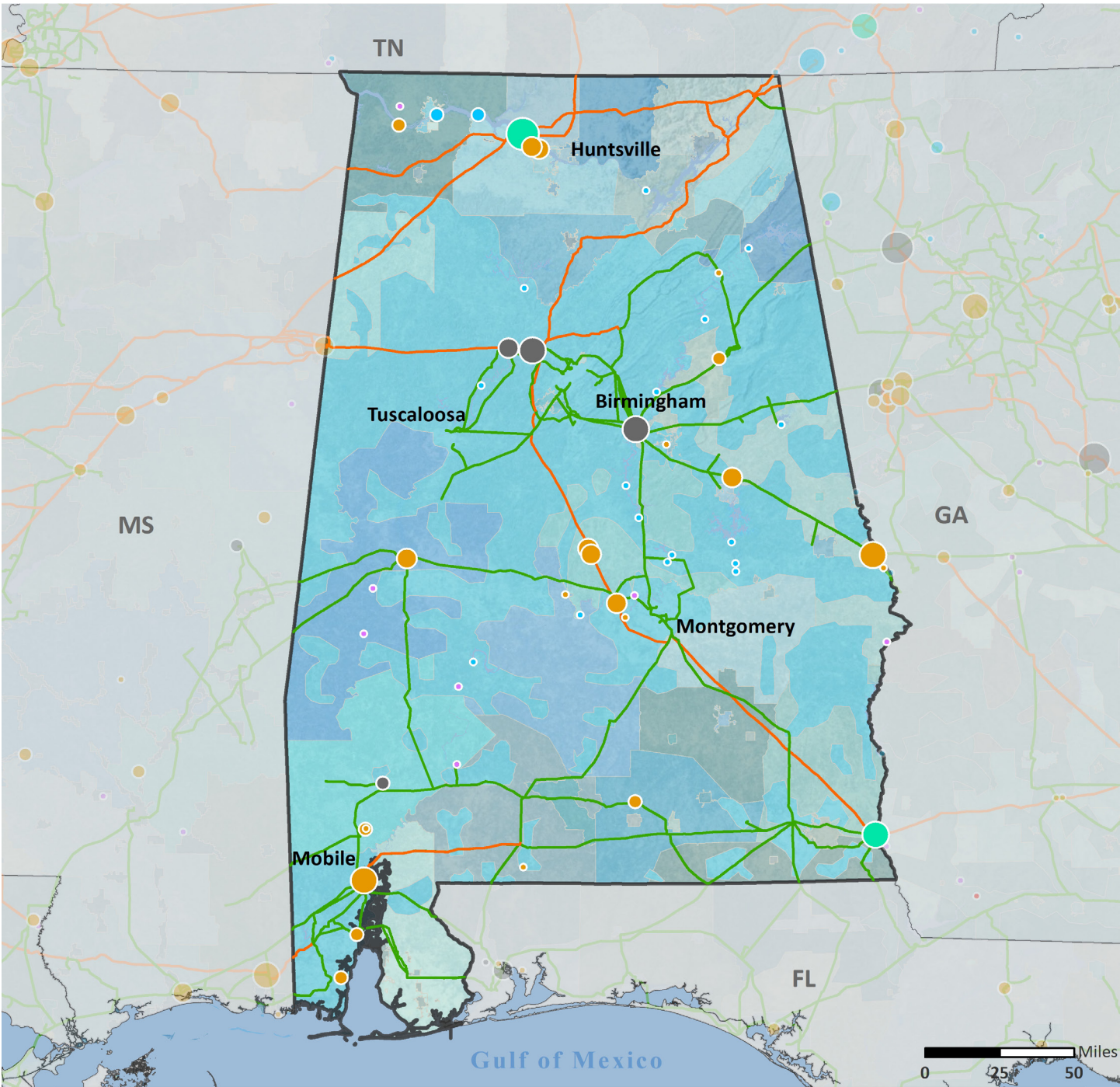
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	15	\$0
Earthquake (≥ 3.5 M)	<1	\$0
Extreme Heat	5	\$0
Flood	35	\$10
Hurricane	1	\$1
Landslide	<1	\$0
Thunderstorm & Lightning	109	\$6
Tornado	19	\$458
Wildfire	1	\$0
Winter Storm & Extreme Cold	12	\$0

Data Sources: NOAA and USGS



ELECTRIC



Power Plants	Primary Generation Source	Transmission Lines (Kilovolts)	Utility Company*
Installed Capacity (Megawatts) ○ 50 - 250 MW ○ 251 - 750 MW ○ 751 - 1,500 MW ○ 1,501 - 3,000 MW ○ 3,501 - 6,500+ MW	● Coal ● Hydro ● Natural Gas ● Nuclear ● Oil ● Renewable	— 220- 315 kV — 345 - 450 kV — 500 - 525 kV — 735 - 765 kV — 1,000 kV (DC)	+ Utility Company* *Shaded by Company







Data Sources: ANL 2019; ESRI 2019; EIA 2019; Platts 2019.

Electric Infrastructure

- Alabama has 62 electric utilities:
 - 2 Investor owned
 - 23 Cooperative
 - 36 Municipal
 - 1 Other utility
- Plant retirements scheduled by 2025: 12 electric generating units totaling 1,834 MW of installed capacity.

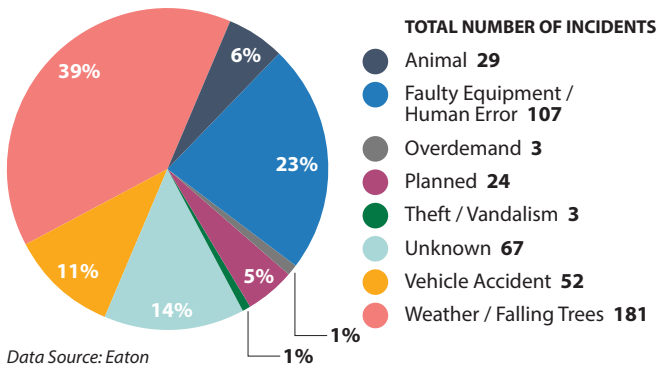
- In 2018, the average Alabama electric customer experienced 1.4 service interruptions that lasted an average of less than 1 hour.
- In Alabama, between 2008 and 2017:
 - The greatest number of electric outages occurred in **June** (2nd for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 263,682 customers on average

Electric Customers and Consumption by Sector, 2018

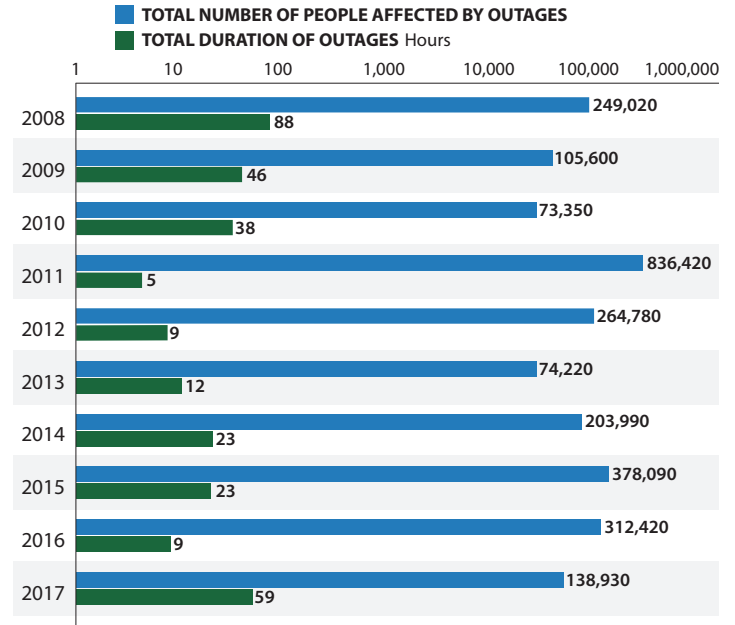
	 CUSTOMERS	 CONSUMPTION
Residential 	85%	37%
Commercial 	14%	26%
Industrial 	<1%	37%
Transportation 	<1%	<1%

Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017

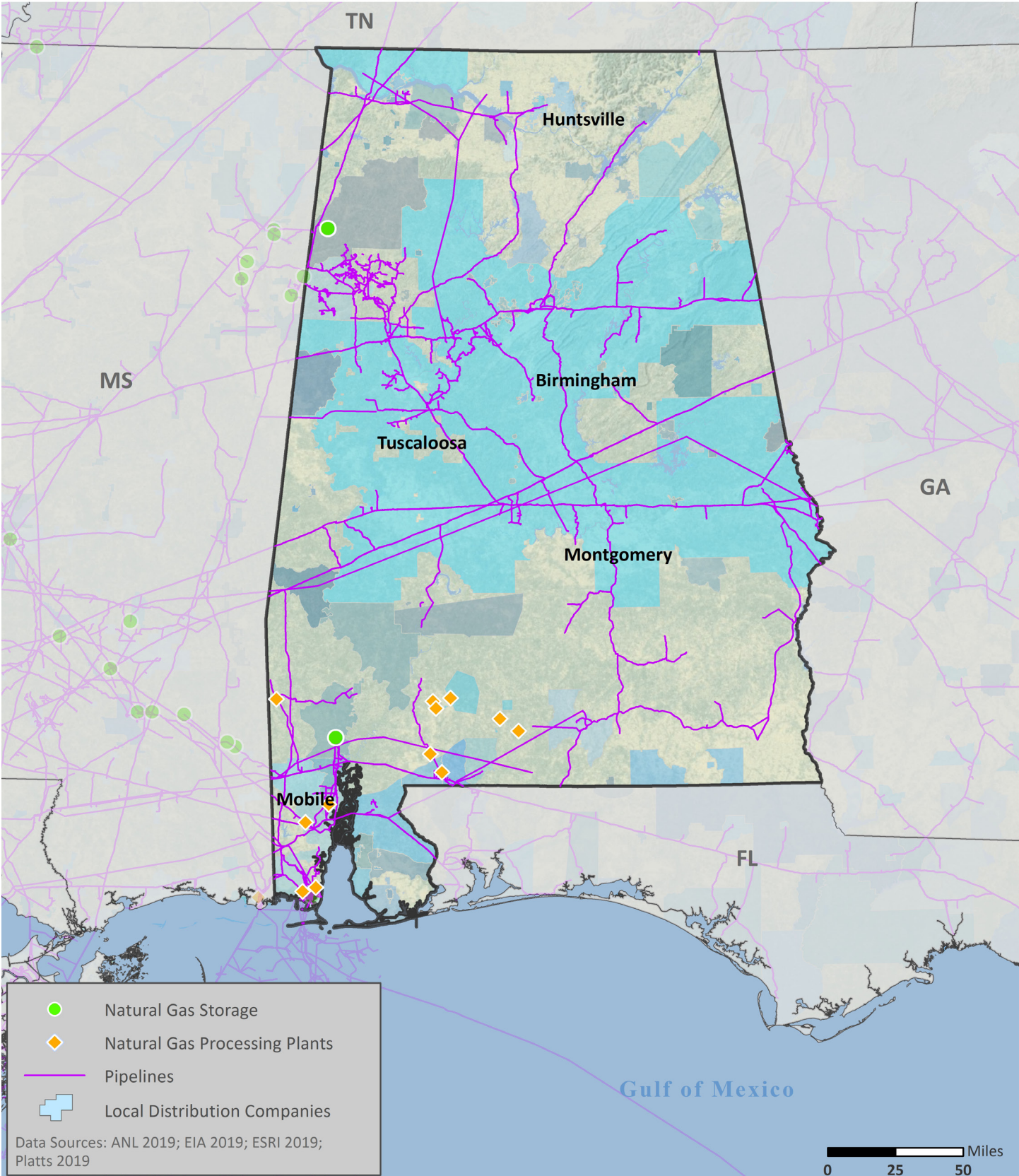


Electric Utility Outage Data, 2008 – 2017



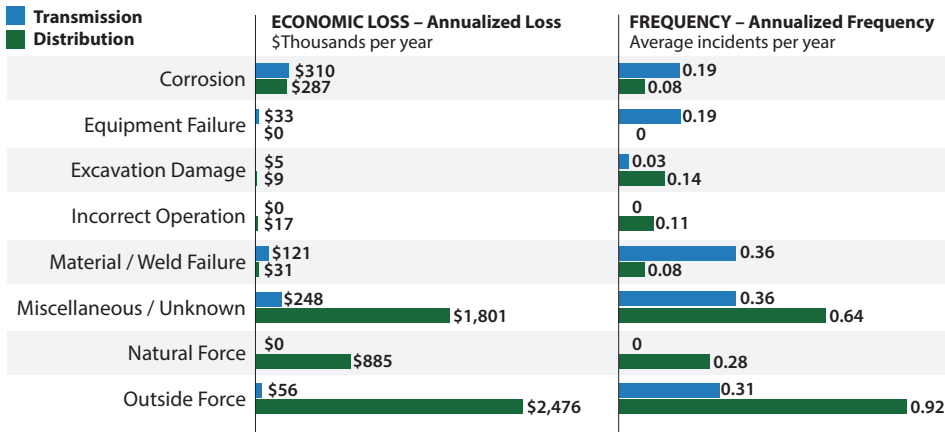


NATURAL GAS



Natural Gas Transport

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








Data Source: DOT PHMSA

- As of 2018, Alabama had:
 - 6,823 miles of natural gas transmission pipelines
 - 31,916 miles of natural gas distribution pipelines
- 48% of Alabama’s natural gas transmission system and 35% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Alabama’s natural gas supply was most impacted by:
 - **Corrosion** when transported by transmission pipelines (4th leading cause nationwide at \$20.15M 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 	91%	4%
Commercial 	8%	3%
Industrial 	<1%	27%
Transportation 	<1%	<1%
Electric Power 	<1%	66%
Other	<1%	<1%

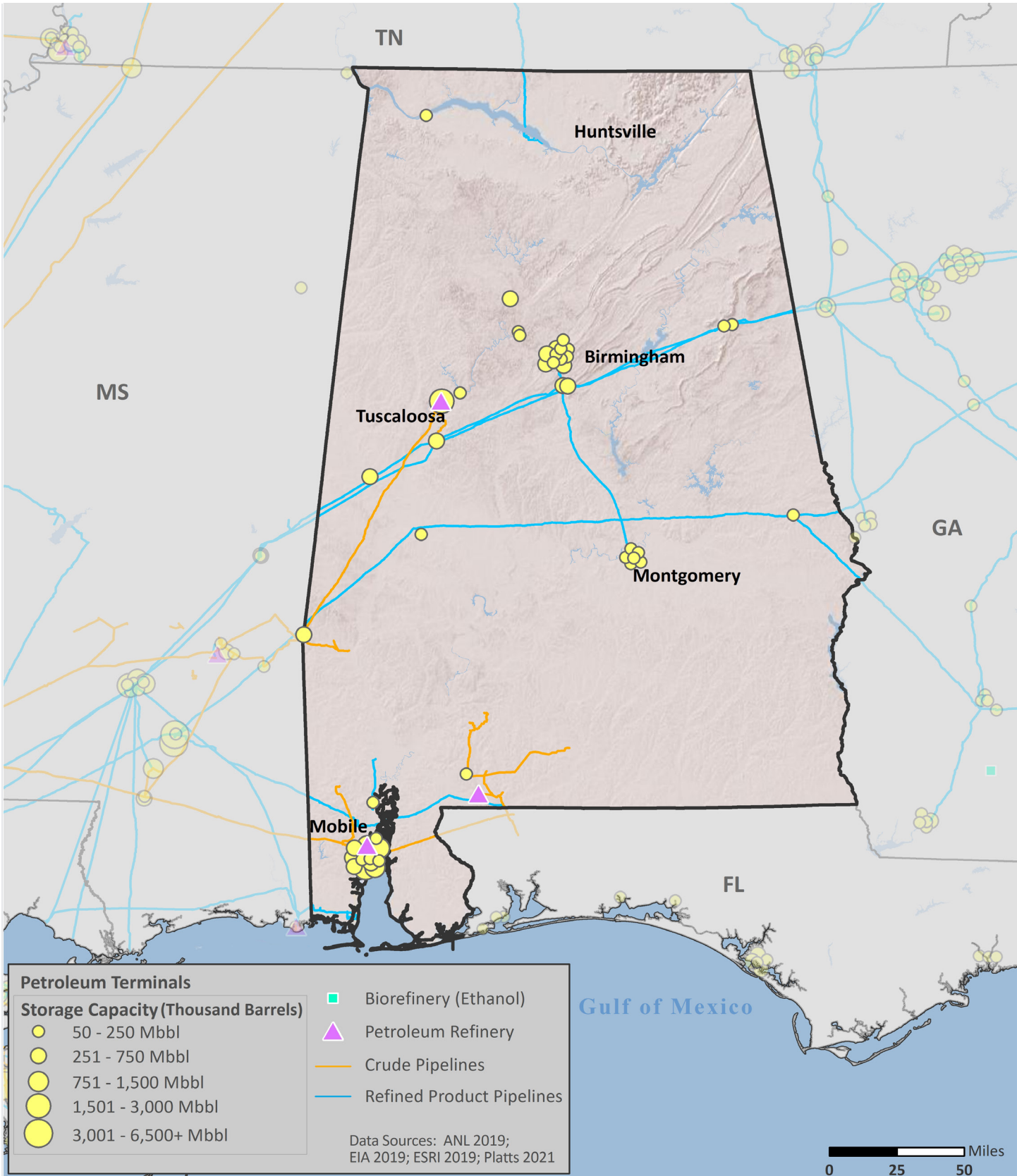
Data Source: EIA

- Alabama has 12 natural gas processing facilities with a total capacity of 1,364 MMcf/d.
- Alabama has 5 liquefied natural gas (LNG) facilities with a total storage capacity of 643,824 barrels.



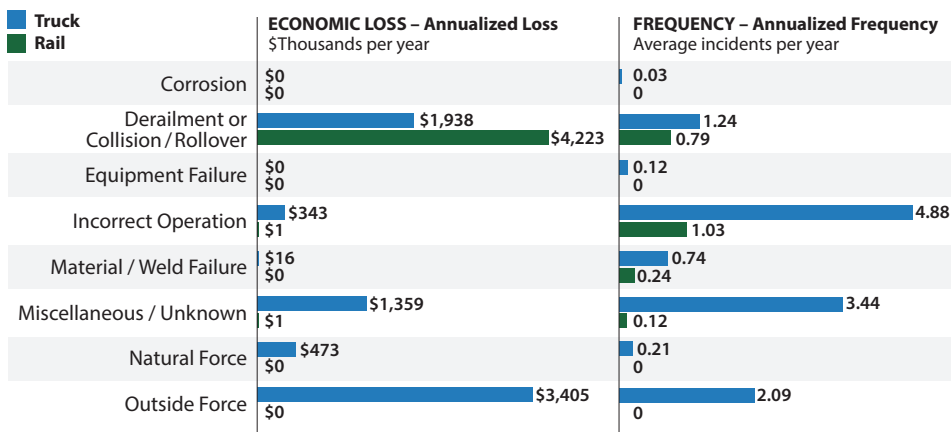


PETROLEUM



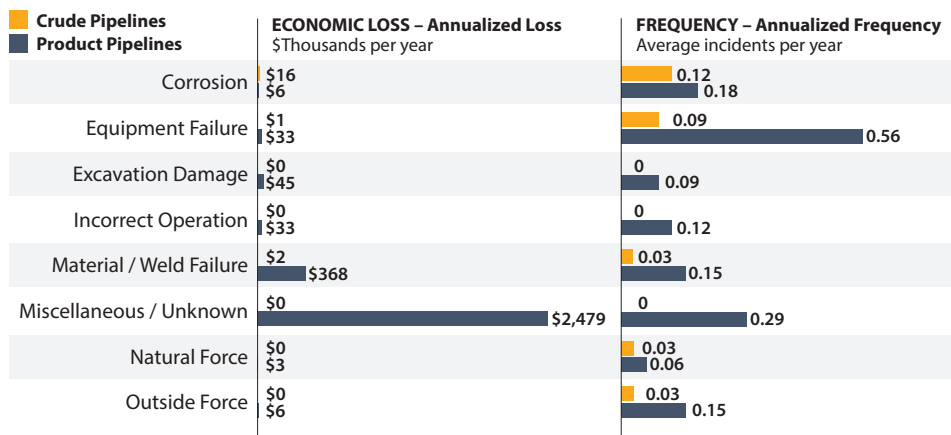
Petroleum Transport

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



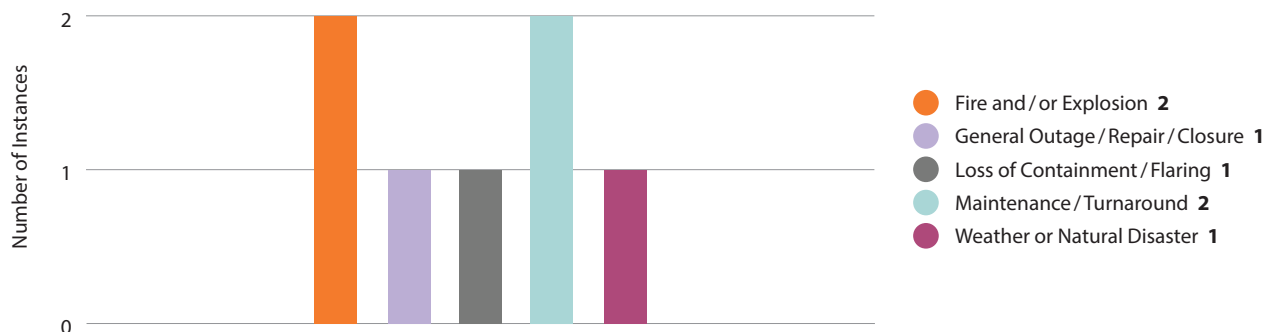
Data Source: DOT PHMSA

- As of 2018, Alabama had:
 - 381 miles of crude oil pipelines
 - 1,113 miles of refined product pipelines
 - 0 miles of biofuels pipelines
- 46% of Alabama’s petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Alabama’s petroleum supply was most impacted by:
 - Outside Forces** events 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)
 - Corrosion** when transported by crude pipelines (3rd leading cause nationwide at \$14.51M)
 - Miscellaneous or Unknown** events when transported by product pipelines (3rd leading cause nationwide at \$11.97M per year)
- Disruptions in other states may impact supply.

Petroleum Refineries

- Alabama has 3 petroleum refineries with a total operable capacity of 141.7 Mb/d.
- Between 2009 and 2019, the leading causes of petroleum refinery disruptions in Alabama were:
 - Fires and/or Explosions** (6th leading cause nationwide)
 - Maintenance** (2nd leading cause nationwide)

Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing