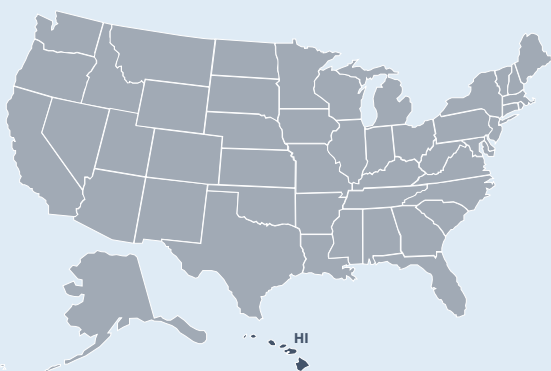




State of Hawaii ENERGY SECTOR RISK PROFILE



Hawaii State Facts



POPULATION

1.42 M



HOUSING UNITS

0.55 M



BUSINESS ESTABLISHMENTS

0.03 M

ENERGY EMPLOYMENT: 15,512 jobs
PUBLIC UTILITY COMMISSION: Hawaii Public Utilities Commission
STATE ENERGY OFFICE: Hawaii State Energy Office
EMERGENCY MANAGEMENT AGENCY: Hawaii Emergency Management Agency
AVERAGE ELECTRICITY TARIFF: 29.18 cents/kWh
ENERGY EXPENDITURES: \$3,897/capita
ENERGY CONSUMPTION PER CAPITA: 199 MMBtu (49th highest out of 50 states and Washington, D.C.)
GDP: \$93.8 billion

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

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 9,340 GWh
COAL: 700 MSTN
NATURAL GAS: 3 Bcf
MOTOR GASOLINE: 11,100 Mbbbl
DISTILLATE FUEL: 6,700 Mbbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 71 plants, 9.8 TWh, 3.0 GW total capacity
Coal: 1 plant, 1.3 TWh, 0.2 GW total capacity
Hydro: 8 plants, 0.1 TWh, 0.0 GW total capacity
Natural Gas: 0 plants
Nuclear: 0 plants
Petroleum: 20 plants, 6.9 TWh, 2.2 GW total capacity
Wind & Solar: 29 plants, 0.8 TWh, 0.5 GW total capacity
Other sources: 13 plants, 0.7 TWh, 0.3 GW total capacity
COAL: 0 MSTN
NATURAL GAS: 0 Bcf
CRUDE OIL: 0 Mbbbl
ETHANOL: 0 Mbbbl

Data from EIA (2018, 2019).

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

Hawaii Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at \$4 million per year (leading cause nationwide at \$12 billion per year).
- Hawaii had 10 Major Disaster Declarations, 8 Emergency Declarations, and 1 Fire Management Assistance Declaration for 9 events between 2013 and 2019.
- There is 1 Fusion Center located in Honolulu.

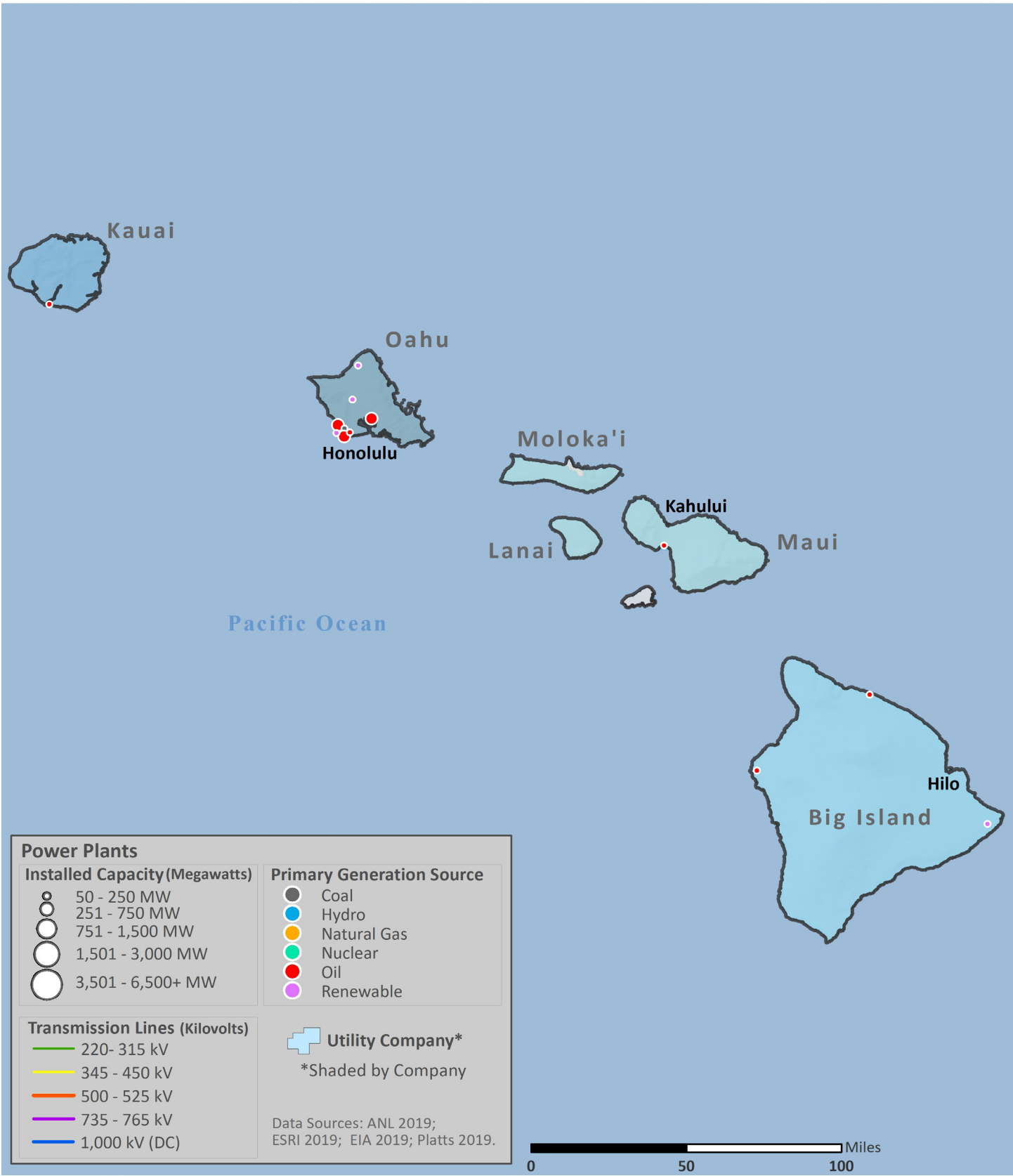
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	13	\$0
Earthquake (≥ 3.5 M)	53	\$0
Extreme Heat	0	\$0
Flood	46	\$4
Hurricane	<1	\$0
Landslide	1	\$0
Thunderstorm & Lightning	37	\$0
Tornado	1	\$0
Wildfire	11	\$0
Winter Storm & Extreme Cold	2	\$0

Data Sources: NOAA and USGS



ELECTRIC









Electric Infrastructure

- Hawaii has 4 electric utilities:
 - 3 Investor owned
 - 1 Cooperative
 - 0 Municipal
 - 0 Other utilities
- Plant retirements scheduled by 2025: 4 electric generating units totaling 34 MW of installed capacity.

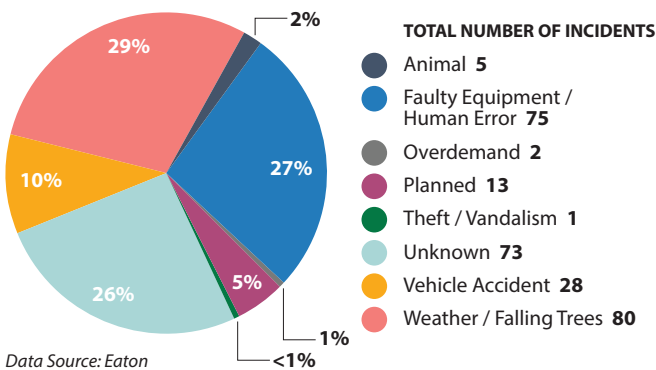
- In 2018, the average Hawaii electric customer experienced 2 service interruptions that lasted an average of 3.2 hours.
- In Hawaii, between 2008 and 2017:
 - The greatest number of electric outages occurred in **December** (4th for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 214,978 customers on average

Electric Customers and Consumption by Sector, 2018

	 CUSTOMERS	 CONSUMPTION
Residential 	88%	29%
Commercial 	12%	32%
Industrial 	<1%	38%
Transportation 	<1%	<1%

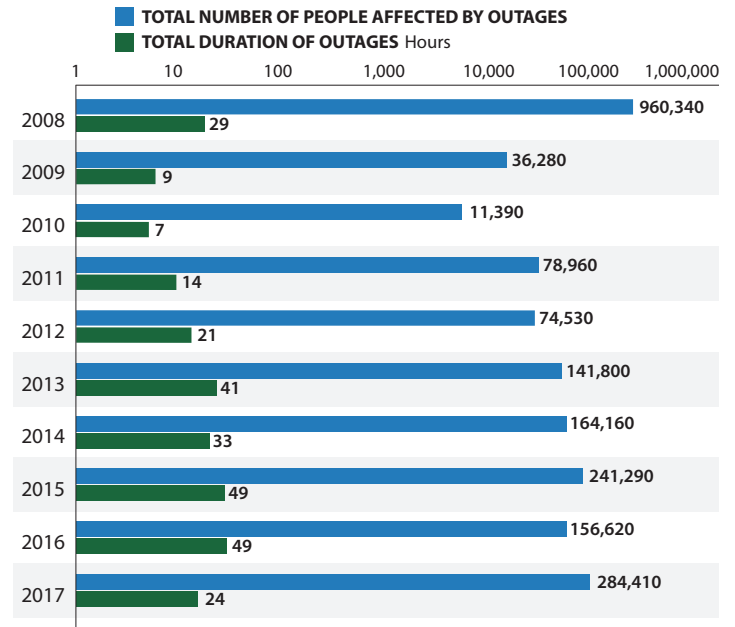
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017

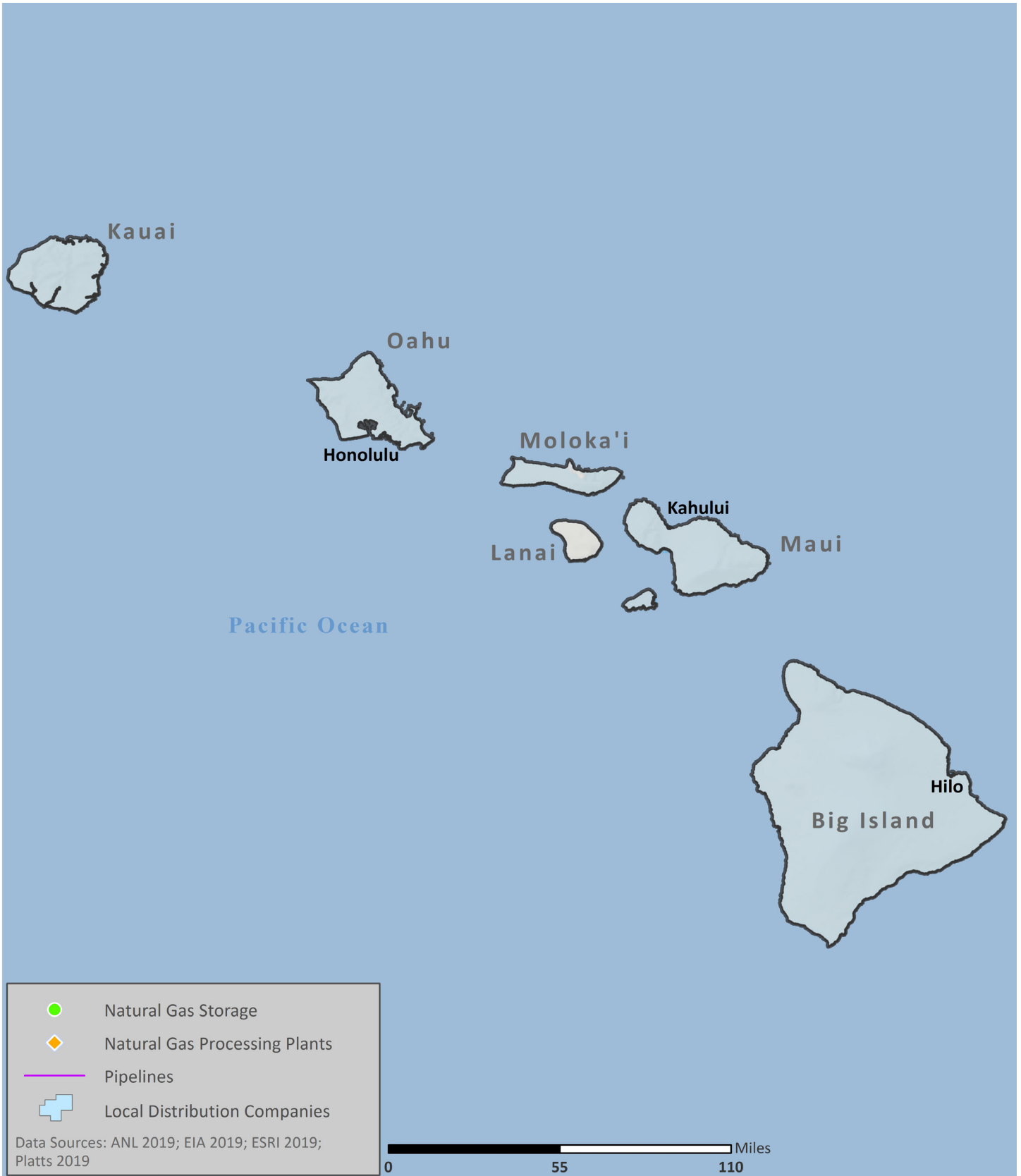


Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton





NATURAL GAS



Natural Gas Transport

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

	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$0 \$16	0 0.03
Equipment Failure	\$0 \$0	0 0
Excavation Damage	\$0 \$29	0 0.06
Incorrect Operation	\$0 \$0	0 0
Material / Weld Failure	\$0 \$0	0 0
Miscellaneous / Unknown	\$0 \$0	0 0
Natural Force	\$0 \$0	0 0
Outside Force	\$5 \$12	0.03 0.06

Data Source: DOT PHMSA

- As of 2018, Hawaii had:
 - 22 miles of natural gas transmission pipelines
 - 616 miles of natural gas distribution pipelines
- 0% of Hawaii’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, Hawaii’s natural gas supply was most impacted by:
 - Outside Forces** when transported by transmission pipelines (3rd leading cause nationwide at \$20.65M per year)
 - Excavation Damage** when transported by distribution pipelines (5th leading cause nationwide at \$16.56M per year)

Natural Gas Processing and Liquefied Natural Gas

Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	91%	18%
Commercial	9%	79%
Industrial	<1%	3%
Transportation	<1%	<1%
Electric Power	<1%	<1%
Other	<1%	<1%

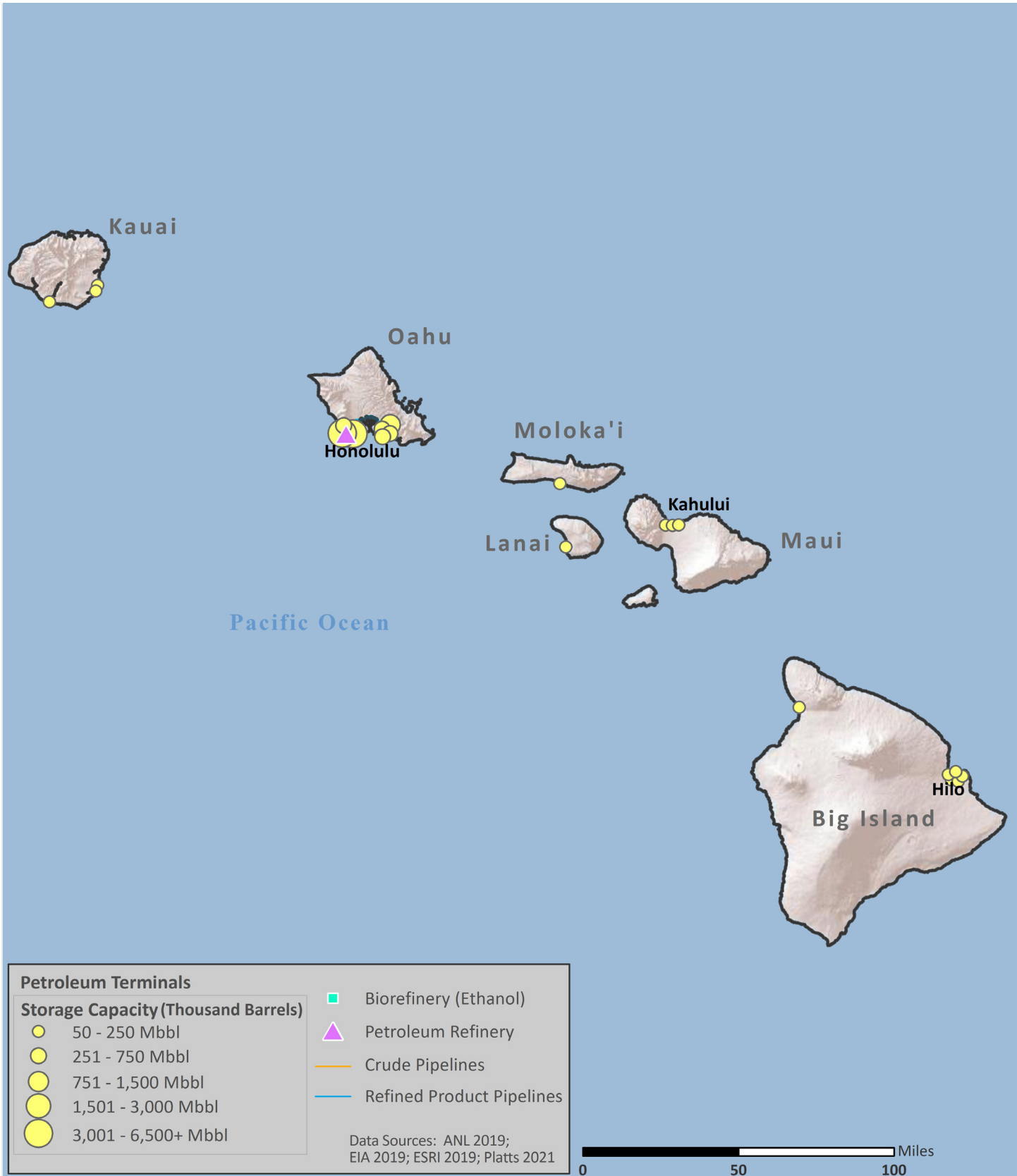
Data Source: EIA

- Hawaii has 0 natural gas processing facilities.
- Hawaii 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

	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$0	0
Derailment or Collision / Rollover	\$28	0.18
Equipment Failure	\$0	0
Incorrect Operation	\$2	0.53
Material / Weld Failure	\$0	0.12
Miscellaneous / Unknown	\$1,403	0.35
Natural Force	\$0	0
Outside Force	\$636	0.18

Data Source: DOT PHMSA

Top Events Affecting Crude Oil and Refined Product Pipelines, 1986 – 2019

	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$97	0.32
Equipment Failure	\$1	0.09
Excavation Damage	\$25	0.09
Incorrect Operation	\$0	0
Material / Weld Failure	\$8	0.06
Miscellaneous / Unknown	\$0	0.03
Natural Force	\$0	0
Outside Force	\$2	0.06

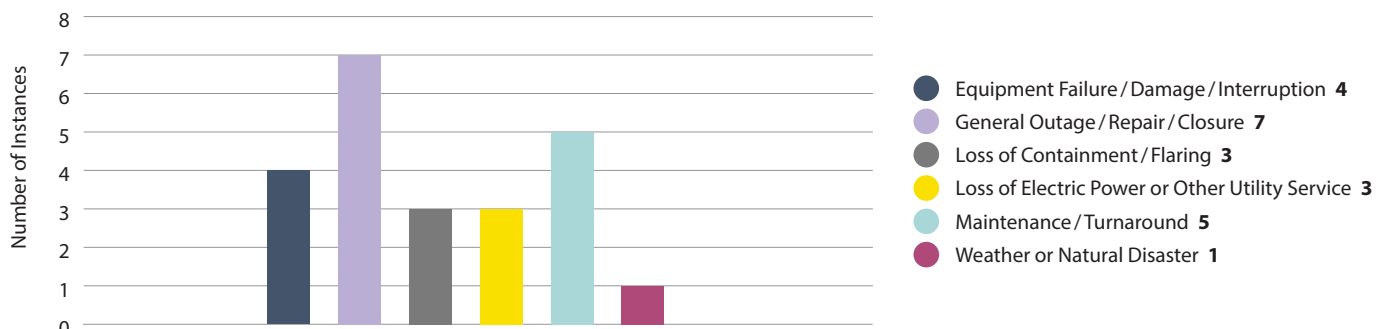
Data Source: DOT PHMSA

- As of 2018, Hawaii had:
 - 0 miles of crude oil pipelines
 - 95 miles of refined product pipelines
 - 0 miles of biofuels pipelines
- 39% of Hawaii’s petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Hawaii’s petroleum supply was most impacted by:
 - **Miscellaneous or Unknown events** when transported by truck (3rd leading cause nationwide at \$52.87M per year)
 - **Corrosion** when transported by product pipelines (2nd leading cause nationwide at \$15.20M per year)
- Disruptions in other states may impact supply.

Petroleum Refineries

- Hawaii has 1 petroleum refinery with a total operable capacity of 147.5 Mb/d.
- Between 2009 and 2019, the leading cause of petroleum refinery disruptions in Hawaii was:
 - **General Outages, Repairs, or Closures** (3rd leading cause nationwide)

Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing