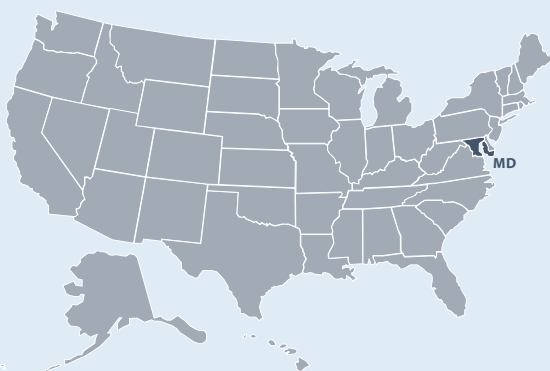# State of Maryland
## ENERGY SECTOR RISK PROFILE

## Maryland State Facts

**POPULATION**
6.04 M

**HOUSING UNITS**
2.46 M

**BUSINESS ESTABLISHMENTS**
0.14 M

**ENERGY EMPLOYMENT:** 32,473 jobs
**PUBLIC UTILITY COMMISSION:** Maryland Public Service Commission
**STATE ENERGY OFFICE:** Maryland Energy Administration
**EMERGENCY MANAGEMENT AGENCY:** Maryland Emergency Management Agency
**AVERAGE ELECTRICITY TARIFF:** 11.57 cents/kWh
**ENERGY EXPENDITURES:** $3,077/capita
**ENERGY CONSUMPTION PER CAPITA:** 218 MMBtu
*(42nd highest out of 50 states and Washington, D.C.)*
**GDP:** $412.6 billion

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

### ANNUAL ENERGY CONSUMPTION
**ELECTRIC POWER:** 93,870 TWh
**COAL:** 5,000 MSTN
**NATURAL GAS:** 276 Bcf
**MOTOR GASOLINE:** 46,400 Mbbl
**DISTILLATE FUEL:** 18,200 Mbbl

### ANNUAL ENERGY PRODUCTION
**ELECTRIC POWER GENERATION:** 141 plants, 39.3 TWh, *16.1 GW total capacity*
    **Coal:** 6 plants, 5.7 TWh, *4.7 GW total capacity*
    **Hydro:** 2 plants, 2.2 TWh, *0.6 GW total capacity*
    **Natural Gas:** 19 plants, 14.6 TWh, *7.0 GW total capacity*
    **Nuclear:** 1 plant, 15.0 TWh, *1.9 GW total capacity*
    **Petroleum:** 15 plants, 0.1 TWh, *1.3 GW total capacity*
    **Wind & Solar:** 84 plants, 1.0 TWh, *0.5 GW total capacity*
    **Other sources:** 4 plants, 0.7 TWh, *10.2 GW total capacity*
**COAL:** 1,800 MSTN
**NATURAL GAS:** 0 Bcf
**CRUDE OIL:** 0 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 Maryland'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.

## Maryland Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at $12 million per year *(leading cause nationwide at $12 billion per year)*.

- Maryland had 28 Major Disaster Declarations, 0 Emergency Declarations, and 0 Fire Management Assistance Declarations for 5 events between 2013 and 2019.

- Maryland registered 15% fewer Heating Degree Days and 47% greater Cooling Degree Days than average in 2019.

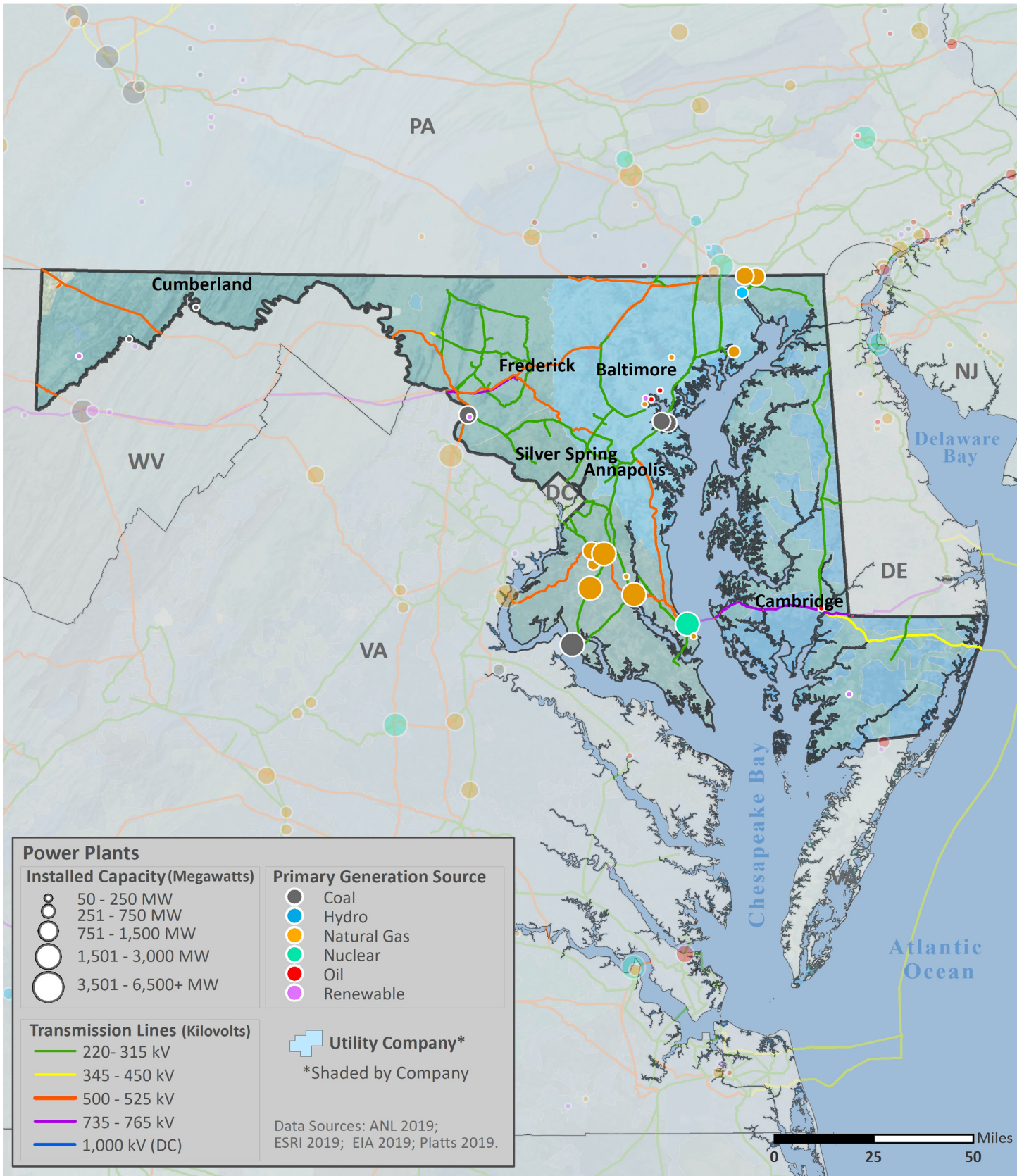- There is 1 Fusion Center located in Woodlawn.

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

| | HAZARD FREQUENCY – Annualized | PROPERTY DAMAGE – Annualized ($Million per year) |
|---|---|---|
| Drought | 1 | $0 |
| Earthquake (≥ 3.5 M) | <1 | $0 |
| Extreme Heat | 7 | $0 |
| Flood | 29 | $12 |
| Hurricane | <1 | $1 |
| Landslide | 0 | $0 |
| Thunderstorm & Lightning | 67 | $4 |
| Tornado | 5 | $0 |
| Wildfire | <1 | $0 |
| Winter Storm & Extreme Cold | 47 | $0 |

*Data Sources: NOAA and USGS*

# ELECTRIC



**Power Plants**

**Installed Capacity (Megawatts)**
- 50 - 250 MW
- 251 - 750 MW
- 751 - 1,500 MW
- 1,501 - 3,000 MW
- 3,501 - 6,500+ MW

**Primary Generation Source**
- Coal
- Hydro
- Natural Gas
- Nuclear
- Oil
- Renewable

**Transmission Lines (Kilovolts)**
- 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

- Maryland has 14 electric utilities:
  - *1 Investor owned*
  - *2 Cooperative*
  - *5 Municipal*
  - *6 Other utilities*
- Plant retirements scheduled by 2025: 18 electric generating units totaling 623 MW of installed capacity.
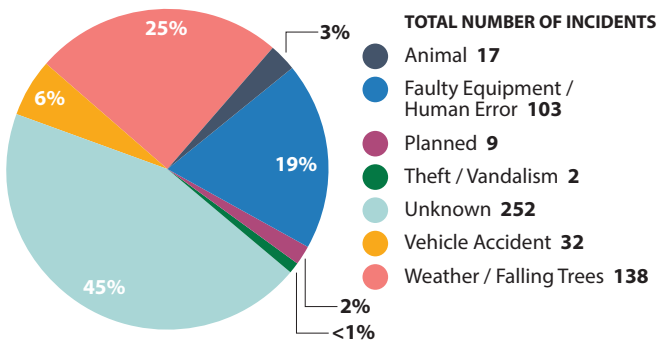
- In 2018, the average Maryland electric customer experienced 1.3 service interruptions that lasted an average of 5.6 hours.
- In Maryland, between 2008 and 2017:
  - *The greatest number of electric outages occurred in **July** (leading month for outages nationwide)*
  - *The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)*
  - *Electric outages affected 682,107 customers on average*

## Electric Customers and Consumption by Sector, 2018

| | CUSTOMERS | CONSUMPTION |
|---|---|---|
| Residential | 90% | 45% |
| Commercial | 10% | 48% |
| Industrial | <1% | 6% |
| Transportation | <1% | <1% |

*Data Source: EIA*

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



TOTAL NUMBER OF INCIDENTS
- Animal **17**
- Faulty Equipment / Human Error **103**
- Planned **9**
- Theft / Vandalism **2**
- Unknown **252**
- Vehicle Accident **32**
- Weather / Falling Trees **138**

25%, 3%, 19%, 45%, 6%, 2%, <1%

*Data Source: Eaton*

## Electric Utility Outage Data, 2008–2017

TOTAL NUMBER OF PEOPLE AFFECTED BY OUTAGES
TOTAL DURATION OF OUTAGES Hours

| Year | People Affected | Duration |
|---|---|---|
| 2008 | 309,840 | 49 |
| 2009 | 302,750 | 21 |
| 2010 | 1,386,690 | 28 |
| 2011 | 1,598,140 | 57 |
| 2012 | 2,220,120 | 4 |
| 2013 | 370,340 | 15 |
| 2014 | 165,750 | 37 |
| 2015 | 145,590 | 38 |
| 2016 | 233,810 | 16 |
| 2017 | 88,040 | 16 |
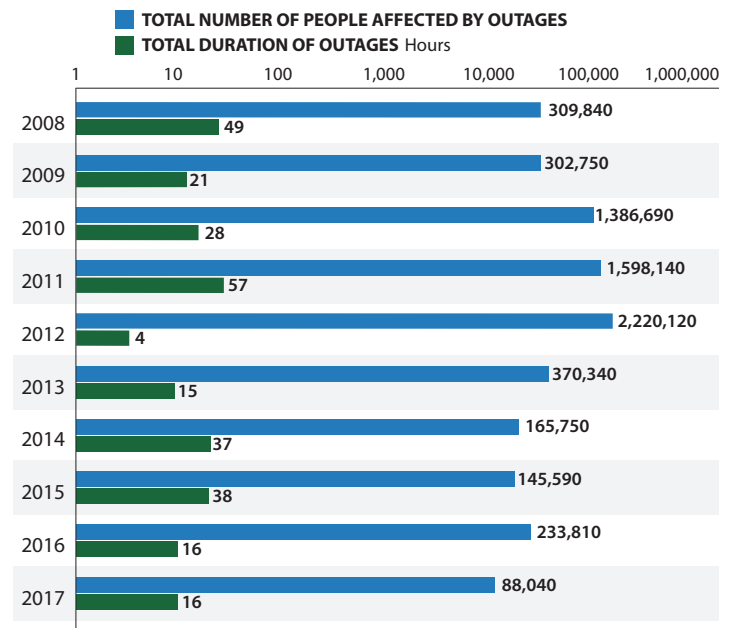
*Note: This chart uses a logarithmic scale to display a very wide range of values.*
*Data Source: Eaton*

# NATURAL GAS



**Legend:**
- 🟢 Natural Gas Storage
- 🔶 Natural Gas Processing Plants
- — Pipelines
- Local Distribution Companies

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

# Natural Gas Transport

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

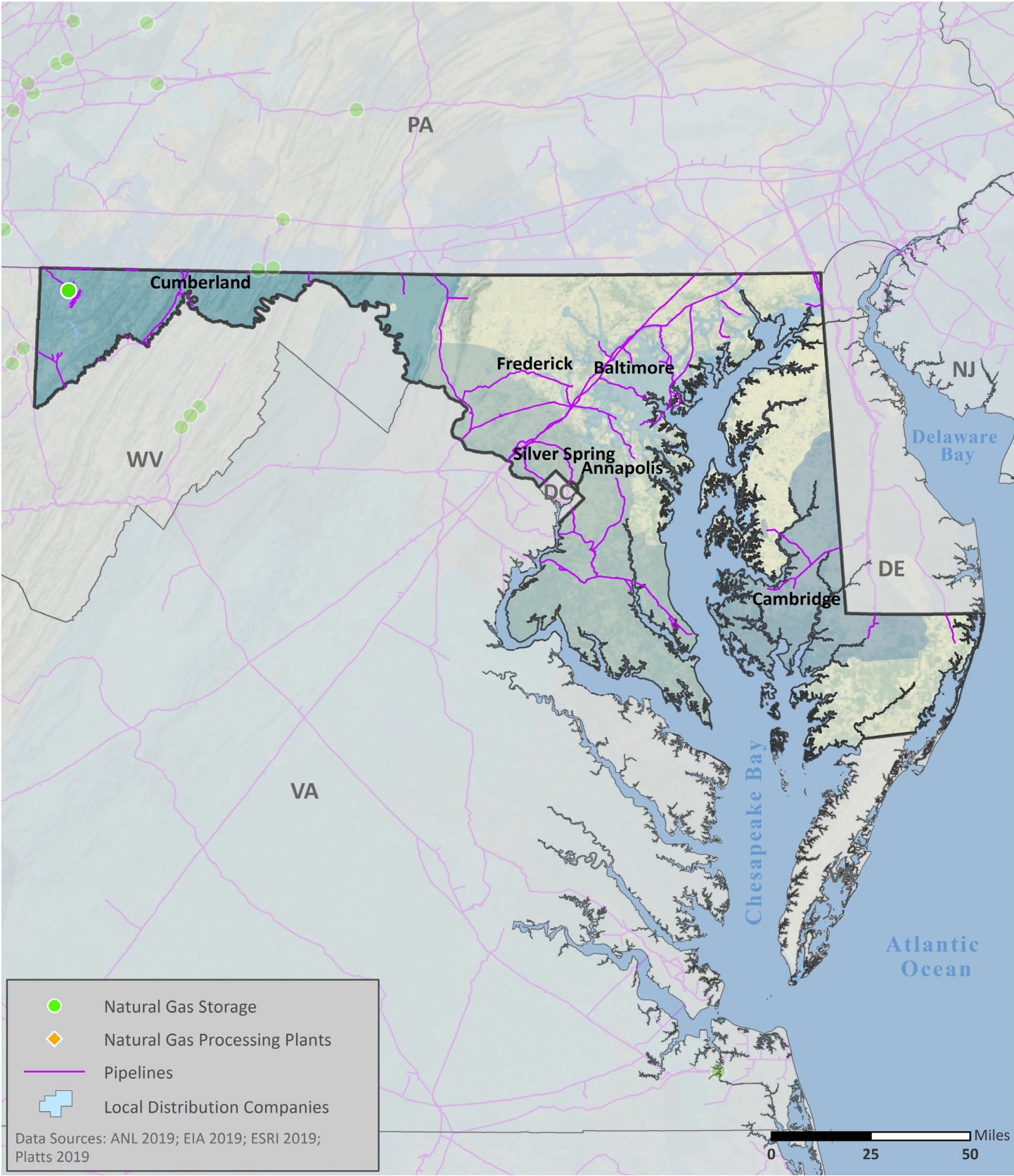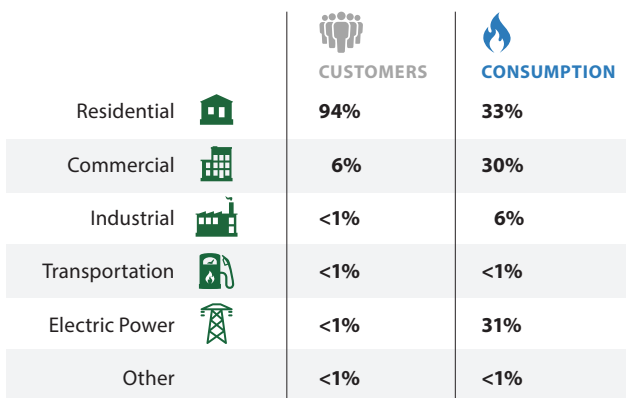| | ECONOMIC LOSS – Annualized Loss $Thousands per year | FREQUENCY – Annualized Frequency Average incidents per year |
|---|---|---|
| **■ Transmission** **■ Distribution** | | |
| Corrosion | $0 / $328 | 0 / 0.06 |
| Equipment Failure | $9 / $3 | 0.03 / 0.03 |
| Excavation Damage | $14 / $93 | 0.06 / 0.33 |
| Incorrect Operation | $0 / $54 | 0.06 / 0.19 |
| Material / Weld Failure | $13 / $6 | 0.03 / 0.03 |
| Miscellaneous / Unknown | $26 / $2,817 | 0.17 / 0.69 |
| Natural Force | $0 / $260 | 0.06 / 0.56 |
| Outside Force | $8 / $1,600 | 0.08 / 1.22 |
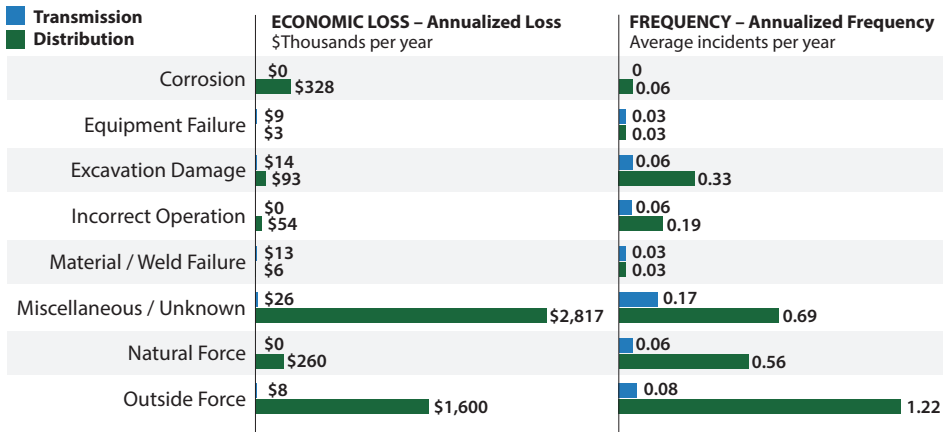
*Data Source: DOT PHMSA*

- As of 2018, Maryland had:
  - *996 miles of natural gas transmission pipelines*
  - *15,162 miles of natural gas distribution pipelines*
- 52% of Maryland's natural gas transmission system and 22% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Maryland's natural gas supply was most impacted by:
  - ***Miscellaneous or Unknown*** *events when transported by transmission pipelines (5th leading cause nationwide at $16.77M 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 | 94% | 33% |
| Commercial | 6% | 30% |
| Industrial | <1% | 6% |
| Transportation | <1% | <1% |
| Electric Power | <1% | 31% |
| Other | <1% | <1% |

*Data Source: EIA*

- Maryland has 0 natural gas processing facilities.
- Maryland has 2 liquefied natural gas (LNG) facilities with a total storage capacity of 4,640,000 barrels.

# PETROLEUM



**Petroleum Terminals**

**Storage Capacity (Thousand Barrels)**
- ○ 50 - 250 Mbbl
- ○ 251 - 750 Mbbl
- ○ 751 - 1,500 Mbbl
- ○ 1,501 - 3,000 Mbbl
- ○ 3,001 - 6,500+ Mbbl

- ■ Biorefinery (Ethanol)
- ▲ Petroleum Refinery
- — Crude Pipelines
- — Refined Product Pipelines

Data Sources: ANL 2019;
EIA 2019; ESRI 2019; Platts 2021
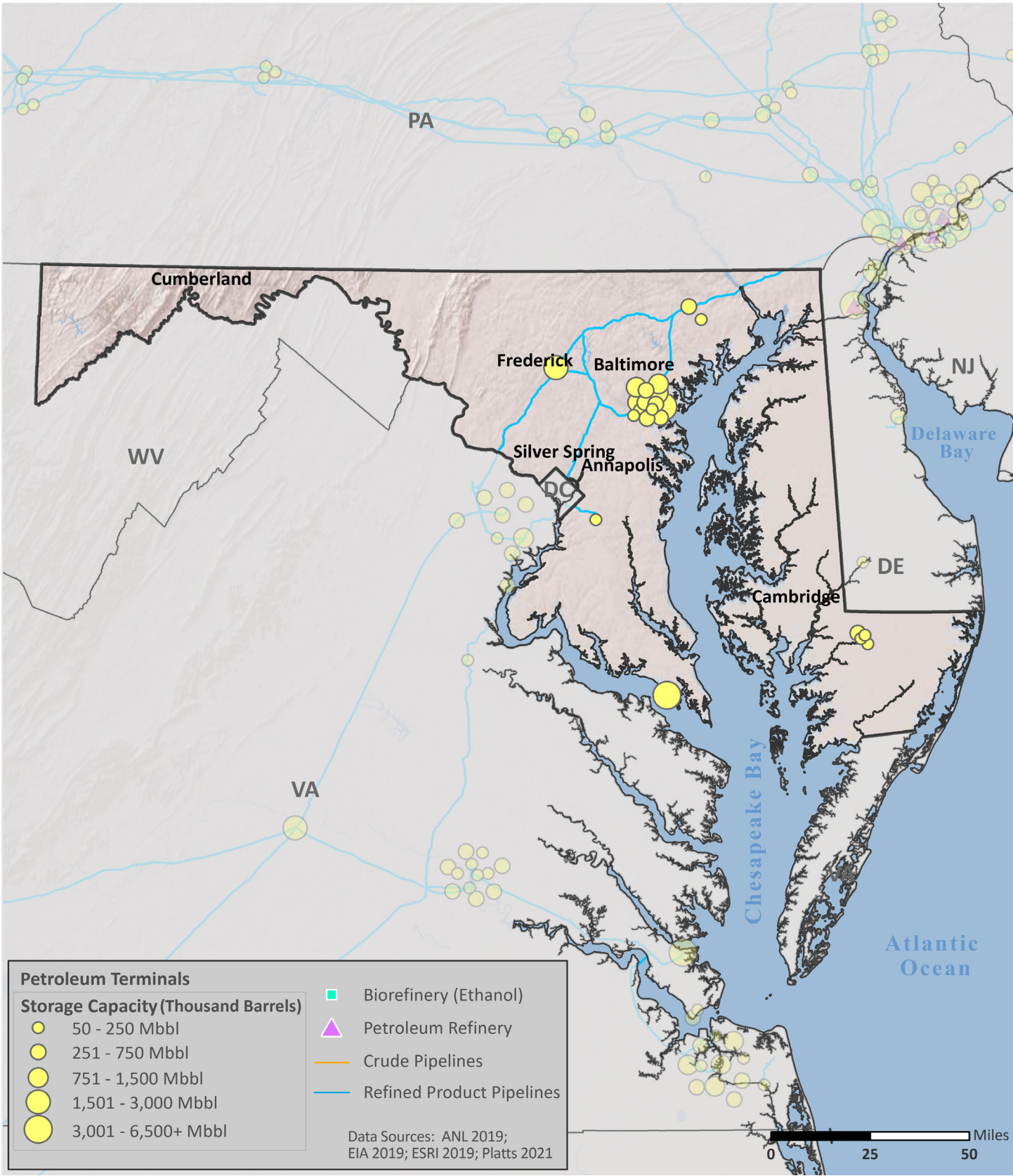
## Petroleum Transport

### Top Events Affecting Petroleum Transport by Truck and Rail, 1986–2019

**Truck**
**Rail**

| | ECONOMIC LOSS – Annualized Loss $Thousands per year | FREQUENCY – Annualized Frequency Average incidents per year |
|---|---|---|
| Corrosion | $0 / $0 | 0.35 / 0 |
| Derailment or Collision / Rollover | $2,811 / $0 | 1.44 / 0 |
| Equipment Failure | $0 / $0 | 0.65 / 0 |
| Incorrect Operation | $23 / $1 | 18.44 / 0.53 |
| Material / Weld Failure | $17 / $0 | 3.82 / 0.18 |
| Miscellaneous / Unknown | $692 / $1 | 13.71 / 0.09 |
| Natural Force | $1,511 / $0 | 0.35 / 0 |
| Outside Force | $18 / $0 | 2.12 / 0 |

*Data Source: DOT PHMSA*

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

**Crude Pipelines**
**Product Pipelines**

| | ECONOMIC LOSS – Annualized Loss $Thousands per year | FREQUENCY – Annualized Frequency Average incidents per year |
|---|---|---|
| Corrosion | $0 / $66 | 0 / 0.12 |
| Equipment Failure | $0 / $3 | 0 / 0.24 |
| Excavation Damage | $0 / $0 | 0 / 0 |
| Incorrect Operation | $0 / $180 | 0 / 0.18 |
| Material / Weld Failure | $0 / $5 | 0 / 0.06 |
| Miscellaneous / Unknown | $0 / $25 | 0 / 0.09 |
| Natural Force | $0 / $0 | 0 / 0 |
| Outside Force | $0 / $9 | 0 / 0.12 |
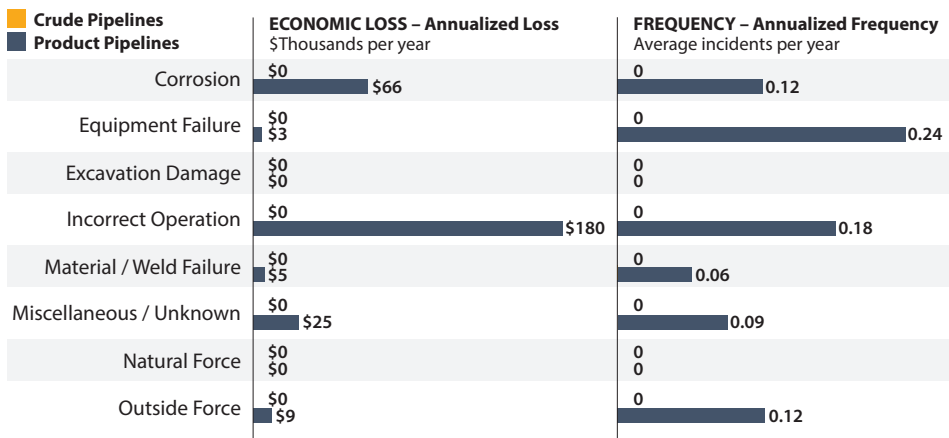
*Data Source: DOT PHMSA*

- As of 2018, Maryland had:
  - *0 miles of crude oil pipelines*
  - *320 miles of refined product pipelines*
  - *0 miles of biofuels pipelines*

- 78% of Maryland's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.

- Between 1986 and 2019, Maryland's petroleum supply was most impacted by:
  - ***Derailments, Collisions, 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)*
  - ***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

- There are no operating petroleum refineries in Maryland.