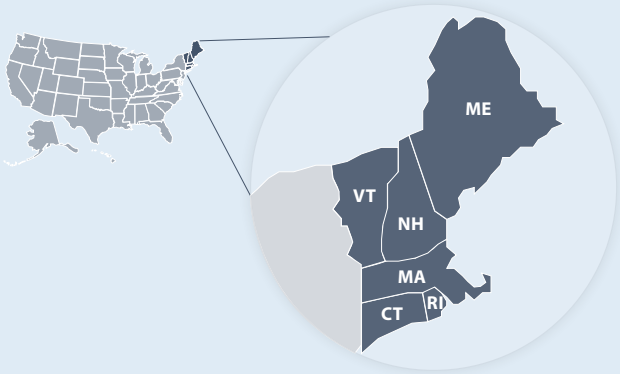
FEMA Region 1
ENERGY SECTOR RISK PROFILE

U.S. DEPARTMENT OF ENERGY
Cybersecurity, Energy Security, and Emergency Response



Region 1 Facts

POPULATION
14.86 M

HOUSING UNITS
6.63 M

BUSINESS ESTABLISHMENTS
0.4 M

ENERGY EMPLOYMENT: 124,608 jobs

POPULATION-WEIGHTED AVERAGE ELECTRICITY TARIFF: 17.71 cents/kWh

POPULATION-WEIGHTED ENERGY EXPENDITURES: $3,538/capita

POPULATION-WEIGHTED ENERGY CONSUMPTION PER CAPITA: 215 MMBtu

GDP: $1,088.9 billion

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

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 180,600 GWh
COAL: 600 MSTN
NATURAL GAS: 910 Bcf
MOTOR GASOLINE: 138,800 Mbbl
DISTILLATE FUEL: 66,200 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 953 plants, 100.0 TWh, *38.3 GW total capacity*
- **Coal:** 3 plants, 0.5 TWh, *1.0 GW total capacity*
- **Hydro:** 179 plants, 7.7 TWh, *1.9 GW total capacity*
- **Natural Gas:** 109 plants, 49.3 TWh, *19.7 GW total capacity*
- **Nuclear:** 2 plants, 29.8 TWh, *3.4 GW total capacity*
- **Petroleum:** 75 plants, 0.2 TWh, *6.4 GW total capacity*
- **Wind & Solar:** 501 plants, 5.2 TWh, *2.7 GW total capacity*
- **Other sources:** 84 plants, 7.3 TWh, *3.6 GW total capacity*

COAL: 0 MSTN
NATURAL GAS: 0 Bcf
CRUDE OIL: 0 Mbbl
ETHANOL: 0 Mbbl

Data from EIA (2018, 2019).

This Energy Risk Profile examines the relative magnitude of the risks that Federal Emergency Management Agency (FEMA) Region 1's energy infrastructure routinely encounters in comparison with the probable impacts. FEMA Region 1 includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

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.

Region 1 Risks and Hazards Overview

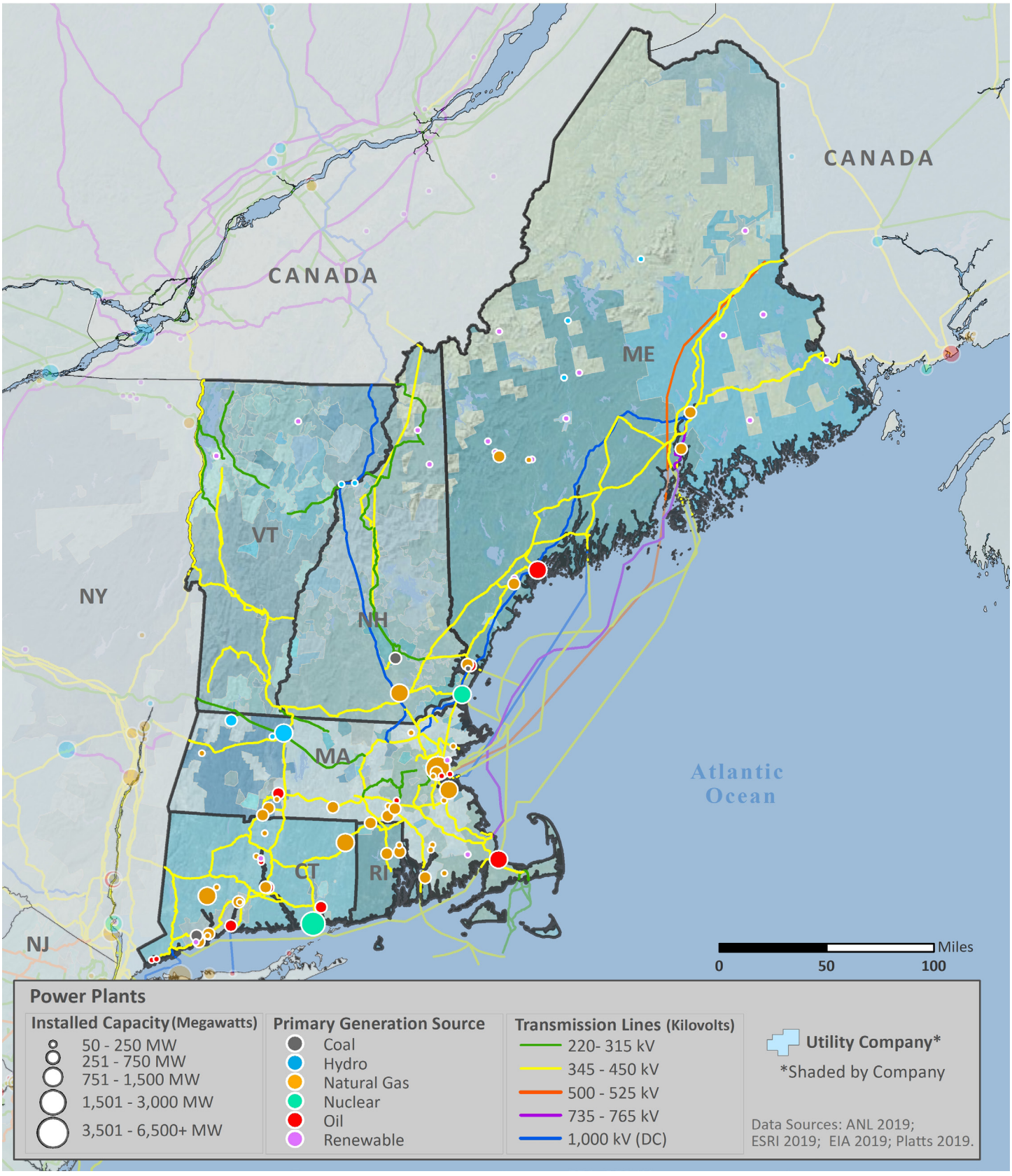
- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at $190 million per year *(leading cause nationwide at $12 billion per year)*.
- Region 1 had 180 Major Disaster Declarations, 13 Emergency Declarations, and 1 Fire Management Assistance Declaration for 36 events between 2013 and 2019.
- The FEMA Region 1 office is located in Boston, MA.

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

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized ($Million per year)
Drought	3	$0
Earthquake (≥ 3.5 M)	<1	$0
Extreme Heat	5	$0
Flood	82	$191
Hurricane	2	$10
Landslide	<1	$0
Thunderstorm & Lightning	167	$12
Tornado	8	$26
Wildfire	<1	$0
Winter Storm & Extreme Cold	103	$6

Data Sources: NOAA and USGS

ELECTRIC


CANADA
CANADA
ME
VT
NY
NH
MA
CT
RI
NJ
Atlantic Ocean
Miles
0
50
100
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

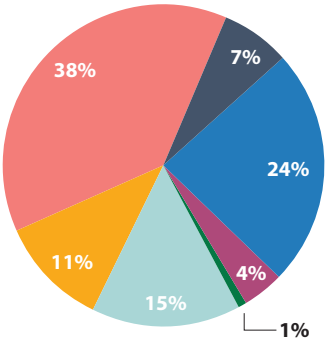
- Region 1 has 140 electric utilities:
  - *14 Investor owned*
  - *5 Cooperative*
  - *72 Municipal*
  - *49 Other utilities*
- Plant retirements scheduled by 2025: 16 electric generating units totaling 1,193 MW of installed capacity.
- In 2018, the average Region 1 electric customer experienced 1.7 service interruptions that lasted an average of 11.9 hours.
- Between 2008 and 2017:
  - *In Region 1, the greatest number of electric outages occurred in October (5th for outages nationwide)*
  - *The leading cause of electric outages in Region 1 was **Weather or Falling Trees** (leading cause nationwide)*
  - *Electric outages affected 1,738,352 customers on average*

Electric Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	88%	41%
Commercial	12%	45%
Industrial	<1%	14%
Transportation	<1%	<1%

Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017

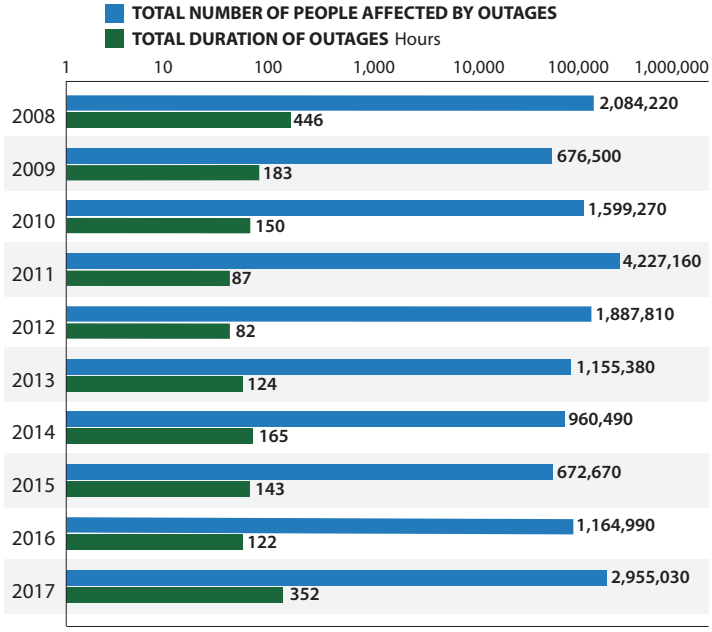


TOTAL NUMBER OF INCIDENTS

- Animal **153**
- Faulty Equipment / Human Error **557**
- Planned **87**
- Theft / Vandalism **8**
- Unknown **351**
- Vehicle Accident **256**
- Weather / Falling Trees **876**

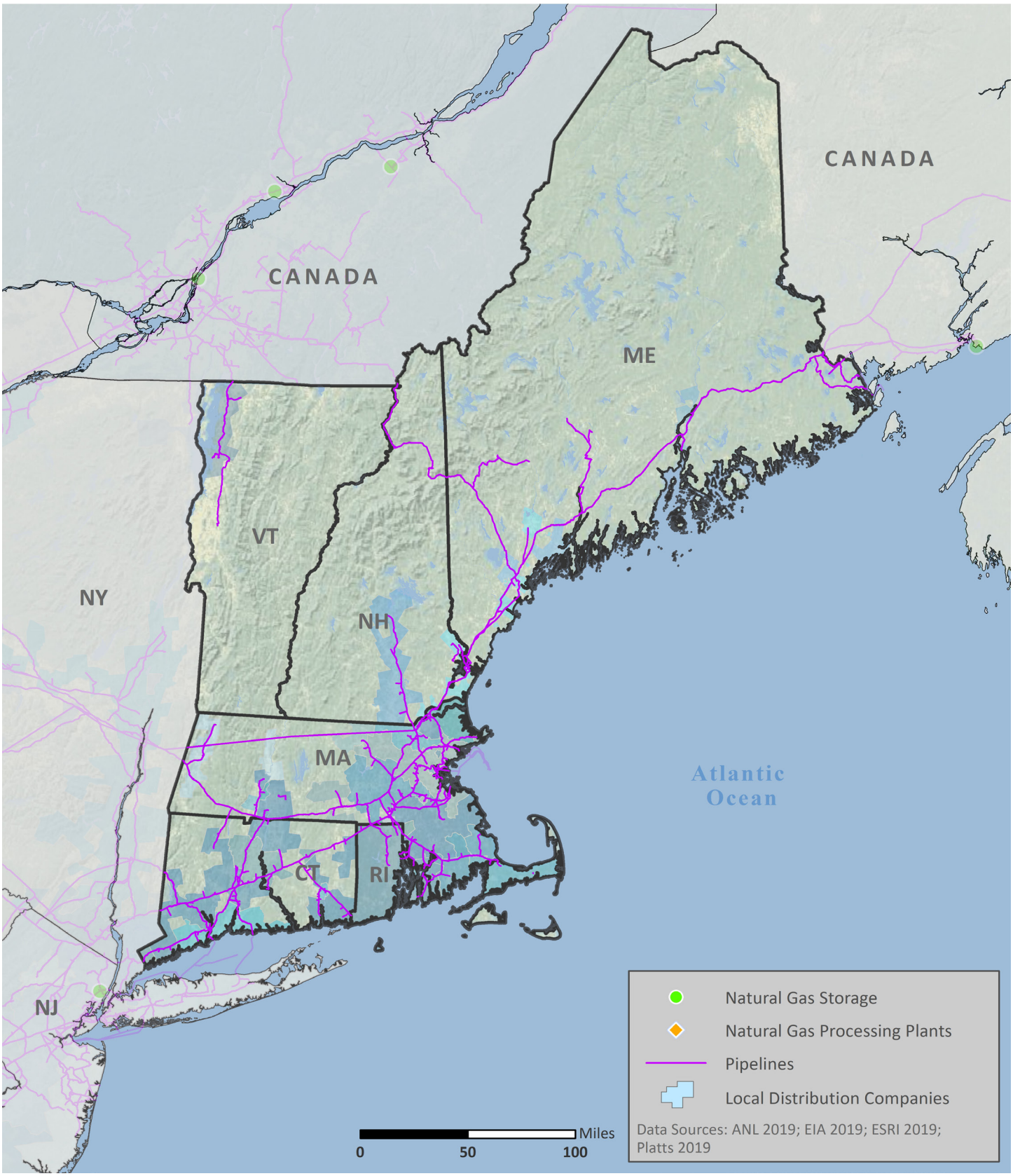
Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017



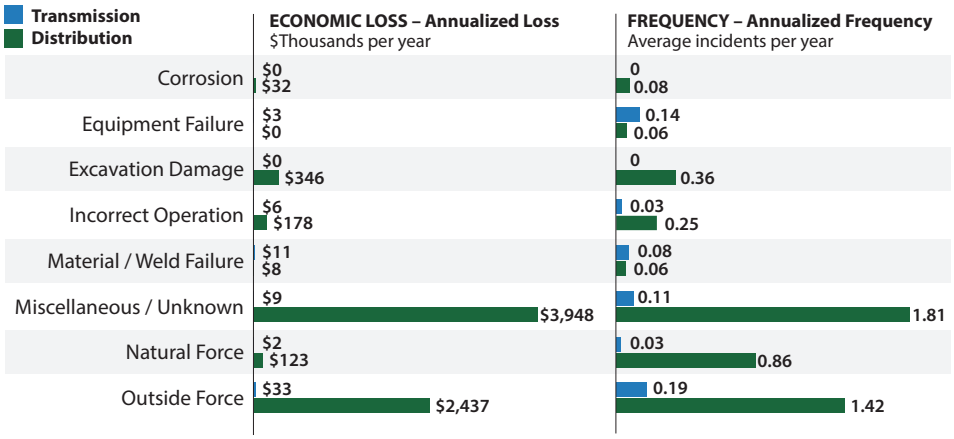
Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton

NATURAL GAS


CANADA
CANADA
ME
VT
NY
NH
MA
CT
RI
NJ
Atlantic Ocean
Natural Gas Storage
Natural Gas Processing Plants
Pipelines
Local Distribution Companies
Data Sources: ANL 2019; EIA 2019; ESRI 2019; Platts 2019
Miles
0
50
100

Natural Gas Transport

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



Data Source: DOT PHMSA

- As of 2018, Region 1 had:
  - *2,701 miles of natural gas transmission pipelines*
  - *37,219 miles of natural gas distribution pipelines*
- 47% of Region 1's natural gas transmission system and 38% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Region 1's natural gas supply was most impacted by:
  - ***Outside Forces*** *when transported by transmission pipelines (3rd leading cause nationwide at $20.65M 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

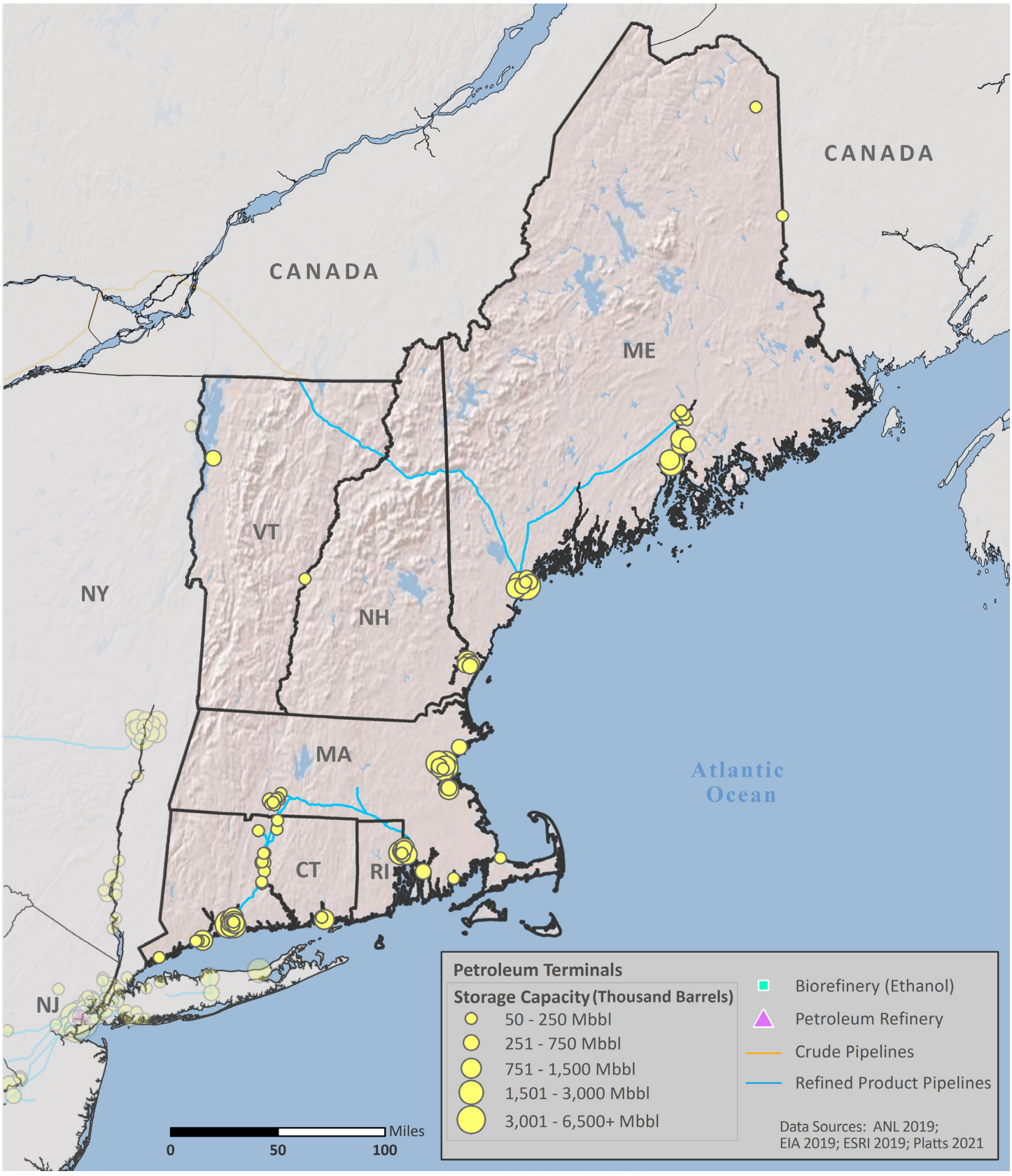
Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	90%	23%
Commercial	10%	23%
Industrial	<1%	12%
Transportation	<1%	<1%
Electric Power	<1%	42%
Other	<1%	<1%

Data Source: EIA

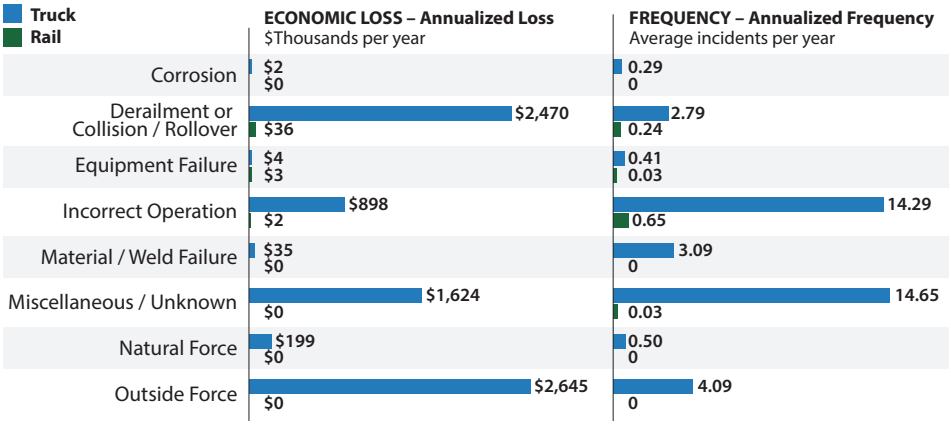
- Region 1 has 0 natural gas processing facilities.
- Region 1 has 30 liquefied natural gas (LNG) facilities with a total storage capacity of 5,641,627 barrels.

PETROLEUM


CANADA
CANADA
ME
VT
NY
NH
MA
CT
RI
NJ
Atlantic Ocean
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
Miles
0
50
100

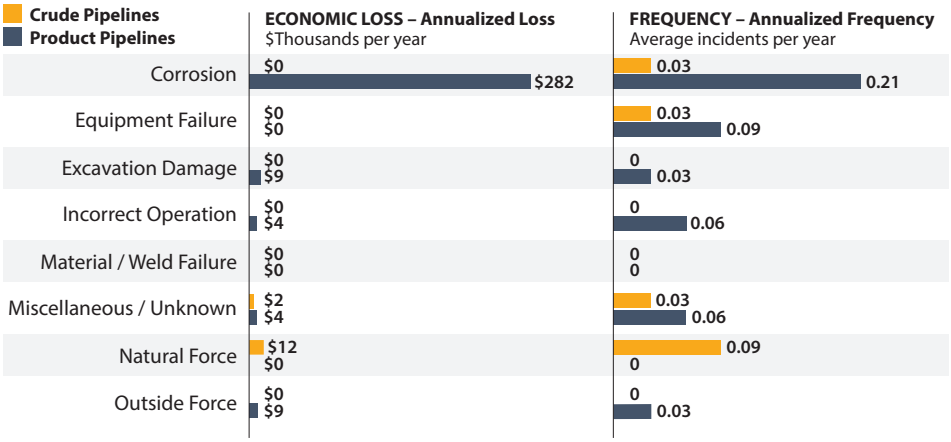
Petroleum Transport

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

- Region 1 is part of Petroleum Administration for Defense District (PADD) 1.
- As of 2018, Region 1 had:
  - *359 miles of crude oil pipelines*
  - *254 miles of refined product pipelines*
  - *0 miles of biofuels pipelines*
- 91% of Region 1's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Region 1's petroleum supply was most impacted by:
  - ***Outside Forces** 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)*
  - ***Outside Forces** when transported by crude pipelines (2nd leading cause nationwide at $15.20M per year)*
  - ***Equipment Failures** when transported by product pipelines (6th leading cause nationwide at $4.66M per year)*
- Disruptions in other states may impact supply.

Petroleum Refineries

- There are no operating petroleum refineries in Region 1.