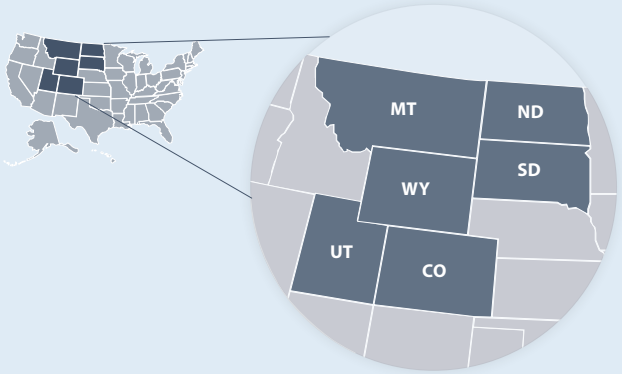
FEMA Region 8
ENERGY SECTOR RISK PROFILE

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



Region 8 Facts

POPULATION
12.14 M

HOUSING UNITS
5.1 M

BUSINESS ESTABLISHMENTS
0.35 M

ENERGY EMPLOYMENT: 219,993 jobs

POPULATION-WEIGHTED AVERAGE ELECTRICITY TARIFF: 9.28 cents/kWh

POPULATION-WEIGHTED ENERGY EXPENDITURES: $3,656.22/capita

POPULATION-WEIGHTED ENERGY CONSUMPTION PER CAPITA: 353.39 MMBtu

GDP: $747.4 billion

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

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 155,970 GWh
COAL: 94,500 MSTN
NATURAL GAS: 995 Bcf
MOTOR GASOLINE: 135,000 Mbbl
DISTILLATE FUEL: 95,400 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 562 plants, 221.1 TWh, *54.0 GW total capacity*
- **Coal:** 40 plants, 127.8 TWh, *24.0 GW total capacity*
- **Hydro:** 119 plants, 24.8 TWh, *6.2 GW total capacity*
- **Natural Gas:** 81 plants, 30.6 TWh, *13.8 GW total capacity*
- **Nuclear:** 0 plants
- **Petroleum:** 40 plants, 0.6 TWh, *0.7 GW total capacity*
- **Wind & Solar:** 246 plants, 35.9 TWh, *13.1 GW total capacity*
- **Other sources:** 36 plants, 1.4 TWh, *1.0 GW total capacity*

COAL: 409,800 MSTN
NATURAL GAS: 4,920 Bcf
CRUDE OIL: 871,500 Mbbl
ETHANOL: 40,400 Mbbl

Data from EIA (2018, 2019).

This Energy Risk Profile examines the relative magnitude of the risks that Federal Emergency Management Agency (FEMA) Region 8's energy infrastructure routinely encounters in comparison with the probable impacts. FEMA Region 8 includes Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

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 8 Risks and Hazards Overview

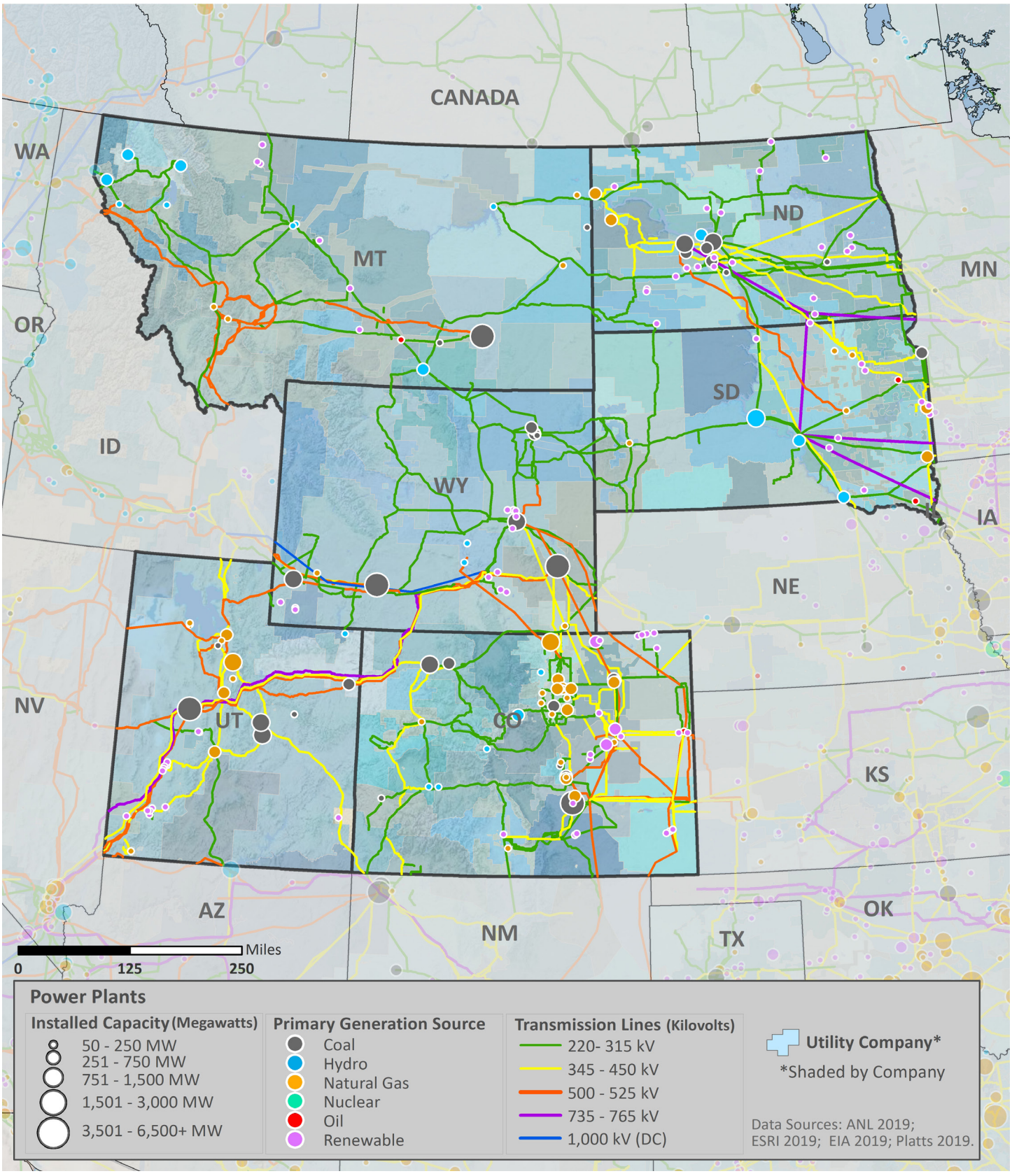
- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Thunderstorms & Lightning** at $476 million per year *(2nd leading cause nationwide at $2.8 billion per year).*
- FEMA Region 8 had 414 Major Disaster Declarations, 21 Emergency Declarations, and 49 Fire Management Assistance Declarations for 76 events between 2013 and 2019.
- The FEMA Region 8 office is located in Denver, CO.

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

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized ($Million per year)
Drought	26	$0
Earthquake (≥ 3.5 M)	16	$0
Extreme Heat	3	$0
Flood	167	$118
Hurricane	0	$0
Landslide	27	$2
Thunderstorm & Lightning	746	$476
Tornado	80	$14
Wildfire	29	$152
Winter Storm & Extreme Cold	316	$23

Data Sources: NOAA and USGS

ELECTRIC


CANADA
WA
OR
ID
MT
WY
NV
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
Miles
0
125
250
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 8 has 261 electric utilities:
  - *9 Investor owned*
  - *114 Cooperative*
  - *123 Municipal*
  - *15 Other utilities*
- Plant retirements scheduled by 2025: 16 electric generating units totaling 2,460 MW of installed capacity.

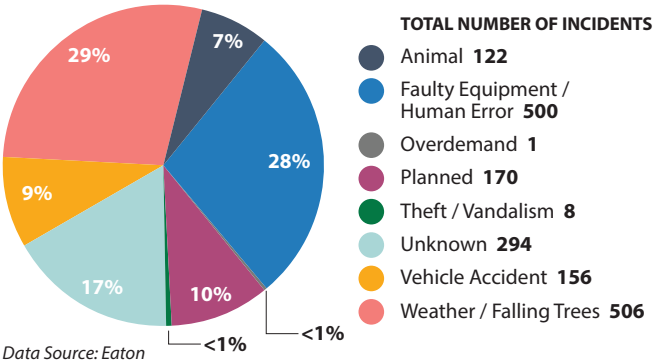
- In 2018, the average Region 8 electric customer experienced 1 service interruption that lasted an average of 2 hours.
- Between 2008 and 2017:
  - *In Region 8, the greatest number of electric outages occurred in **October** (5th for outages nationwide)*
  - *The leading cause of electric outages in Region 8 was **Weather or Falling Trees** (leading cause nationwide)*
  - *Electric outages affected 594,256 customers on average*

Electric Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	85%	31%
Commercial	14%	35%
Industrial	1%	34%
Transportation	<1%	<1%

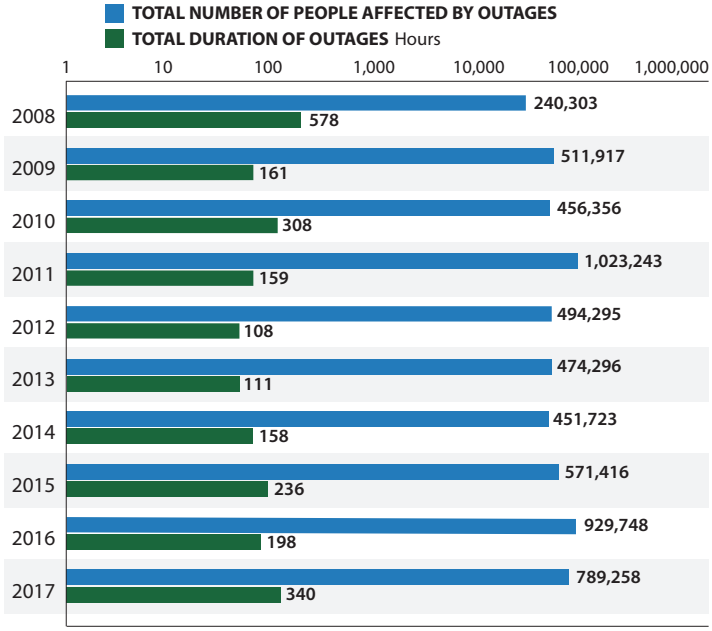
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



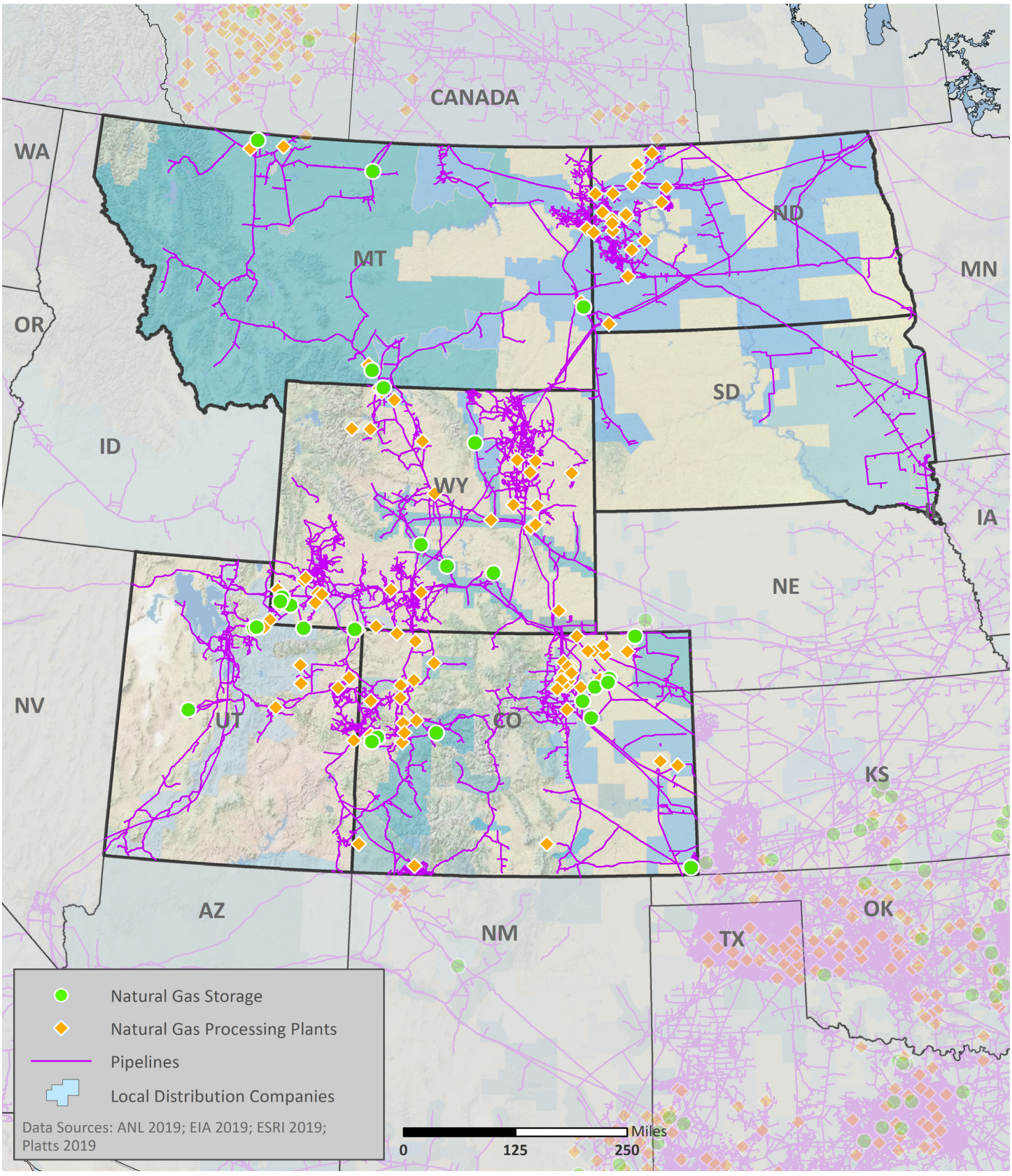
Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017



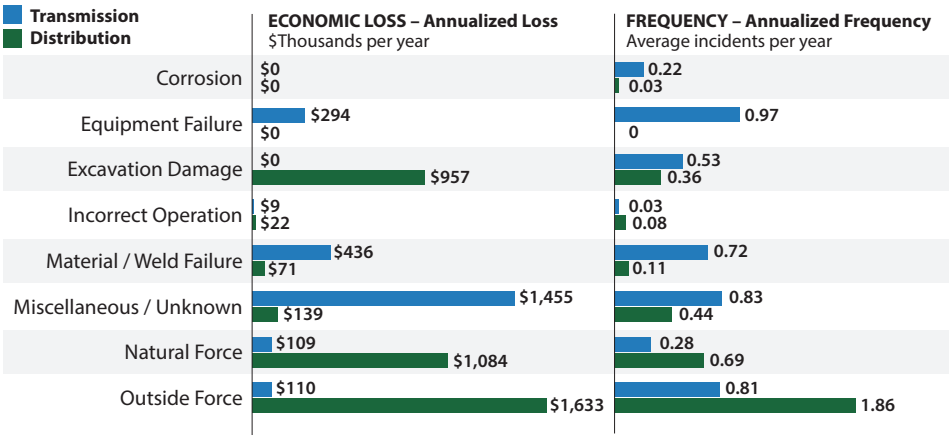
Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton

NATURAL GAS


CANADA
WA
OR
ID
MT
ND
MN
SD
WY
IA
NE
NV
UT
CO
KS
AZ
NM
OK
TX
Natural Gas Storage
Natural Gas Processing Plants
Pipelines
Local Distribution Companies
Data Sources: ANL 2019; EIA 2019; ESRI 2019; Platts 2019
0
125
250
Miles

Natural Gas Transport

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



Data Source: DOT PHMSA

- As of 2018, Region 8 had:
  - *25,532 miles of natural gas transmission pipelines*
  - *76,814 miles of natural gas distribution pipelines*
- 36% of Region 8's natural gas transmission system and 31% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Region 8'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)*
  - ***Outside Forces*** *when transported by distribution pipelines (leading cause nationwide at $76.59M per year)*

Natural Gas Processing and Liquefied Natural Gas

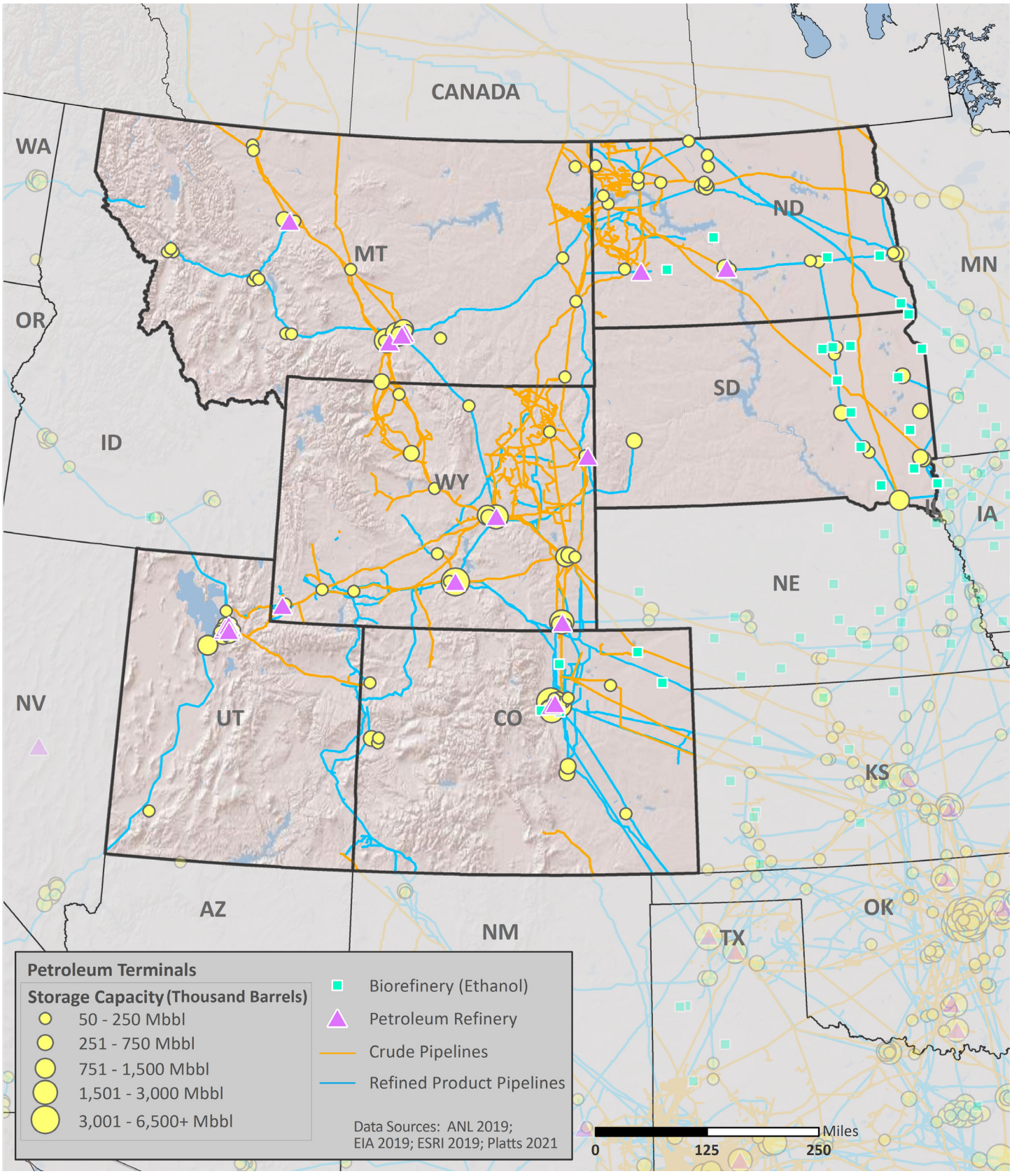
Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	91%	27%
Commercial	8%	17%
Industrial	<1%	29%
Transportation	<1%	<1%
Electric Power	<1%	27%
Other	<1%	<1%

Data Source: EIA

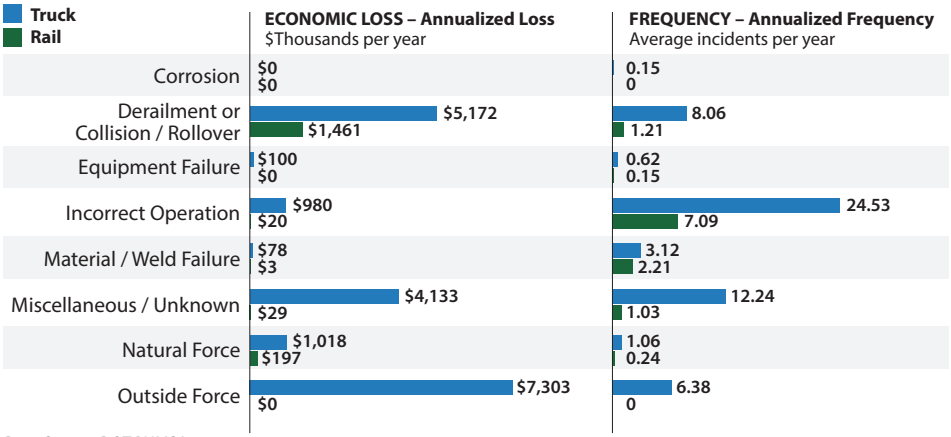
- Region 8 has 98 natural gas processing facilities.
- Region 8 has 3 liquefied natural gas (LNG) facilities with a total storage capacity of 7,361 barrels.

PETROLEUM


CANADA
WA
OR
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
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
0
125
250
Miles

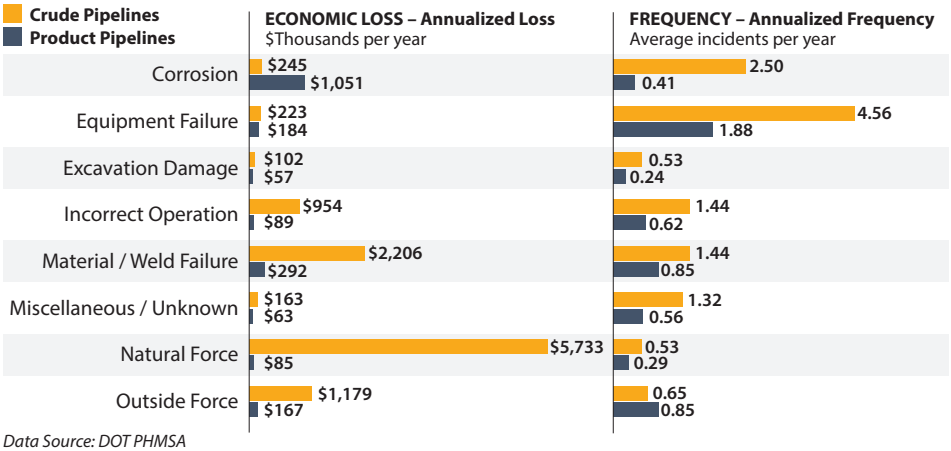
Petroleum Transport

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



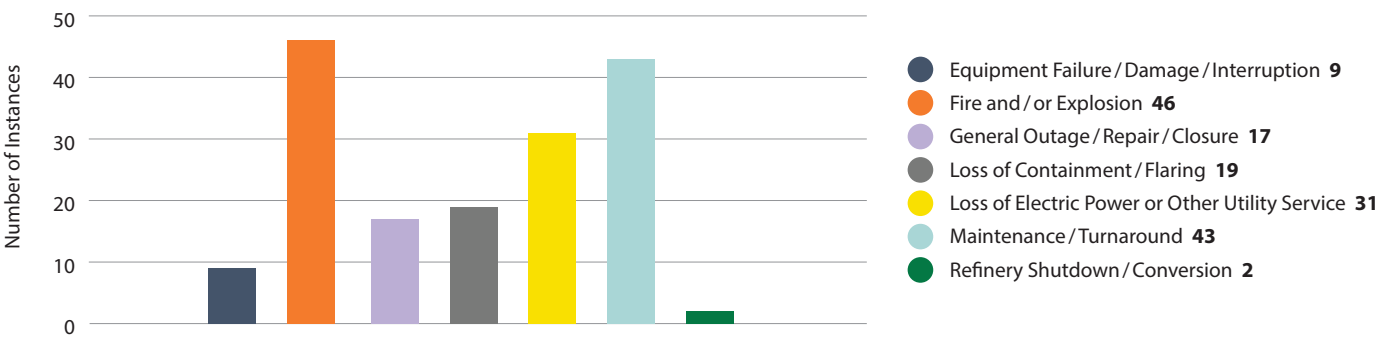
Data Source: DOT PHMSA

- Region 8 is part of Petroleum Administration for Defense Districts (PADDs) 2 and 4.
- As of 2018, Region 8 had:
  - *13,456 miles of crude oil pipelines*
  - *5,255 miles of refined product pipelines*
  - *0 miles of biofuels pipelines*
- 42% of Region 8's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Region 8'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 (4th leading cause nationwide at $8.71M 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

- Region 8 has 18 petroleum refineries with a total operable capacity of 777 Mb/d.

Causes and Frequency of Petroleum Refinery Disruptions, 2009 – 2019



Data Source: Hydrocarbon Publishing