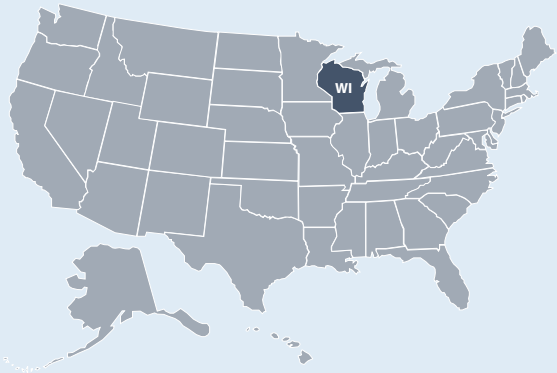
State of Wisconsin
ENERGY SECTOR RISK PROFILE

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



Wisconsin State Facts

POPULATION
5.81 M

HOUSING UNITS
2.71 M

BUSINESS ESTABLISHMENTS
0.14 M

ENERGY EMPLOYMENT: 39,390 jobs
PUBLIC UTILITY COMMISSION: Public Service Commission of Wisconsin
STATE ENERGY OFFICE: Wisconsin Office of Energy Innovation
EMERGENCY MANAGEMENT AGENCY: Wisconsin Emergency Management
AVERAGE ELECTRICITY TARIFF: 10.58 cents/kWh
ENERGY EXPENDITURES: $3,523/capita
ENERGY CONSUMPTION PER CAPITA: 312 MMBtu
(23rd highest out of 50 states and Washington, D.C.)
GDP: $336.3 billion

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

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 70,970 GWh
COAL: 20,400 MSTN
NATURAL GAS: 573 Bcf
MOTOR GASOLINE: 58,000 Mbbl
DISTILLATE FUEL: 25,700 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 221 plants, 62.8 TWh, *17.3 GW total capacity*
- **Coal:** 10 plants, 26.3 TWh, *5.9 GW total capacity*
- **Hydro:** 66 plants, 2.6 TWh, *0.5 GW total capacity*
- **Natural Gas:** 46 plants, 20.3 TWh, *7.6 GW total capacity*
- **Nuclear:** 1 plant, 10.0 TWh, *1.3 GW total capacity*
- **Petroleum:** 31 plants, 0.1 TWh, *0.8 GW total capacity*
- **Wind & Solar:** 34 plants, 1.9 TWh, *0.8 GW total capacity*
- **Other sources:** 33 plants, 1.4 TWh, *0.4 GW total capacity*

COAL: 0 MSTN
NATURAL GAS: 0 Bcf
CRUDE OIL: 0 Mbbl
ETHANOL: 13,400 Mbbl

Data from EIA (2018, 2019).

This State Energy Risk Profile examines the relative magnitude of the risks that the state of Wisconsin'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.

Wisconsin Risks and Hazards Overview

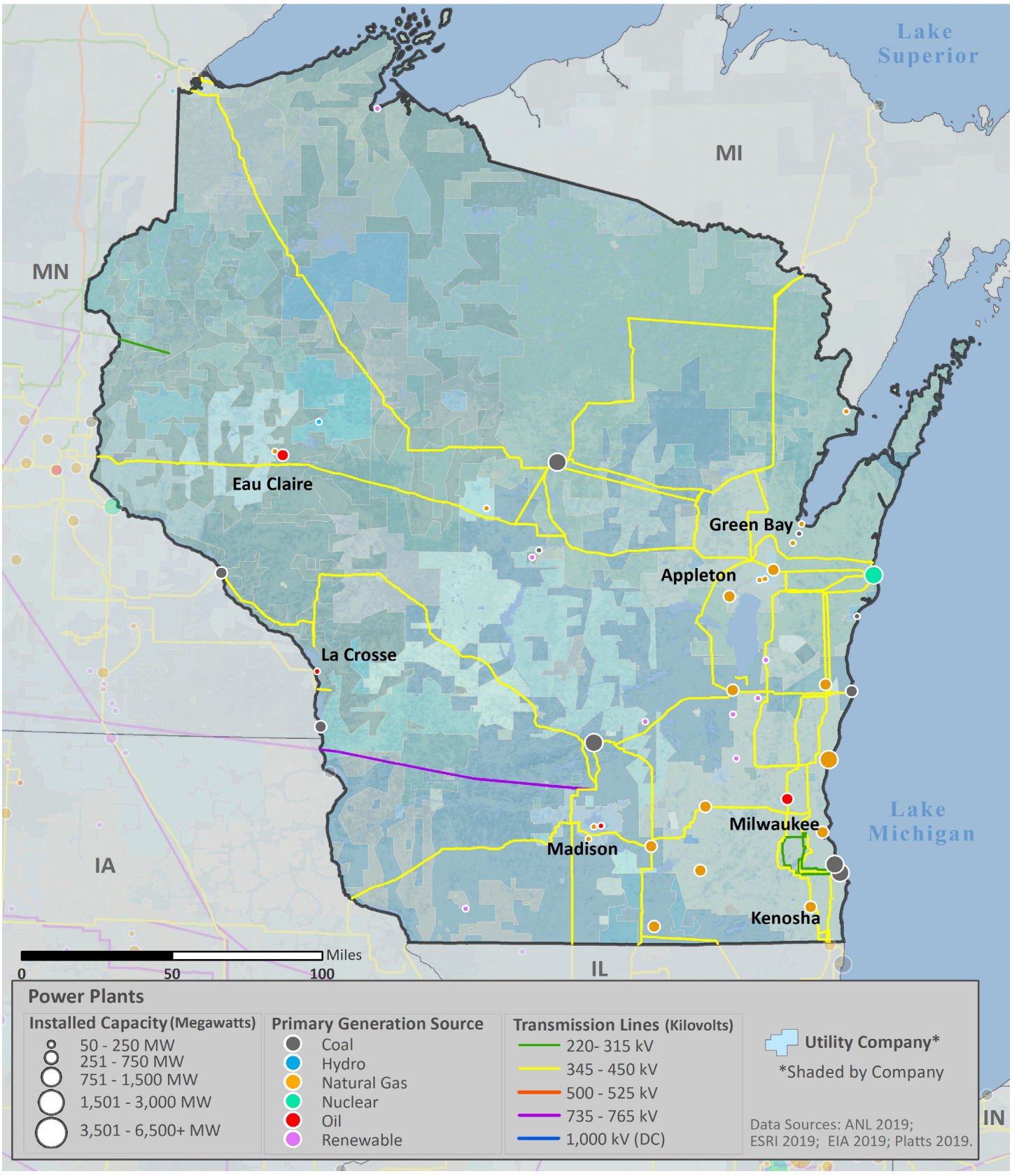
- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at $36 million per year *(leading cause nationwide at $12 billion per year).*
- Wisconsin had 79 Major Disaster Declarations, 0 Emergency Declarations, and 0 Fire Management Assistance Declarations for 7 events between 2013 and 2019.
- Wisconsin registered 3% fewer Heating Degree Days and 10% greater Cooling Degree Days than average in 2019.
- There are 2 Fusion Centers in Wisconsin. The Primary Fusion Center is located in Madison.

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

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized ($Million per year)
Drought	9	$0
Earthquake (≥ 3.5 M)	0	$0
Extreme Heat	4	$0
Flood	28	$36
Hurricane	0	$0
Landslide	0	$0
Thunderstorm & Lightning	102	$16
Tornado	17	$17
Wildfire	1	$0
Winter Storm & Extreme Cold	52	$1

Data Sources: NOAA and USGS

ELECTRIC


Lake Superior
MI
MN
Eau Claire
Green Bay
Appleton
La Crosse
Milwaukee
Madison
Kenosha
Lake Michigan
IA
IL
IN
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

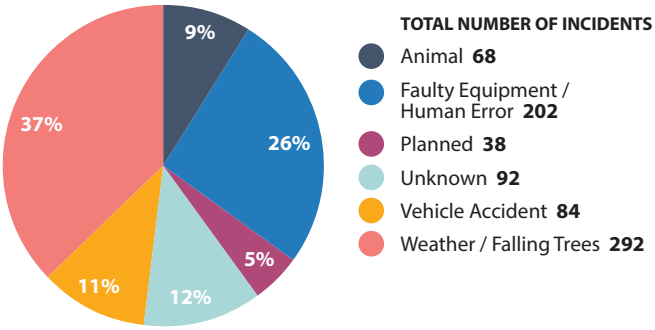
- Wisconsin has 121 electric utilities:
  - *13 Investor owned*
  - *24 Cooperative*
  - *81 Municipal*
  - *3 Other utilities*
- Plant retirements scheduled by 2025: 37 electric generating units totaling 879 MW of installed capacity.
- In 2018, the average Wisconsin electric customer experienced 0.8 service interruptions that lasted an average of 2 hours.
- In Wisconsin, 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 / Falling Trees** (leading cause nationwide)*
  - *Electric outages affected 295,518 customers on average*

Electric Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	88%	32%
Commercial	12%	34%
Industrial	<1%	34%
Transportation	<1%	<1%

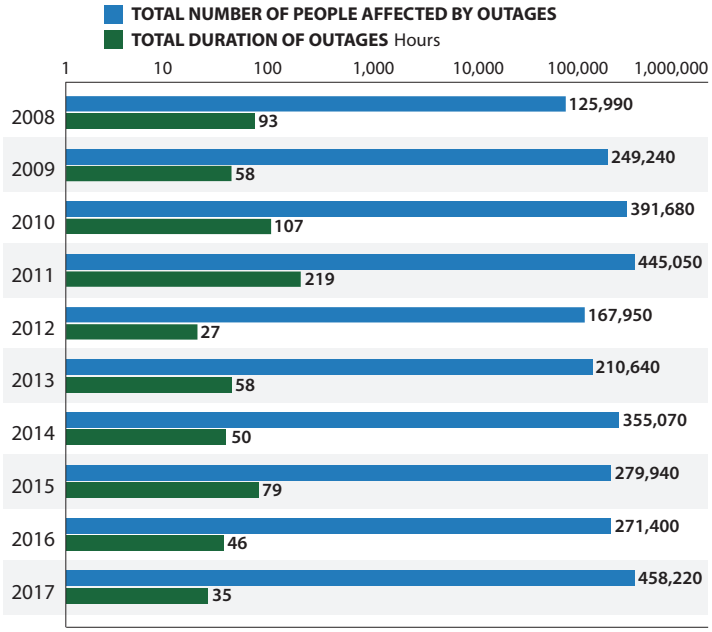
Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017



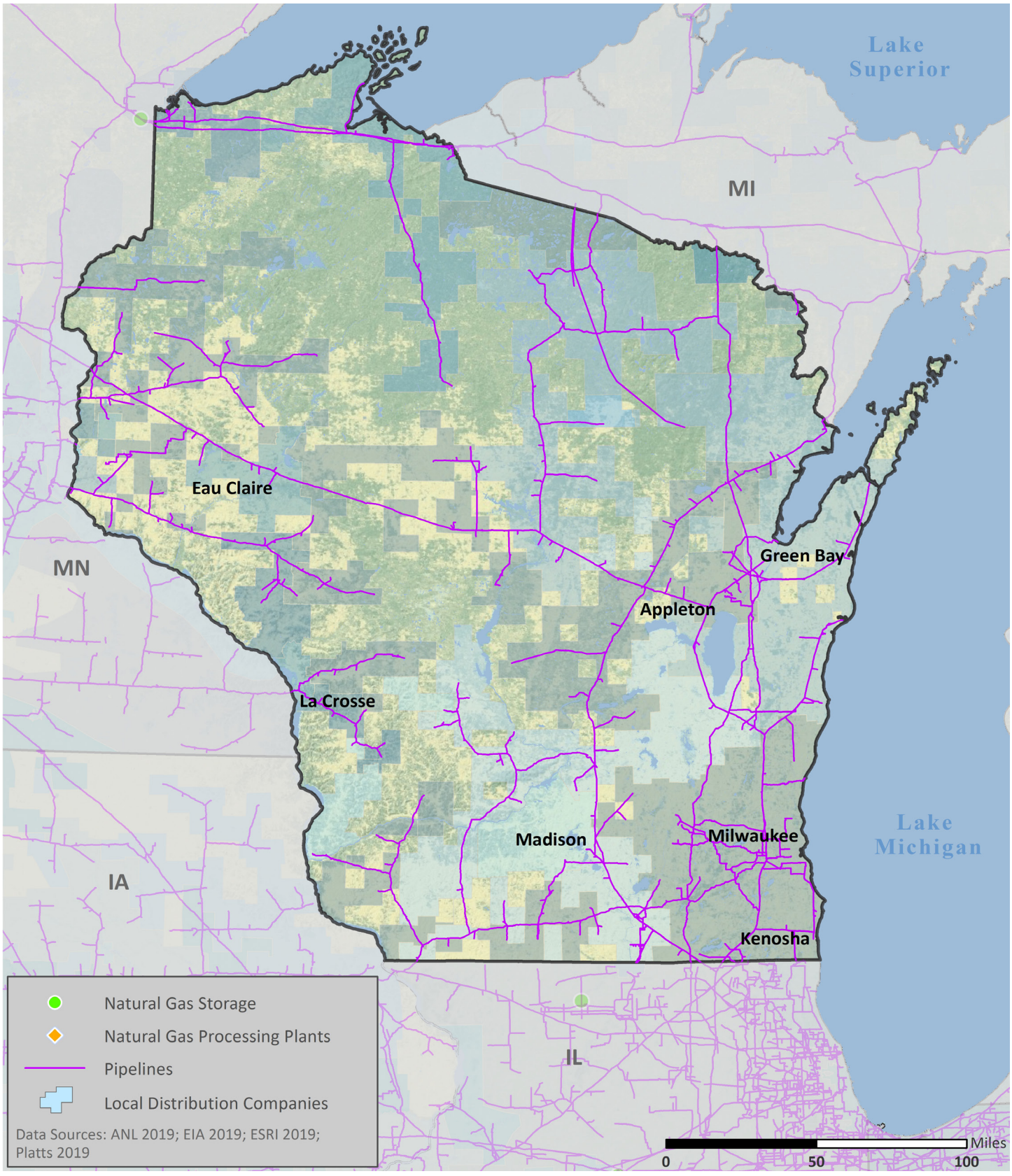
Data Source: Eaton

Electric Utility Outage Data, 2008 – 2017



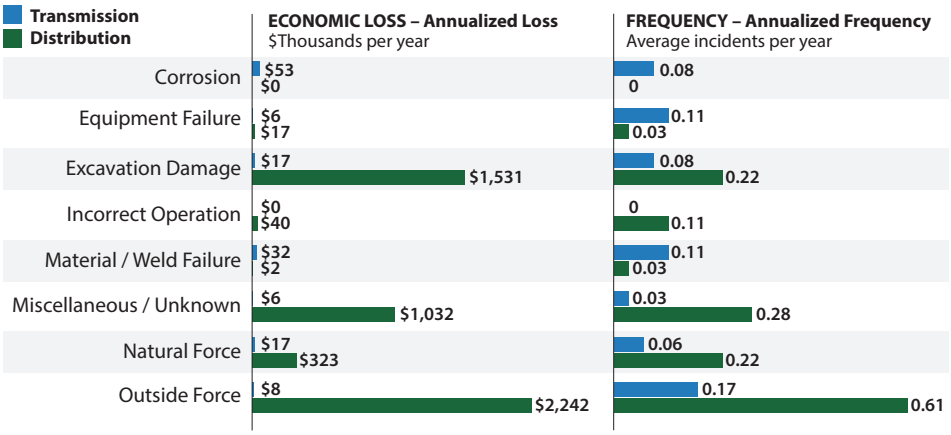
Note: This chart uses a logarithmic scale to display a very wide range of values.
Data Source: Eaton

NATURAL GAS


Lake Superior
MI
Eau Claire
MN
Green Bay
Appleton
La Crosse
Madison
Milwaukee
Lake Michigan
IA
Kenosha
IL
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, Wisconsin had:
  - *4,561 miles of natural gas transmission pipelines*
  - *40,437 miles of natural gas distribution pipelines*
- 67% of Wisconsin's natural gas transmission system and 14% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Wisconsin'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

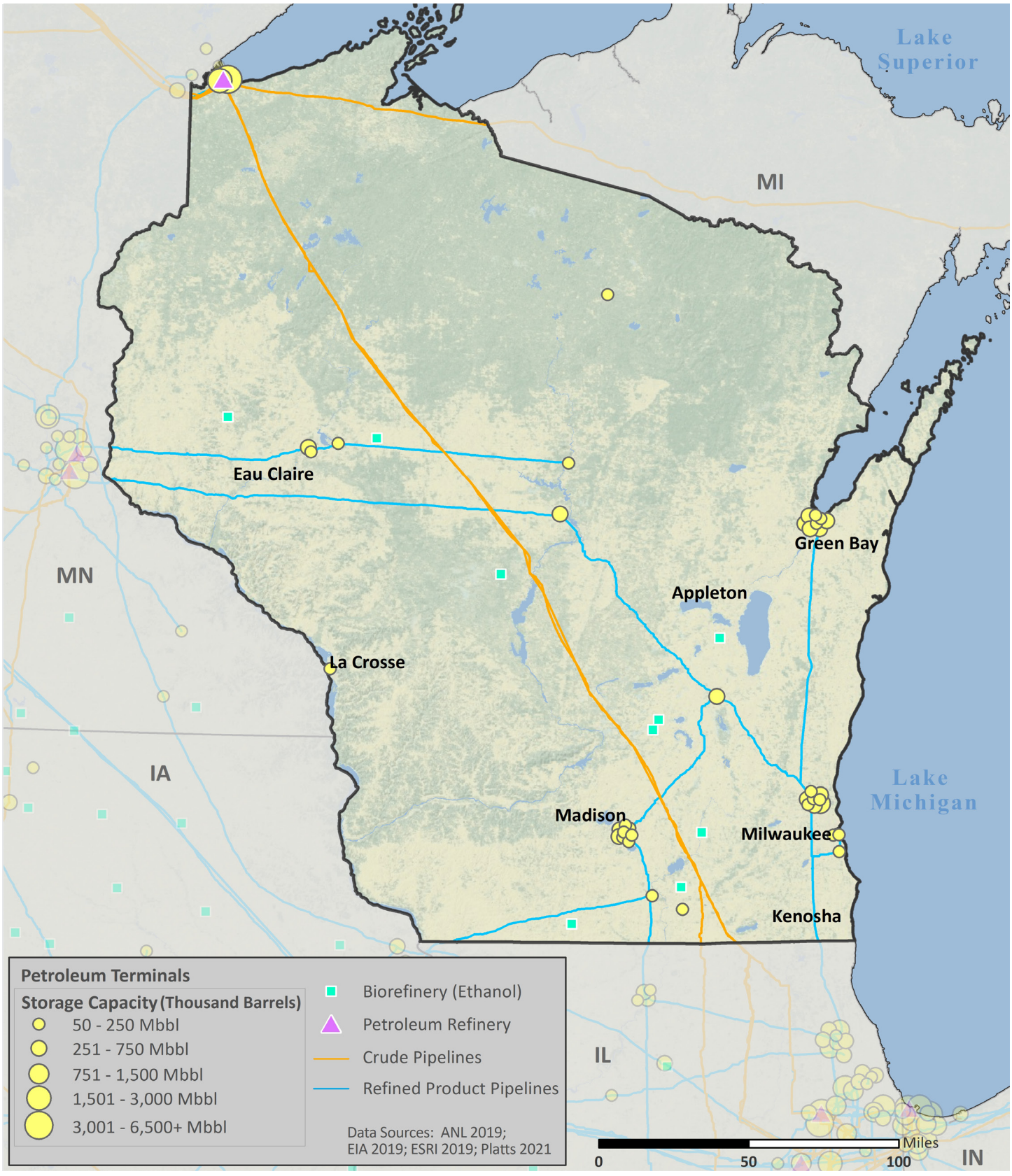
Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential	91%	24%
Commercial	9%	16%
Industrial	<1%	27%
Transportation	<1%	<1%
Electric Power	<1%	33%
Other	<1%	<1%

Data Source: EIA

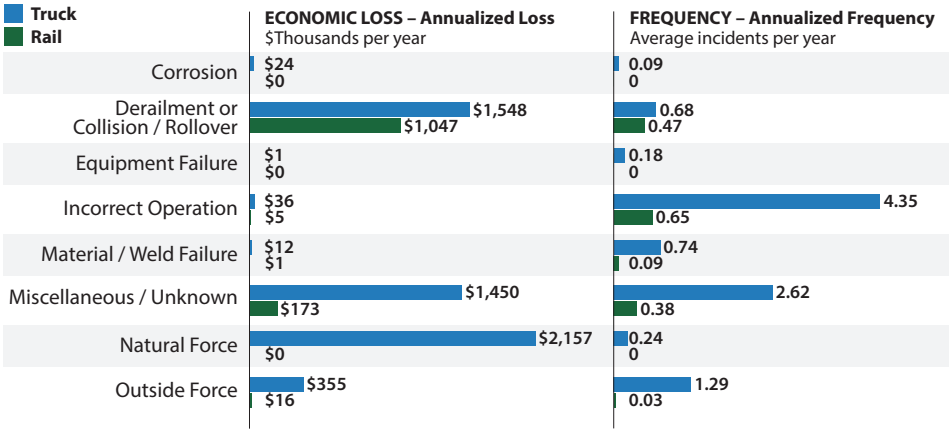
- Wisconsin has 0 natural gas processing facilities.
- Wisconsin has 3 liquefied natural gas (LNG) facilities with a total storage capacity of 155,220 barrels.

PETROLEUM


Lake Superior
MI
Eau Claire
Green Bay
MN
Appleton
La Crosse
IA
Lake Michigan
Madison
Milwaukee
Kenosha
IL
IN
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

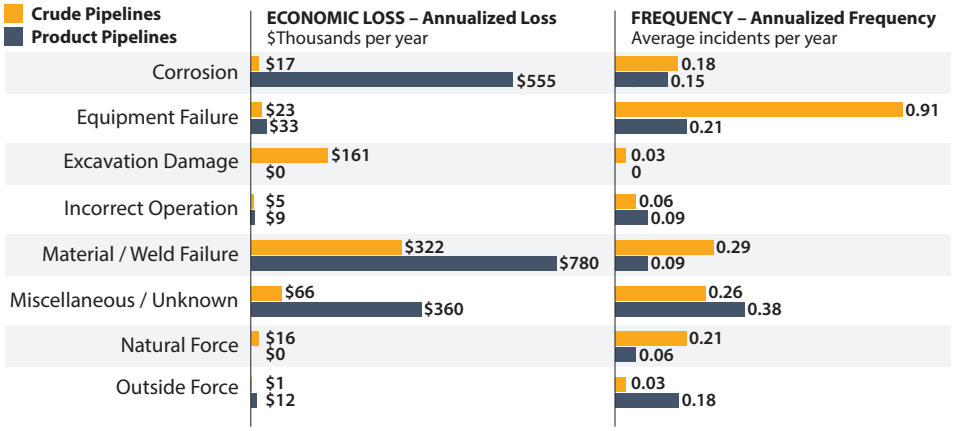
Petroleum Transport

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



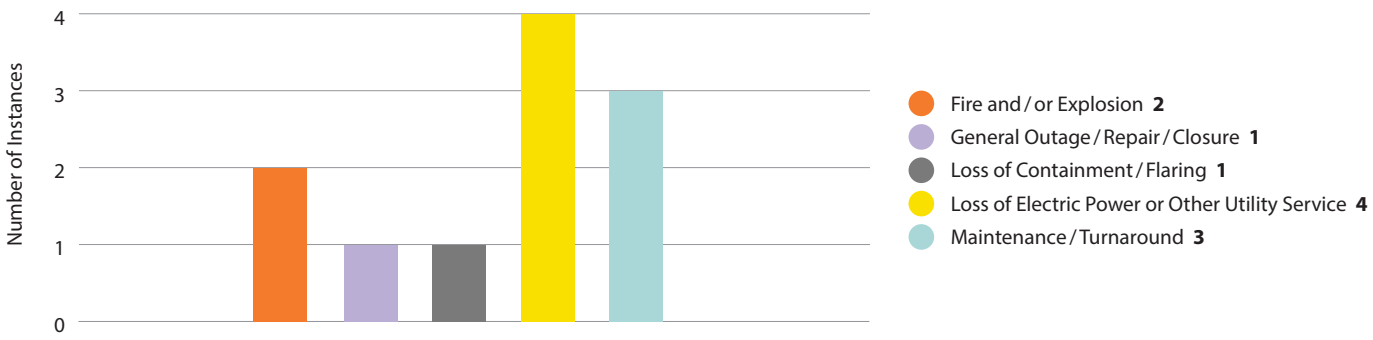
Data Source: DOT PHMSA

- As of 2018, Wisconsin had:
  - *1,181 miles of crude oil pipelines*
  - *1,112 miles of refined product pipelines*
  - *0 miles of biofuels pipelines*
- 36% of Wisconsin's petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Wisconsin's petroleum supply was most impacted by:
  - ***Natural Forces*** *when transported by truck (4th leading cause nationwide at $28.16M per year)*
  - ***Derailments, Collisions, or Rollovers*** *when transported by rail (leading cause nationwide at $19.71M per year)*
  - ***Material Failures*** *when transported by crude pipelines (leading cause nationwide at $41.36M per year)*
  - ***Material Failures*** *when transported by product pipelines (4th leading cause nationwide at $9.47M per year)*
- Disruptions in other states may impact supply.

Petroleum Refineries

- Wisconsin has 1 petroleum refinery with a total operable capacity of 38 Mb/d.
- Between 2009 and 2019, the leading cause of petroleum refinery disruptions in Wisconsin was:
  - ***Loss of Electric Power or Other Utility Services*** *(5th leading cause nationwide)*

Causes and Frequency of Petroleum Refinery Disruptions, 2009–2019



Data Source: Hydrocarbon Publishing