State of New York
ENERGY SECTOR RISK PROFILE

This State Energy Risk Profile examines the relative magnitude of the risks that the State of New York’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.

The Risk Profile highlights risk considerations relating to the electric, petroleum and natural gas infrastructures to become more aware of risks to these energy systems and assets.

NEW YORK STATE FACTS

State Overview
Population: 19.65 million (6% total U.S.)
Housing Units: 8.13 million (6% total U.S.)
Business Establishments: 0.53 million (7% total U.S.)

Annual Energy Consumption
Electric Power: 143.2 TWh (4% total U.S.)
Coal: 3,000 MSTN (<1% total U.S.)
Natural Gas: 47 Bcf (<1% total U.S.)
Motor Gasoline: 126,500 Mbarrels (4% total U.S.)
Distillate Fuel: 57,400 Mbarrels (4% total U.S.)

Annual Energy Production
Electric Power Generation: 135.8 TWh (3% total U.S.)
Coal: 4.6 TWh, 3% [2.9 GW total capacity]
Petroleum: 0.6 TWh, <1% [5.7 GW total capacity]
Natural Gas: 59.5 TWh, 44% [21.1 GW total capacity]
Nuclear: 40.8 TWh, 30% [5.7 GW total capacity]
Hydro: 24.2 TWh, 18% [5.9 GW total capacity]
Other Renewable: 3.0 TWh, 2% [1.8 GW total capacity]

NATURAL HAZARDS OVERVIEW


As reported by NOAA, the natural hazard in New York that caused the greatest overall property loss during 1996 to 2014 is Flood at $120.6 million per year.

The natural hazard with the second-highest property loss in New York is Winter Storm & Extreme Cold at $19.9 million per year.

According to NOAA, the most common natural hazard in New York is Thunderstorm & Lightning, which occurs once every 3.9 days on the average during the months of March to October.

The second-most common natural hazard in New York is Winter Storm & Extreme Cold, which occurs once every 5.7 days on the average during the months of October to March.

Data Source: NOAA
ELECTRIC

Electric Power Plants: 334 (3% total U.S.)
- Coal-fired: 10 (1% total U.S.)
- Petroleum-fired: 51 (2% total U.S.)
- Natural Gas-fired: 87 (3% total U.S.)
- Nuclear: 5 (4% total U.S.)
- Hydro-electric: 157 (5% total U.S.)
- Other Renewable: 24 (1% total U.S.)

Transmission Lines:
- High-Voltage (>230 kV): 2,832 Miles
- Low-Voltage (<230 kV): 4,371 Miles

Power Plants
- Nameplate Capacity (MW):
  - 50 - 250
  - 251 - 750
  - 751 - 1,500
  - 1,501 - 3,000
  - 3,501 - 6,500+

Primary Fuel Type
- Coal
- Natural Gas
- Oil
- Uranium
- Water
- Renewable

Transmission Lines
- 220kV - 315kV
- 345kV - 450kV
- 500kV - 525kV
- 735kV - 765kV
- 1,000kV (DC)

Utility Company
*Shaded by Company

Data Sources:
ANL 2013; ESRH 2012; EIA 2014; Plants 2014.
Electric Transmission

- According to NERC, the leading cause of electric transmission outages in New York is Faulty Equipment/Human Error.
- New York experienced 50 electric transmission outages from 1992 to 2009, affecting a total of 7,952,784 electric customers.
- Faulty Equipment/Human Error affected the largest number of electric customers as a result of electric transmission outages.


Number of NERC-Reported Electric Transmission Outages by Cause (1992–2009)

Data Source: NERC

Electric Distribution

- Between 2008 and 2013, the greatest number of electric outages in New York has occurred during the month of July.
- The leading cause of electric outages in New York during 2008 to 2013 was Weather/Falling Trees.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in New York was 2,828,062.
- The average duration of electric outages in New York during 2008 to 2013 was 7,865 minutes or 131.1 hours a year.

Electric-Utility Reported Power Outages by Month (2008–2013)


Utility Outage Data (2008–2013)

Data Source: Eaton

NOTE: # of Incidents – The number within each pie slice is the number of event incidents attributable to each cause.
Petroleum Infrastructure Overview
- Refineries: 0 (0% total U.S.)
- Terminals: 71 (4% total U.S.)
- Crude Pipelines: 86 Miles (<1% total U.S.)
- Product Pipelines: 1,800 Miles (<1% total U.S.)
- Bio-Refineries (Ethanol): 2 (1% total U.S.)
Petroleum Transport

The leading event type affecting the transport of petroleum product by rail and truck in New York during 1986 to 2014 was Incorrect Operation for rail transport and Miscellaneous/Unknown for truck transport, with an average 1.0 and 42.5 incidents per year, respectively.

Top Events Affecting Petroleum Transport by Truck and Rail (1986-2014)

- **Economic Loss**
  - Outside Force: $1
  - Natural Forces: $1
  - Miscellaneous / Unknown: $1
  - Material / Weld Failures: $0
  - Incorrect Operation: $0
  - Equipment Failure: $0
  - Derailment or Collision / Rolllover: $1
  - Corrosion: $2

- **Frequency**
  - Rail
    - Outside Force: 0.02
    - Natural Forces: 0.04
    - Miscellaneous / Unknown: 0.04
    - Material / Weld Failures: 0.10
    - Incorrect Operation: 0.8
    - Equipment Failure: 0.8
    - Derailment or Collision / Rollover: 0.59
    - Corrosion: 0.2
  - Truck
    - Outside Force: 2.5
    - Natural Forces: 0.4
    - Miscellaneous / Unknown: 0.4
    - Material / Weld Failures: 0.3
    - Incorrect Operation: 0.0
    - Equipment Failure: 0.0
    - Derailment or Collision / Rollover: 0.0
    - Corrosion: 0.0

Data Source: DOT PHMSA

The leading event type affecting crude oil pipeline and petroleum product pipelines in New York during 1986 to 2014 was Material/Weld Failures for crude oil pipelines and Material/Weld Failures for product pipelines, with an average 0.07 and 0.31 incidents per year (or one incident every 14.5 and 3.2 years, respectively).

Top Events Affecting Crude Oil and Refined Product Pipelines in New York (1986-2014)

- **Economic Loss**
  - Corrosion: $1.1
  - Natural Forces: $2.7
  - Incorrect Operation: $5.0
  - Excavation Damage: $6.9
  - Miscellaneous / Unknown: $2.1
  - Material / Weld Failures: $3.6
  - Equipment Failure: $22.4
  - Outside Force: $46.2
  - Product Pipelines: $206.2
  - Crude Pipelines: $147.0
  - Product Pipelines: $768.9
  - Crude Pipelines: $714.8

- **Frequency**
  - Crude Pipelines
    - Corrosion: 0.03
    - Natural Forces: 0.03
    - Incorrect Operation: 0.00
    - Excavation Damage: 0.00
    - Miscellaneous / Unknown: 0.03
    - Material / Weld Failures: 0.03
    - Equipment Failure: 0.03
    - Outside Force: 0.03
    - Product Pipelines: 0.24
  - Product Pipelines
    - Corrosion: 0.14
    - Natural Forces: 0.14
    - Incorrect Operation: 0.14
    - Excavation Damage: 0.14
    - Miscellaneous / Unknown: 0.10
    - Material / Weld Failures: 0.07
    - Equipment Failure: 0.10
    - Outside Force: 0.10
    - Product Pipelines: 0.31

Data Source: DOT PHMSA
NATURAL GAS

Natural Gas Infrastructure Overview
Gas Wells: 7,145 (1% total U.S.)
Processing Plants: 0 (0% total U.S.)
Storage Fields: 22 (5% total U.S.)
Interstate Pipelines: 3,840 Miles (1% total U.S.)
Local Distribution Companies: 31 (2% total U.S.)

Data Sources: ANL 2013; EIA 2014; ESRI 2012; Platts 2014; NPMS 2011.
Natural Gas Transport

- The leading event type affecting natural gas transmission and distribution pipelines in New York during 1986 to 2014 was Equipment Failure for Transmission Pipelines and Miscellaneous/Unknown for Distribution Pipelines, with an average 0.26 (or one incident every 3.9 years) and 2.39 incidents per year, respectively.


- Corrosion
- Equipment Failure
- Excavation Damage
- Incorrect Operation
- Material / Weld Failures
- Miscellaneous / Unknown
- Natural Forces
- Outside Force

Economic Loss and Frequency data are shown with bar charts.

Data Source: DOT PHMSA
**DATA SOURCES**

**Overview Information**
- Census Bureau (2012) State and County QuickFacts [http://quickfacts.census.gov/qfd/download_data.html]

**Production Numbers**

**Consumption Numbers**

**Electricity**
- Platts (2014 Q2) Transmission Lines (Miles by Voltage Level)
- Platts (2014 Q2) Power Plants (Production and Capacity by Type)

**Petroleum**
- Argonne National Laboratory (2012) Petroleum Terminal Database
- Argonne National Laboratory (2014) Ethanol Plants
- NPMS (2011) Petroleum Product Pipeline (Miles of Interstate Pipeline)
- NPMS (2011) Crude Pipeline (Miles of Interstate Pipeline)

**Natural Gas**
- EIA (2013) Number of Producing Gas Wells [http://www.eia.gov/dnav/ng/ng_prod_wells_s1_a.htm]
- NPMS (2011) Natural Gas Pipeline (Miles of Interstate Pipeline)
- Platts (2014 Q2) Local Distribution Companies (LDCs)

**Event Related**

*The NERC disturbance reports are not published after 2009.

**Notes**
- Natural Hazard, Other, includes extreme weather events such as astronomical low tide, dense smoke, frost/freeze, and rip currents.
- Each incident type is an assembly of similar causes reported in the data source. Explanations for the indescribable incident types are below.
  - Outside Force refers to pipeline failures due to vehicular accident, sabotage, or vandalism.
  - Natural Forces refers to damage that occurs as a result of naturally occurring events (e.g., earth movements, flooding, high winds, etc.)
  - Miscellaneous/Unknown includes releases or failures resulting from any other cause not listed or of an unknowable nature.
  - Overdemand refers to outages that occur when the demand for electricity is greater than the supply, causing forced curtailment.
- Number (#) of Incidents – The number within each pie chart piece is the number of outages attributable to each cause.

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**FOR MORE INFORMATION CONTACT:**

Alice Lippert  
Senior Technical Advisor  
Office of Electricity Delivery and Energy Reliability  
U.S. Department of Energy  
e-mail: energyanalysis@hq.doe.gov