State of Connecticut
ENERGY SECTOR RISK PROFILE

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

CONNECTICUT STATE FACTS

<table>
<thead>
<tr>
<th>State Overview</th>
<th>Annual Energy Production</th>
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</thead>
<tbody>
<tr>
<td>Population: 3.60 million (1% total U.S.)</td>
<td>Electric Power Generation: 36.1 TWh (1% total U.S.)</td>
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<td>Housing Units: 1.49 million (1% total U.S.)</td>
<td>Coal: 0.7 TWh, 2% [0.4 GW total capacity]</td>
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<td>Business Establishments: 0.09 million (1% total U.S.)</td>
<td>Petroleum: 0.1 TWh, &lt;1% [3.7 GW total capacity]</td>
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<tr>
<td>Annual Energy Consumption</td>
<td>Natural Gas: 16.5 TWh, 46% [3.4 GW total capacity]</td>
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<td>Electric Power: 29.5 TWh (1% total U.S.)</td>
<td>Nuclear: 17.1 TWh, 47% [2.2 GW total capacity]</td>
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<td>Coal: 400 MSTN (&lt;1% total U.S.)</td>
<td>Hydro: 0.3 TWh, &lt;1% [0.1 GW total capacity]</td>
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<tr>
<td>Natural Gas: 224 Bcf (1% total U.S.)</td>
<td>Other Renewable: 0 TWh, 0% [0 GW total capacity]</td>
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<td>Motor Gasoline: 34,100 Mbarrels (1% total U.S.)</td>
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<tr>
<td>Distillate Fuel: 17,200 Mbarrels (1% total U.S.)</td>
<td>Coal: 0 MSTN (0% total U.S.)</td>
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<td></td>
<td>Natural Gas: 0 Bcf (0% total U.S.)</td>
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<tr>
<td></td>
<td>Crude Oil: 0 Mbarrels (0% total U.S.)</td>
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<td>Ethanol: 0 Mbarrels (0% total U.S.)</td>
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NATURAL HAZARDS OVERVIEW

Annual Frequency of Occurrence of Natural Hazards in Connecticut (1996–2014)

- According to NOAA, the most common natural hazard in Connecticut is Thunderstorm & Lightning, which occurs once every 11.6 days on the average during the months of March to October.
- The second-most common natural hazard in Connecticut is Winter Storm & Extreme Cold, which occurs once every 24.5 days on the average during the months of October to March.

Annualized Property Loss due to Natural Hazards in Connecticut (1996–2014)

- As reported by NOAA, the natural hazard in Connecticut that caused the greatest overall property loss during 1996 to 2014 is Hurricane at $2.2 million per year.
- The natural hazard with the second-highest property loss in Connecticut is Flood at $1.7 million per year.
**ELECTRIC**

Electric Power Plants: 73 (1% total U.S.)
- Coal-fired: 1 (<1% total U.S.)
- Petroleum-fired: 28 (1% total U.S.)
- Natural Gas-fired: 28 (1% total U.S.)
- Nuclear: 1 (1% total U.S.)
- Hydro-electric: 15 (1% total U.S.)
- Other Renewable: 0 (0% total U.S.)

Transmission Lines:
- High-Voltage (>230 kV): 373 Miles
- Low-Voltage (<230 kV): 971 Miles
Electric Transmission

- According to NERC, the leading cause of electric transmission outages in Connecticut is Faulty Equipment/Human Error.
- Connecticut experienced 24 electric transmission outages from 1992 to 2009, affecting a total of 488,243 electric customers.
- Complete Electrical System Failure affected the largest number of electric customers as a result of electric transmission outages.

### Electric Customers Disrupted by NERC-Reported Electric Transmission Outages by Cause (1992–2009)

- Faulty Equipment / Human Error: 278,000
- Major Generation Inadequacy: 53,242
- Severe Weather - Lightning: 0
- Severe Weather - Heat Wave: 0
- Complete Electrical System Failure: 157,000

Data Source: NERC

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

- Faulty Equipment / Human Error: 11
- Major Generation Inadequacy: 5
- Severe Weather - Lightning: 2
- Severe Weather - Heat Wave: 0
- Complete Electrical System Failure: 3
- All Other Causes: 1

Data Source: NERC

Electric Distribution

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

- Between 2008 and 2013, the greatest number of electric outages in Connecticut has occurred during the month of June.
- The leading cause of electric outages in Connecticut during 2008 to 2013 was Weather/Falling Trees.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in Connecticut was 522,697.
- The average duration of electric outages in Connecticut during 2008 to 2013 was 2,517 minutes or 41.9 hours a year.

### Causes of Electric-Utility Reported Outages (2008–2013)

- Animal: 138
- Faulty Equipment / Human Error: 104
- Overdemand: 33
- Planned: 35
- Theft / Vandalism: 8
- Unknown: 0
- Vehicle Accident: 0
- Weather / Falling Trees: 0

Data Source: Eaton

### Utility Outage Data (2008–2013)

- Total number of people affected by outages:
  - 2008: 17,390
  - 2009: 16,890
  - 2010: 16,250
  - 2011: 15,910
  - 2012: 14,900
  - 2013: 9,170

- Total duration of outages (minutes):
  - 2008: 1,398
  - 2009: 1,472
  - 2010: 1,060
  - 2011: 1,270
  - 2012: 1,320
  - 2013: 1,470

Data Source: Eaton

NOTE: # of Incidents – The number within each pie slice is the number of event incidents attributable to each cause.
PETROLEUM

Petroleum Infrastructure Overview
- Refineries: 0 (0% total U.S.)
- Terminals: 31 (2% total U.S.)
- Crude Pipelines: 0 Miles (0% total U.S.)
- Product Pipelines: 240 Miles (<1% total U.S.)
- Bio-Refineries (Ethanol): 0 (0% total U.S.)

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

Data Sources: ACE 2012; ANL 2013; EIA 2014; ESRI 2012; NPMS 2011.
Petroleum Transport

- The leading event type affecting the transport of petroleum product by rail and truck in Connecticut during 1986 to 2014 was Incorrect Operation for rail transport and Miscellaneous/Unknown for truck transport, with an average 0.1 (or one incident every 10 years) and 7.5 incidents per year, respectively.

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

- The leading event type affecting petroleum product pipelines in Connecticut during 1986 to 2014 was Corrosion, with an average 0.14 incidents per year (or one incident every 7.3 years). There are no crude oil pipelines in the State of Connecticut.

Top Events Affecting Crude Oil and Refined Product Pipelines in Connecticut (1986–2014)
NATURAL GAS

Natural Gas Infrastructure Overview
Gas Wells: 0 (0% total U.S.)
Processing Plants: 0 (0% total U.S.)
Storage Fields: 1 (<1% total U.S.)
Interstate Pipelines: 300 Miles (<1% total U.S.)
Local Distribution Companies: 10 (1% total U.S.)
Natural Gas Transport

The leading event type affecting natural gas transmission and distribution pipelines in Connecticut during 1986 to 2014 was **Material/Weld Failures** for Transmission Pipelines and **Miscellaneous/Unknown** for Distribution Pipelines, with an average 0.06 and 0.42 incidents per year (or one incident every 15.5 and 2.4 years), respectively.


- **Corrosion**: $0
- **Equipment Failure**: $0
- **Excavation Damage**: $0
- **Incorrect Operation**: $0
- **Material/Weld Failures**: $0.02
- **Miscellaneous/Unknown**: $0.34
- **Natural Forces**: $0.77
- **Outside Force**: $0.113

**Economic Loss**

- **Transmission**: $2,801
- **Distribution**: $0

**Frequency**

- **Transmission**: 0.06
- **Distribution**: 0.42

Data Source: DOT PHMSA
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


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.

FOR MORE INFORMATION CONTACT:
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