State of Rhode Island
ENERGY SECTOR RISK PROFILE

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

RHODE ISLAND STATE FACTS

<table>
<thead>
<tr>
<th>State Overview</th>
<th>Annual Energy Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population: 1.05 million (&lt;1% total U.S.)</td>
<td>Electric Power Generation: 8.3 TWh (&lt;1% total U.S.)</td>
</tr>
<tr>
<td>Housing Units: 0.46 million (&lt;1% total U.S.)</td>
<td>Coal: 0 TWh, 0% [0 GW total capacity]</td>
</tr>
<tr>
<td>Business Establishments: 0.03 million (&lt;1% total U.S.)</td>
<td>Petroleum: 0 TWh, 0% [0 GW total capacity]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Energy Consumption</th>
<th>Annual Energy Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Power: 7.7 TWh (&lt;1% total U.S.)</td>
<td>Natural Gas: 95 Bcf (&lt;1% total U.S.)</td>
</tr>
<tr>
<td>Coal: 0 MSTN (0% total U.S.)</td>
<td>Coal: 0 MSTN (0% total U.S.)</td>
</tr>
<tr>
<td>Natural Gas: 95 Bcf (&lt;1% total U.S.)</td>
<td>Natural Gas: 0 Bcf (0% total U.S.)</td>
</tr>
<tr>
<td>Motor Gasoline: 11,600 Mbarrels (&lt;1% total U.S.)</td>
<td>Crude Oil: 0 Mbarrels (0% total U.S.)</td>
</tr>
<tr>
<td>Distillate Fuel: 4,400 Mbarrels (&lt;1% total U.S.)</td>
<td>Ethanol: 0 Mbarrels (0% total U.S.)</td>
</tr>
</tbody>
</table>

NATURAL HAZARDS OVERVIEW

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

- According to NOAA, the most common natural hazard in Rhode Island is Thunderstorm & Lightning, which occurs once every 24.7 days on the average during the months of March to October.
- The second-most common natural hazard in Rhode Island is Winter Storm & Extreme Cold, which occurs once every 68.9 days on the average during the months of October to March.

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

- As reported by NOAA, the natural hazard in Rhode Island that caused the greatest overall property loss during 1996 to 2014 is Flood at $3.9 million per year.
- The natural hazard with the second-highest property loss in Rhode Island is Winter Storm & Extreme Cold at $0.5 million per year.
### ELECTRIC

**Electric Power Plants:** 12 (<1% total U.S.)
- Coal-fired: 0 (0% total U.S.)
- Petroleum-fired: 2 (<1% total U.S.)
- Natural Gas-fired: 7 (<1% total U.S.)
- Nuclear: 0 (0% total U.S.)
- Hydro-electric: 2 (<1% total U.S.)
- Other Renewable: 1 (<1% total U.S.)

**Transmission Lines:**
- High-Voltage (>230 kV): 16 Miles
- Low-Voltage (<230 kV): 403 Miles
Electric Transmission

- According to NERC, the leading cause of electric transmission outages in Rhode Island is **Faulty Equipment/Human Error**.
- Rhode Island experienced **19 electric transmission outages** from 1992 to 2009, affecting a total of **233,359** electric customers.
- **Severe Weather - High Winds** affected the largest number of electric customers as a result of electric transmission outages.


![Chart showing electric transmission outages by cause](chart.png)

#### Electric Distribution

- Between 2008 and 2013, the greatest number of electric outages in Rhode Island has occurred during the month of **January**.
- The leading cause of electric outages in Rhode Island during 2008 to 2013 was **Weather/Falling Trees**.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in Rhode Island was **183,755**.
- The average duration of electric outages in Rhode Island during 2008 to 2013 was **303 minutes or 5.1 hours a year**.


![Chart showing causes of electric outages](chart2.png)

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

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Produced by Department of Energy (DOE), Office of Electricity Delivery & Energy Reliability (OE)
PETROLEUM

Petroleum Infrastructure Overview
Refineries: 0 (0% total U.S.)
Terminals: 11 (1% total U.S.)
Crude Pipelines: 0 Miles (0% total U.S.)
Product Pipelines: 120 Miles (<1% total U.S.)
Bio-Refineries (Ethanol): 0 (0% total U.S.)
Petroleum Transport

The leading event type affecting the transport of petroleum product by rail and truck in Rhode Island during 1986 to 2014 was Incorrect Operation for rail transport and Miscellaneous/Unknown for truck transport, with an average 0.04 and 0.6 incidents per year (or one incident every 25 and 1.6 years), respectively.

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

The leading event type affecting petroleum product pipelines in Rhode Island during 1986 to 2014 was Miscellaneous/Unknown, with an average 0.03 incidents per year (or one incident every 29 years). There are no crude oil pipelines in the State of Rhode Island.

Top Events Affecting Crude Oil and Refined Product Pipelines in Rhode Island (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: 180 Miles (<1% total U.S.)
Local Distribution Companies: 8 (<1% total U.S.)
Natural Gas Transport

The leading event type affecting natural gas transmission and distribution pipelines in Rhode Island during 1986 to 2014 was Outside Force for Transmission Pipelines and Outside Force for Distribution Pipelines, with an average 0.03 and 0.13 incidents per year (or one incident every 31 and 7.8 years), respectively.

Top Events Affecting Natural Gas Transmission and Distribution in Rhode Island (1986–2014)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Economic Loss</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion</td>
<td>$24</td>
<td>0.06</td>
</tr>
<tr>
<td>Equipment Failure</td>
<td>$0</td>
<td>0.03</td>
</tr>
<tr>
<td>Excavation Damage</td>
<td>$20</td>
<td>0.13</td>
</tr>
<tr>
<td>Incorrect Operation</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Material / Weld Failures</td>
<td>$21</td>
<td>0.13</td>
</tr>
<tr>
<td>Miscellaneous / Unknown</td>
<td>$6</td>
<td>0.13</td>
</tr>
<tr>
<td>Natural Forces</td>
<td>$48</td>
<td>0.13</td>
</tr>
<tr>
<td>Outside Force</td>
<td></td>
<td>0.13</td>
</tr>
</tbody>
</table>

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.

FOR MORE INFORMATION CONTACT:
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