State of Alaska
ENERGY SECTOR RISK PROFILE

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

ALASKA STATE FACTS

State Overview
Population: 0.74 million (<1% total U.S.)
Housing Units: 0.31 million (<1% total U.S.)
Business Establishments: 0.02 million (<1% total U.S.)

Annual Energy Consumption
Electric Power: 6.4 TWh (<1% total U.S.)
Coal: 400 MSTN (<1% total U.S.)
Natural Gas: 622 Bcf (3% total U.S.)
Motor Gasoline: 6,300 Mbarrels (<1% total U.S.)
Distillate Fuel: 13,200 Mbarrels (1% total U.S.)

Annual Energy Production
Electric Power Generation: 6.9 TWh (2% total U.S.)
Coal: 0.7 TWh, 10% [0.1 GW total capacity]
Petroleum: 1 TWh, 15% [0.7 GW total capacity]
Natural Gas: 3.6 TWh, 52% [1.0 GW total capacity]
Nuclear: 0 TWh, 0% [0 GW total capacity]
Hydro: 1.6 TWh, 23% [0.4 GW total capacity]
Other Renewable: 0.01 TWh, <1% [0.01 GW total capacity]

Coal: 2,100 MSTN (<1% total U.S.)
Natural Gas: 350 Bcf (1% total U.S.)
Crude Oil: 192,400 Mbarrels (8% total U.S.)
Ethanol: 0 Mbarrels (0% total U.S.)

NATURAL HAZARDS OVERVIEW

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

According to NOAA, the most common natural hazard in Alaska is Earthquake (≥3.5 M), which occurs once every 2.5 days on the average.

The second-most common natural hazard in Alaska is Winter Storm & Extreme Cold, which occurs once every 4 days on the average during the months of October to March.

As reported by NOAA, the natural hazard in Alaska that caused the greatest overall property loss during 1996 to 2014 is Flood at $10.3 million per year.

The natural hazard with the second-highest property loss in Alaska is Earthquake at $2.6 million per year.
**Electric Power Plants:** 139 (1% total U.S.)
- Coal-fired: 5 (<1% total U.S.)
- Petroleum-fired: 89 (4% total U.S.)
- Natural Gas-fired: 13 (<1% total U.S.)
- Nuclear: 0 (0% total U.S.)
- Hydro-electric: 28 (1% total U.S.)
- Other Renewable: 4 (<1% total U.S.)

**Transmission Lines:**
- High-Voltage (>230 kV): 676 Miles
- Low-Voltage (<230 kV): 1,021 Miles

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**Power Plants**

<table>
<thead>
<tr>
<th>Nameplate Capacity (MW)</th>
<th>Primary Fuel Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 - 250</td>
<td>Coal</td>
</tr>
<tr>
<td>251 - 750</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>751 - 1,500</td>
<td>Oil</td>
</tr>
<tr>
<td>1,501 - 3,000</td>
<td>Uranium</td>
</tr>
<tr>
<td>3,501 - 6,500+</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>Renewable</td>
</tr>
</tbody>
</table>

**Transmission Lines**

- Below 100 kV
- 115 - 161 kV
- 220 kV - 315 kV
- 345 kV - 450 kV

Data Sources:
- ANL 2013;
- ESRI 2012;
- EIA 2014;
- Platts 2014.
Electric Transmission

- According to NERC, the leading cause of electric transmission outages in Alaska is Transmission Line Faults and Overloads.
- Alaska experienced 1 electric transmission outage from 1992 to 2009, affecting a total of 14,273 electric customers.
- Transmission Line Faults and Overloads affected the largest number of electric customers as a result of electric transmission outages.

Electric Distribution

- Between 2008 and 2013, the greatest number of electric outages in Alaska has occurred during the month of November.
- The leading cause of electric outages in Alaska during 2008 to 2013 was Weather/Falling Trees.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in Alaska was 39,282.
- The average duration of electric outages in Alaska during 2008 to 2013 was 1,860 minutes or 31.0 hours a year.
PETROLEUM

Petroleum Infrastructure Overview
Refineries: 6 (4% total U.S.)
Terminals: 72 (4% total U.S.)
Crude Pipelines: 1,476 Miles (3% total U.S.)
Product Pipelines: 7,800 Miles (1% total U.S.)
Bio-Refineries (Ethanol): 0 (0% total U.S.)
Petroleum Transport

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

- The leading event type affecting the transport of petroleum product by rail and truck in Alaska during 1986 to 2014 was Derailment/Rollover for rail transport and Collision/Rollover for truck transport, with an average 0.6 and 0.6 incidents per year (or one incident every 1.6 and 1.6 years), respectively.

Petroleum Refinery

- The leading cause of petroleum refinery disruptions in Alaska from 2003 to 2014 was Loss of Containment/Flaring. Alaska's petroleum refineries experienced 30 major incidents from 2003 to 2014. The average production impact from disruptions of Alaska's refineries from 2003 to 2014 is 61.2 thousand barrels per day.


- Loss of Containment / Flaring
- Maintenance/ Turnaround
- Cause Not Specified
- Fire and/or Explosion
- All Other Causes

Average Production Impact (thousand barrels per day) from Petroleum Refinery Outages in Alaska (2003–2014)
NATURAL GAS

Natural Gas Infrastructure Overview
Gas Wells: 152 (<1% total U.S.)
Processing Plants: 0 (0% total U.S.)
Storage Fields: 1 (<1% total U.S.)
Interstate Pipelines: 4,800 Miles (1% total U.S.)
Local Distribution Companies: 2 (<1% total U.S.)
Natural Gas Transport

The leading event type affecting natural gas transmission and distribution pipelines in Alaska during 1986 to 2014 was **Outside Force** for Transmission Pipelines and **Natural Forces** for Distribution Pipelines, with an average 0.16 (or one incident every 6.2 years) and 1.65 incidents per year, respectively.

### Top Events Affecting Natural Gas Transmission and Distribution in Alaska (1986–2014)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Economic Loss</th>
<th>Annual Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Equipment Failure</td>
<td>$0</td>
<td>0.00</td>
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<tr>
<td>Excavation Damage</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Incorrect Operation</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Material / Weld Failures</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Miscellaneous / Unknown</td>
<td>$48</td>
<td>0.06</td>
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<tr>
<td>Natural Forces</td>
<td>$2,065</td>
<td>0.32</td>
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<tr>
<td>Outside Force</td>
<td>$230</td>
<td>0.11</td>
</tr>
</tbody>
</table>

**Economic Loss**: Annual Loss ($ Thousands per Year)

**Frequency**: Annual Frequency (Average per Year)

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


*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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