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

**LOUISIANA STATE FACTS**

**State Overview**
- Population: 4.63 million (1% total U.S.)
- Housing Units: 1.99 million (1% total U.S.)
- Business Establishments: 0.10 million (1% total U.S.)

**Annual Energy Consumption**
- Electric Power: 84.7 TWh (2% total U.S.)
- Coal: 14,700 MSTN (2% total U.S.)
- Natural Gas: 1,337 Bcf (6% total U.S.)
- Motor Gasoline: 57,800 Mbarrels (2% total U.S.)
- Distillate Fuel: 37,400 Mbarrels (3% total U.S.)

**Annual Energy Production**
- Electric Power Generation: 103.4 TWh (3% total U.S.)
  - Coal: 21.4 TWh, 21% [3.8 GW total capacity]
  - Petroleum: 3 TWh, 3% [1.1 GW total capacity]
  - Natural Gas: 58.6 TWh, 57% [22.4 GW total capacity]
  - Nuclear: 15.7 TWh, 15% [2.2 GW total capacity]
  - Hydro: 0.7 TWh, <1% [0.2 GW total capacity]
  - Other Renewable: 0 TWh, 0% [0.4 GW total capacity]
- Coal: 4,000 MSTN (<1% total U.S.)
- Natural Gas: 2,960 Bcf (12% total U.S.)
- Crude Oil: 70,700 Mbarrels (3% total U.S.)
- Ethanol: 0 Mbarrels (0% total U.S.)

**NATURAL HAZARDS OVERVIEW**

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

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Annual Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td>2</td>
</tr>
<tr>
<td>Earthquake</td>
<td>3</td>
</tr>
<tr>
<td>Extreme Heat</td>
<td>27</td>
</tr>
<tr>
<td>Flood</td>
<td>10</td>
</tr>
<tr>
<td>Hurricane</td>
<td>15</td>
</tr>
<tr>
<td>Thunderstorm &amp; Lightning</td>
<td>1</td>
</tr>
<tr>
<td>Tornado</td>
<td>4</td>
</tr>
<tr>
<td>Wildfire</td>
<td>0</td>
</tr>
<tr>
<td>Winter Storm &amp; Extreme Cold</td>
<td>0</td>
</tr>
</tbody>
</table>

Data Source: NOAA

- According to NOAA, the most common natural hazard in Louisiana is Thunderstorm & Lightning, which occurs once every 3.5 days on the average during the months of March to October.
- The second-most common natural hazard in Louisiana is Flood, which occurs once every 13.5 days on the average.

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

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Annualized Property Loss (Million per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td>$53.6</td>
</tr>
<tr>
<td>Earthquake</td>
<td>$0.0</td>
</tr>
<tr>
<td>Extreme Heat</td>
<td>$0.0</td>
</tr>
<tr>
<td>Flood</td>
<td>$0.0</td>
</tr>
<tr>
<td>Hurricane</td>
<td>$208.2</td>
</tr>
<tr>
<td>Thunderstorm &amp; Lightning</td>
<td>$0.0</td>
</tr>
<tr>
<td>Tornado</td>
<td>$97.0</td>
</tr>
<tr>
<td>Wildfire</td>
<td>$11.5</td>
</tr>
<tr>
<td>Winter Storm &amp; Extreme Cold</td>
<td>$0.1</td>
</tr>
</tbody>
</table>

Data Source: NOAA

- As reported by NOAA, the natural hazard in Louisiana that caused the greatest overall property loss during 1996 to 2014 is Hurricane at $208.2 million per year.
- The natural hazard with the second-highest property loss in Louisiana is Flood at $131.0 million per year.
Electric Power Plants: 84 (1% total U.S.)
- Coal-fired: 4 (<1% total U.S.)
- Petroleum-fired: 8 (<1% total U.S.)
- Natural Gas-fired: 63 (2% total U.S.)
- Nuclear: 2 (2% total U.S.)
- Hydro-electric: 1 (<1% total U.S.)
- Other Renewable: 6 (<1% total U.S.)

Transmission Lines:
- High-Voltage (>230 kV): 3,857 Miles
- Low-Voltage (<230 kV): 558 Miles
### Electric Transmission

- According to NERC, the leading cause of electric transmission outages in Louisiana is **Natural Disaster - Hurricane/Tropical Storm**.
- Louisiana experienced **38 electric transmission outages** from 1992 to 2009, affecting a total of **2,557,662 electric customers**.
- **Natural Disaster - Hurricane/Tropical Storm** affected the largest number of electric customers as a result of electric transmission outages.


![Graph showing the number of electric transmission outages by cause from 1992 to 2009.]

**Data Source: NERC**

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### Electric Distribution

- **Between 2008 and 2013**, the greatest number of electric outages in Louisiana has occurred during the month of **September**.
- The leading cause of electric outages in Louisiana during 2008 to 2013 was **Weather/Falling Trees**.
- On average, the number of people affected annually by electric outages during 2008 to 2013 in Louisiana was **477,507**.
- The average duration of electric outages in Louisiana during 2008 to 2013 was **1,220 minutes** or **20.3 hours** a year.

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

![Graph showing the number of electric utility reported power outages by month from 2008 to 2013.]

**Data Source: Eaton**

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

Petroleum Infrastructure Overview
Refineries: 19 (13% total U.S.)
Terminals: 92 (5% total U.S.)
Crude Pipelines: 2,625 Miles (5% total U.S.)
Product Pipelines: 57,600 Miles (9% total U.S.)
Bio-Refineries (Ethanol): 1 (<1% 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 Louisiana during 1986 to 2014 was Incorrect Operation for rail transport and Miscellaneous/Unknown for truck transport, with an average 2.7 and 5.5 incidents per year, respectively.

Petroleum Refinery

The leading cause of petroleum refinery disruptions in Louisiana from 2003 to 2014 was Maintenance/Turnaround. Louisiana's petroleum refineries experienced 608 major incidents from 2003 to 2014. The average production impact from disruptions of Louisiana's refineries from 2003 to 2014 is 56.7 thousand barrels per day.


# of Incidents

- Maintenance/Turnaround: 157
- Equipment Failure or Damage: 96
- Operational Upset or Process Problem: 61
- Loss of Containment / Flaring: 189
- All Other Causes: 105

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

- Maintenance/Turnaround: 53.1
- Equipment Failure or Damage: 51.8
- Operational Upset or Process Problem: 4.5
- Loss of Containment / Flaring: 12.2
- All Other Causes: 103.3

Data Source: DOE OE
NATURAL GAS

Natural Gas Infrastructure Overview
- Gas Wells: 19,683 (4% total U.S.)
- Processing Plants: 54 (10% total U.S.)
- Storage Fields: 21 (5% total U.S.)
- Interstate Pipelines: 44,640 Miles (9% total U.S.)
- Local Distribution Companies: 108 (6% total U.S.)
Natural Gas Transport

- The leading event type affecting natural gas transmission and distribution pipelines in Louisiana during 1986 to 2014 was Corrosion for Transmission Pipelines and Excavation Damage for Distribution Pipelines, with an average 5.35 and 1.81 incidents per year, respectively.

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

- **Natural Gas Transport**

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

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Economic Loss</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion</td>
<td>$2,454</td>
<td>5.35</td>
</tr>
<tr>
<td>Equipment Failure</td>
<td>$502</td>
<td>0.10</td>
</tr>
<tr>
<td>Excavation Damage</td>
<td>$406</td>
<td>0.12</td>
</tr>
<tr>
<td>Incorrect Operation</td>
<td>$204</td>
<td>0.00</td>
</tr>
<tr>
<td>Material/Weld Failures</td>
<td>$1,061</td>
<td>0.05</td>
</tr>
<tr>
<td>Miscellaneous/Unknown</td>
<td>$1,412</td>
<td>0.15</td>
</tr>
<tr>
<td>Natural Forces</td>
<td>$1,641</td>
<td>0.02</td>
</tr>
<tr>
<td>Outside Force</td>
<td>$6,849</td>
<td>0.00</td>
</tr>
</tbody>
</table>

  Data Source: DOT PHMSA

Natural Gas Processing

- According to data derived from DOE’s Energy Assurance Daily, the leading cause of natural gas processing plant disruptions in Louisiana from 2005 to 2014 is Weather or Natural Disaster.
- Louisiana’s natural gas processing plants experienced 34 disruptions from 2005 to 2014.
- The average production impact from disruptions of Louisiana’s natural gas processing plants from 2005 to 2014 is 595 million cubic feet per day (MMcfd).


- **Weather or Natural Disaster**
- **Loss of Electric Power or Other Utility Service**
- **Maintenance/Turnaround**
- **Equipment Failure or Damage**
- **All Other Causes**

<table>
<thead>
<tr>
<th>Event Type</th>
<th># of Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather or Natural Disaster</td>
<td>3</td>
</tr>
<tr>
<td>Loss of Electric Power or Other Utility</td>
<td>2</td>
</tr>
<tr>
<td>Maintenance/Turnaround</td>
<td>2</td>
</tr>
<tr>
<td>Equipment Failure or Damage</td>
<td>5</td>
</tr>
<tr>
<td>All Other Causes</td>
<td>5</td>
</tr>
</tbody>
</table>

  Data Source: DOE OE

Average Production Impact (MMcfd) from Natural Gas Processing Plant Disruptions in Louisiana (2005–2014)

- **Weather or Natural Disaster**: 656 MMcfd
- **Loss of Electric Power or Other Utility Service**: 315 MMcfd
- **Maintenance/Turnaround**: 850 MMcfd
- **Equipment Failure or Damage**: 500 MMcfd
- **All Other Causes**: 63 MMcfd

Data Source: DOE OE
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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