EPRI
2016 Outage Data for Reliability and Resiliency Survey

Sal Martino
EPRI - Technical Leader

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The Big Picture
Reliability abroad


Source: CEER Benchmarking Report 5.2, 2015

Average annual interruption time for customers connected to distribution networks
Last available year (light color) and 5 years average (dark color)

2013 Average SAIDI: 208.5
Source: 2013 US EIA Survey
Distribution Grid Resiliency Project

Objectives

- Analyze data provided
- Correlate to performance
- Projections based on strategies

<table>
<thead>
<tr>
<th>Weather Condition</th>
<th>Number of Outages</th>
<th>Outages with Tree Listed as Cause</th>
<th>% of Outages Caused by Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Winds</td>
<td>22,979</td>
<td>22,840</td>
<td>99.40%</td>
</tr>
<tr>
<td>Snow</td>
<td>19,086</td>
<td>18,873</td>
<td>98.88%</td>
</tr>
<tr>
<td>Normal Weather</td>
<td>7,525</td>
<td>5,586</td>
<td>74.22%</td>
</tr>
<tr>
<td>Hurricane</td>
<td>4,601</td>
<td>4,180</td>
<td>90.85%</td>
</tr>
<tr>
<td>Thunder Storm</td>
<td>3,320</td>
<td>2,203</td>
<td>68.10%</td>
</tr>
<tr>
<td>Ice Storm</td>
<td>1,393</td>
<td>1,236</td>
<td>88.73%</td>
</tr>
<tr>
<td>Blizzard</td>
<td>360</td>
<td>278</td>
<td>77.22%</td>
</tr>
<tr>
<td>Rain</td>
<td>262</td>
<td>158</td>
<td>60.31%</td>
</tr>
<tr>
<td>Other</td>
<td>165</td>
<td>17</td>
<td>10.30%</td>
</tr>
<tr>
<td>Hot Weather</td>
<td>152</td>
<td>45</td>
<td>29.51%</td>
</tr>
<tr>
<td>Tornado</td>
<td>6</td>
<td>5</td>
<td>83.33%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>59,850</td>
<td>55,481</td>
<td>92.70%</td>
</tr>
</tbody>
</table>
Outage Data

Limitations

- Inconsistencies
- No validation process
- Crucial data is missing
Outage Data Survey

Demographics

- Issued in March 2015
- 13 Questions
- 22 Respondents

- IOU 73%
- Muni/Co-Op 27%

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Outage Data Survey – Data Collection

Q: “Which set of cause codes are used for internal reporting?”

- Custom Cause Codes: 86%
- IEEE 1782: 14%
Outage Data Survey – Data Collection

Q: “Who is primarily responsible for entering outage cause?”

- Lineworkers: 54%
- Control Center Personnel: 27%
- Order Dispatchers: 5%
- Engineers: 9%
- Other: 5%
Outage Data Survey – Data Storage

Q: “What is the reliability data ‘system of record’?”

- Custom Database/Mainframe: 36%
- Outage Management System (OMS): 59%
- Other: 5%
Outage Data Survey – Data Processing

Q: "How often do you validate/reconcile data”

- **Daily**: 38%
- **Monthly**: 38%
- **Weekly**: 14%
- **Other**: 10%
Outage Data Survey – Data Processing

Top Items Corrected through Validation

- Outage Start and End Times
- Number of customers affected
- Cause Code
- Restoration Steps Consistency
- Comments Inconsistent with Data Entered
Outage Data Survey – Data Analytics

Q: “How do you supplement outage data for analysis?”

- Outage Management System (OMS): 15 (88%)
- Geographic Information System (GIS): 11 (65%)
- Inspection Records: 9 (53%)
- Customer Information System (CIS): 9 (53%)
- Custom Database/Mainframe: 8 (47%)
- Vegetation Management System (VMS): 8 (47%)
- Distribution Management System (DMS): 6 (35%)
- Asset Management System (AMS): 3 (18%)
- Other: 2 (12%)
Group Discussion

Topics

- Data input GUI
- Data Prepopulating
  - GPS, AMI, weather, etc.
- Outage follow-up practices
- Proactive analysis of outage data
Group Discussion
Lineworker information input

- Same interface as office personnel use

- Manual Data Entry

- Opportunity for improvement with
  - Automation
  - User Interface
  - “Less is More”

Group Discussion

Q: “Can logic be applied to prepopulate information?”
Group Discussion

Q: “When is there a need to understand/identify the root cause of an outage?”
Group Discussion

Q: “What outage data can be used proactively?”

- What information does the industry collect, and what information needs to be collected going forward to allow us to be more proactive?
For more information

Sal Martino
smartino@epri.com
704-595-2832
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