<table>
<thead>
<tr>
<th>Time Period</th>
<th>Average Annual Wildfires</th>
<th>Average Annual Acreage Burned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Over the past 10 years</strong></td>
<td>67,000</td>
<td>7.0 million</td>
</tr>
<tr>
<td><strong>Over the past 5 years In California alone</strong></td>
<td>144</td>
<td>1,400</td>
</tr>
<tr>
<td><strong>Every year since 2000</strong></td>
<td>72,400</td>
<td>7.0 million</td>
</tr>
</tbody>
</table>

This figure is nearly double the average annual acreage burned in the 1990s.
California Reporting Utilities:

Ignition Data

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>FIRES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation/Contact</td>
<td>552</td>
</tr>
<tr>
<td>Dropped Conductor</td>
<td>218</td>
</tr>
<tr>
<td>Pole/Equip Failure</td>
<td>151</td>
</tr>
<tr>
<td>Fuse Operation</td>
<td>35</td>
</tr>
<tr>
<td>Animals/Other</td>
<td>117</td>
</tr>
</tbody>
</table>
Australia in the News

- Government & public requirements for safer utility fire mitigation product solutions

Top stories

Australia fires are approaching the capital, Canberra
Vox
1 week ago

Australia fires: A visual guide to the bushfire crisis
BBC.com
1 week ago

Heatwave brings dangerous fire conditions to bushfire-ravaged Australia
The Guardian
1 week ago
Agenda

1. Arrester Fire Protection
2. Fire Protection Coating (FPC)
3. Wildlife Mitigation
4. Grid Monitoring for Wildfire Mitigation
High Voltage A.C. Surge Arresters

- Arrester acts as high impedance device at nominal 60 Hz operation
- Arrester responds to high current impulses
  - Lightning surges
  - Switching surges
  - Limits voltage across protected equipment
- Arrester returns to high impedance state
Australia Standards (AS 1307.2-1996)

- Australian standard for HV surge arresters
- Verification of spark production class using ground paper method
  - Class A – 0 sparks
  - Class B – 3 sparks
  - Class C – unrestricted quantity of sparks
- Products available which meet AS 1307.2-1996 requirements

2.46 SPARK An incandescent particle capable of igniting a suitable fire ignition bed to the point of actual flame or to a smouldering condition that can be fanned to a flame or to visible incandescence in an illumination of 200 lx.

NOTE: Research has been carried out on the fire ignition probability of various ignition bed materials related to the diameter of molten copper particles at a temperature just above their melting point (see AS 1033.1). For the test requirements of this Standard, a minimum spark is taken as the thermal equivalent of a 1.1 mm diameter molten copper particle (see Paragraph L2 in Appendix L).

The 1.1 mm molten copper particle is used to calibrate ground papers. Much smaller particles of materials which burn may constitute a spark, e.g. aluminium, steel and organic substances (see Paragraphs L2 and L4 in Appendix L).
California Fire Prevention

- California Department of Forestry & Fire Protection with the Public Utilities Commission of California have developed the California Power Line Fire Prevention Field Guide.

- Outlines procedures to minimize risk of catastrophic wildfires caused by electrical power lines and equipment.

- Testing process and requirements for obtaining exemption for electrical equipment are detailed in the guide.

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**Figure 1:** CPUC fire-threat map showing High Fire-Threat Districts (HFTDs) Tier 2 (Elevated) and Tier 3 (Extreme). An interactive version of this map with downloadable data is located here.
High Voltage A.C. Surge Arresters

• Arrester current increases due to excessive duty

• Typically equipped with ground lead disconnector (GLD)
  • Separates shorted arrester from system
  • Creates an external power arc
  • Visual indication to field personnel

• How to contain potential fire risk?
Hubbell’s Fire Protection Arrester Solution

• Arrester designed to minimize the possibility of an arrester producing sparks
• In the event of short circuit, PDV-100SP remains connected to line
• Arrester certified to AS Class A without a disconnector
• Product available for new or upgraded installations
Hubbell’s Fire Protection Disconnector Solution

• Disconnector designed to remove the possibility of fire-producing sparks dropped by a surge arrester

• Upon activation, FPD disconnects arrester from line
  • Visual indication provided via yellow sleeve inside FPD

• Product available for retrofit installations

• Additional protection against interference provided through wildlife guarding
Future Development

• Utility and manufacturer interest to develop standardized test methods
• IEEE C62.11 & IEC 60099-4 partnership
• Leverage AS1307.2 & CalFire expertise in tandem with arrester industry experts
• Continue evaluating future product improvements
Fire Protection Coating (FPC)
Protecting the Structure

Passive Fire Protection

• Reinforce the pole structure regardless of the fire’s source
• When and where to deploy:
  • High risk areas
  • Controlled burn zones
  • Active fire path
• Further reduce duration and cost of outage
Fire Mitigation - Coatings vs. Wraps

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Coatings</th>
<th>Wraps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serviceability</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ease and Speed of Initial Install</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Easy to Remove and Reinstall After a Fire</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Allows pole to breathe</td>
<td>Yes</td>
<td>Depends</td>
</tr>
</tbody>
</table>

“Only 19% of utilities surveyed have a specific pole fire mitigation program or strategy in place”
-Pole Fire 2019 Survey
Fire Protection Coating (FPC)

FPC is an intumescent coating formulated to preserve the structural integrity of wooden utility poles in the event of a fire

- Intumescent char forms as a reaction to heat or fire
Fire Protection Testing

Limited industry guidelines for fire protection of utility poles

Proposed ASTM Method for Wood Utility Poles

• Test Sequence:
  • 10 minute radiant panel exposure at 1652°F (900°C)
  • 5 minutes gas ring burner in combination with panel
  • Simulated wind up to 4 hours, or until temperature is below 122°F (50°C)

Future Standard Should Include

• Mechanical loading
• Weathering evaluation
• Performance baseline for comparing methods
Wildlife Mitigation
Five Ways Wildlife Can Cause Fires

1

Animals themselves can be a Potential Fire Risk.
Five Ways Wildlife Can Cause Fires

Nesting creates dangerous ignition potential.
Five Ways Wildlife Can Cause Fires

Electrical equipment can explode. Close in faults can cause failures in electrical equipment which may result in catastrophic fires.
Five Ways Wildlife Can Cause Fires

4

Over-voltage can lead to ignition.
Five Ways Wildlife Can Cause Fires

Non-FR rated cover may be a source of ignition as it supports combustion.
Guard Performance

Must meet the IEEE 1656 - 2010 guidelines

Must meet the IEC 60695-11-10 flammability test (UL94 equivalent) and won't burn or drip

Achieve V-0 FR rating in the IEC 60695-11-10 vertical flame test procedure
Wildlife Contact Prevention
Wildlife Contact Prevention

- Superior Retention
- Easy to install, remove & reapply
- Adaptability → Better Fit
Wildlife Contact Prevention

- NO GAPS – NO ZAPS!
- Site-specific Solutions
- Comprehensive Installation Instructions
Grid Monitoring for Wildfire Mitigation

Visibility Before, During & After the Emergency
Grid Monitoring for Wildfire Mitigation

Visibility Before, During & After the Emergency

1. Long Before: Avoid
2. Just Before: Prepare
3. During: Emergency Ops
4. After: Restoration
Long Before: Avoid

1. **Detect & Locate Potential Hazards**
   - Utilize multiple tools
     - Different types of hazards
     - Increases confidence levels
     - Improves location
   - Leverage tools with multiple uses
     - Cost effective
     - Existing tools - quick path to results

2. **Operational Considerations**
   - Proactive personnel & processes
   - Dispatch: probability vs location risk
Long Before: Avoid

3. Smart line sensors & analytics
   - Transient fault current events
     - Vegetation – targeted tree trimming
     - Line down
     - Failing equipment, incl. arrestors
     - Wildlife
     - Slapping conductors
   - Analyze & alert on logged events & data
   - Dispatch to fault current location
Just Before: Prepare

1. **Similar to severe weather preparation**
   - Real-time visibility crucial
   - Targeted parts of network

2. **Public Safety Power Shutoffs (PSPS)**
   - Reconfigure & isolate where possible
   - Plan for load shifts – displaced customers

Public Safety Power Shutoff
ARE YOU PREPARED?
During: Emergency Operations

1. Weather & fire conditions are fluid
2. Emergency switching continues
3. Similar practices for ice storms
   - Weather-driven crew prepositioning
4. Real-time visibility crucial
   - Mobility may be important
5. Priority visibility
   - First responders, on-site command centers, shelters, critical infrastructure
6. Backfeed hazards
   - Generators, DERs, microgrids
After: Temporary & Permanent Restorations

1. Best-case scenario
   - Standard restoration operations

2. Worst-case scenario
   - Severely damaged circuits & substations
   - Temporary SCADA for mobile generators & substations
   - Longer term customer & load displacement
Enhanced visibility, flexibility, and mobility are critical

1. Smart line sensors
2. Integrated wireless
3. Monitoring & analysis software
Summary

• Hubbell offers arrester solutions to mitigate the possibility of an arrester generating sparks and is actively engaged in revisions to the arrester test standards to drive future improvements which consider current market needs

• Reinforcing pole structures with passive fire protection methods can significantly reduce the financial impact and duration of outages following a fire

• Wildlife interactions are a more important cause of wildfire ignition than one might think. Contact prevention is key. Performance and fitment qualities of wildlife mitigation products are just as important to prevention as is where and how they are applied

• Grid Monitoring tools are essential to provide visibility before/during/after wildfires as part of emergency operations

• Aclara’s Grid Monitoring tools are mobile, quick to install, and have their own integrated wireless and head-end software visibility that make them an invaluable quick-response tool for wildfire emergencies
BUILD. MAINTAIN. MODERNIZE.

Face the future with confidence.

HUBBELLPowersystems.com