



WILDFIRE MITIGATION WITH SENSORS  
AND ANALYTICS

## Introduction

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Wildfires: They're bigger and more common than they were 35 years ago, says the [National Interagency Fire Center](#), a government-backed organization. The fires burn hotter, too, according to research conducted by scholars at [Columbia University](#). "A warming climate means that wildfires will continue to get more severe in the decades to come," noted a [Washington Post article](#).

This bad news adds liability for electric utilities because power-system equipment can and does cause wildfires. California's three largest investor-owned utilities, for instance, reported to regulators that between June 2014 and year-end 2017, utility operations ignited a combined 2,014 fires, according to the [Los Angeles Times](#).

Meanwhile, the [California Department of Forestry and Fire Protection](#) estimates that there are more than [129 million dead trees](#) that could kindle the state's next inferno should a lightning strike, smouldering cigarette, or downed power line send sparks flying. According to the [U.S. Forest Service](#), the risk of wildfires is high in approximately 50% of California.

Add to this statistic the fact that [85% of wildfires](#) are caused by the activities of humans, which include, in addition to unattended campfires, burning of debris, and equipment use and malfunctions. In fact, the deadliest and most destructive wildfire in California History – the Camp Fire – which destroyed the town of Paradise and killed 85 people in 2018, was caused by [dry vegetation ignited by electric power lines](#). So, what can be done to prevent these fires?

In populated areas, good Samaritans may see when something happens to an electrical line and report the problem. But distribution and sub-transmission lines don't always follow a road, and they often traverse large stretches of unpopulated or remote areas. Worse, impending equipment failures and initial sparks are rarely visible to electric utilities until failures and flames begin. To effectively manage vegetation and mitigate wildfire risks, utilities need visibility into grid conditions without having to devote significant workforce resources to monitoring conditions in the field.

In addition, utilities employ public safety power shutoff (PSPS) measures to prevent fires that involve proactively de-energizing power lines when terrain and weather conditions are ideal for wildfire ignition. This means power providers need to clearly understand the load requirements in the region, account for customers being switched, and track changes in load patterns due to displaced customers. Again, it's crucial for utility operations staffers to see what's happening on the system.

## Improving Situational Awareness

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In recent times, system operators have used sensor-enabled analytics to gain situational awareness of dangerous conditions and resolve them before a fire starts and impacts customers. Smart grid sensors can quickly and easily be deployed across broad sections of a utility's territory to provide immediate visibility to distribution and sub-transmission lines, especially in remote areas. Line workers can install the sensors within minutes, and circuit owners can remotely provision or configure them.



Aclara's Grid Monitoring solution combines easy-to-deploy smart grid sensors with Predictive Grid® analytics that help utilities through all stages of fire mitigation: prevention, emergency operations, outage restoration and ongoing support for the infrastructure repair process.

The Aclara Grid Monitoring solution provides continual monitoring of lines for abnormal events that may cause a variety of problems for utilities. It also detects patterns of events and activity that are often precursors to more severe occurrences. Once the sensor system detects these recurring patterns, the utility can dispatch inspectors or line crews to investigate the cause.

Many utilities that have used this approach have uncovered dangerous situations that could cause sparks and ignite wildfires. Vegetation growing into the lines, downed wires, failing transformers and conductor slap are all examples of activity that shows up via sensors and can be corrected before more serious issues arise. By utilizing the Aclara Grid

Monitoring solution, utilities may proactively avoid fires caused by vegetation or equipment failure. With Aclara's configuration templates, parameters can easily be changed over the air to increase or decrease sensitivity during periods of high wildfire risk versus normal operations.

Utility planners and response personnel also can deploy and use sensors to aid in planning for Public Safety Power Shutoff events. Smart grid sensors provide enhanced visibility of specific segments of feeders when switching or load transfers are required, plus the sensors help utility workers track changes in load patterns due to displaced customers. Because of the ease of installation, sensors can be deployed to monitor at either manual or SCADA-enabled switch locations.

## Mitigating Wildfire Risks

Smart grid sensors can help utilities concerned about wildfire prevention in two ways: by alerting them to line disturbances that may indicate a fire and by identifying the location of downed power lines that can spark and cause fires.

### *Line disturbances*

Figure 1, for example, shows an example of how a utility was alerted to a developing problem based on a specific pattern of line disturbances. The system then logged a separate event and sent notification to the designated users alerting them to the pattern.

Date/Time	Substation	Circuit	Location	Phase	Event Type	Peak Current	Rule Classification	Map	Detail
2018-10-17 07:09:26				B	Line Disturbance-Recurring		Line Disturbance	NA	<a href="#">Link</a>

Date/Time	Substation	Circuit	Location	Phase	Event Type	Peak Current	Rule Classification	Map	Detail
2018-10-17 07:09:26				B	Line Disturbance	1076	Trunk Fault	<a href="#">Map</a>	<a href="#">Link</a>
2018-10-12 10:25:40				B	Line Disturbance	918	Lateral Fault	<a href="#">Map</a>	<a href="#">Link</a>
2018-10-12 04:40:44				B	Line Disturbance	1077	Trunk Fault	<a href="#">Map</a>	<a href="#">Link</a>

**Figure 1 – Line Disturbance Events**

California has identified specific High Fire-Threat Districts (HFTD) where additional fire-safety regulations apply. If the event had occurred on a circuit in one of these high-risk areas, the circuit owner could have immediately dispatched a crew to investigate.

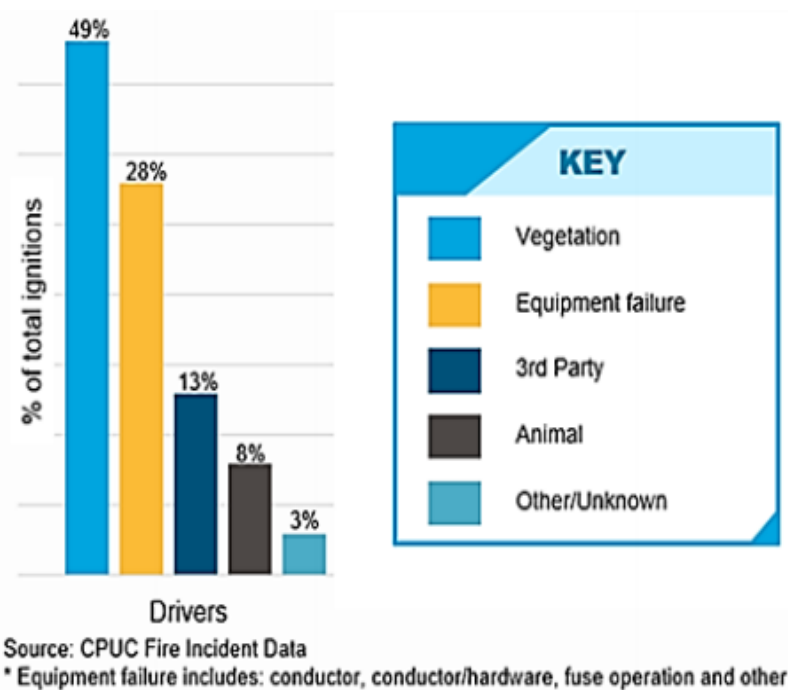
### *Vegetation management*

Smart grid sensors can help utilities identify areas where vegetation or other obstructions could cause sparks that could lead to fires. An investor-owned utility in the Midwest, for example, was using Aclara

smart grid sensors and, over the course of six months, the Aclara system identified and alerted utility staff to nine separate events that required attention.

The utility investigated these events and found six instances of vegetation in contact with the primary conductor. In one of these events, utility workers found fishing line wrapped around the phase and neutral wires. In total, utility staff estimated that finding these problems avoided approximately 400,000 customer minutes lost. In areas where wildfires are common, finding this type of fault can reduce the risk of a fire.

Another utility in the Northeast recently deployed smart grid sensors as part of their capital program to increase monitoring on their circuits. Even though the sensors were installed just six months after the circuit had hotspot tree trimming performed, the sensors detected areas of the circuit that were still experiencing vegetation contacts. The utility used the fault location capability of the Aclara Grid Monitoring solution to dispatch tree crews to resolve the remaining problem areas quickly and efficiently.



**Figure 2– Wildfire Drivers**

Going forward, sensor data is allowing the utility to target tree trimming to the areas that need it, thereby saving money. System operators can leverage analytics to determine if specific circuits need hotspot trimming and then evaluate the effectiveness in reducing faults. The ability to monitor power lines in this way reduces the chances for a vegetation-caused fire. Data from a [California Public Utility Commission \(CPUC\)](#) study on Fire Incident Data released in 2019 found that 49% of fires related to utility infrastructure were due to vegetation contact with conductors (Figure 2).

### *Downed power lines*

A western U.S. utility detected a pattern of faults using Aclara’s predictive analytics technology. The system automatically alerted the dispatch center that an event was occurring on a remote section of line in an unpopulated area.

The dispatch center hadn’t received any other alarms or alerts from SCADA devices in the area, nor had there been any incoming phone calls from customers in the area. System operators dispatched a



trouble shooter who subsequently found a still-energized primary conductor that was down in a remote field. Since this was an isolated wilderness area, the conductor may have continued to be down and energized for several days until someone noticed it. This could have turned into a fire event if smart grid sensors did not detect it early.

## Managing Loads for Emergency Operations

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Smart grid sensors are ideal to provide load and voltage data in near real-time so that utilities can maintain situational awareness around problem areas. This allows emergency switching and load transfers to take place with the confidence that other issues will not arise due to overloading of other equipment. If necessary, sensors can be quickly relocated, especially if the winds shift or the area of focus suddenly changes.

Sensors also quickly provide visibility for sections of line serving facilities that were set up for first responders as local command centers. When sensors are installed at the sites of mobile substations or generators, they provide a form of instant SCADA measurements to the control center. In addition, the Aclara Grid Monitoring solution quickly integrates into back-office systems such as historians, SCADA, DMS or OMS systems using an intuitive DNP3 interface. This allows the sensor data to be used with other data from relays, reclosers, and capacitor banks for a more comprehensive view of the grid.

During faults and other disturbances, the sensor analytics automatically determine what type of disturbance occurred, where it occurred, and whether the section is still out of power. This data is sent through the DNP interface to the back-office systems so that decisions about where to send crews and where to sectionalize can be made.

## The Recovery: Outage Restoration and Repairs

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The Aclara Grid Monitoring solution helps utilities with the recovery stage of wildfire events, too. The

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“Aclara’s sensors are fast and flexible enough to deploy in time-critical situations, like the one we faced back in the summer of 2015. Within hours, and using only two-line crews, we had the situational awareness we needed to make informed decisions on the best way to manage the emergency and restore power to our customer”

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Director of Marketing and Conservation

system enables control-center workers to confirm switching operations as they return circuits to their original and normal configurations. It also verifies the outage restoration.

In the case where circuits and substations may have been destroyed, the sensors can monitor prolonged temporary solutions that could leave lines or other equipment overloaded as weather patterns change.

For example, a Midwestern investor-owned utility deployed the Aclara Grid Monitoring solution during and

after a major substation fire. All circuits needed to be switched to other sources until the substation was rebuilt.

The rebuilding process required many months of operating the system in an abnormal state during peak loading conditions. Grid Monitoring sensors quickly and easily provided the operations department with the visibility of the grid necessary to ensure that no new outages occurred due to overloaded lines and transformers.

## Conclusion

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By improving situational awareness of line conditions in remote areas of service territories and providing a way to identify faults before they become emergency conditions, Aclara's Grid Monitoring solution with smart grid sensors offers a sense of security to utilities struggling to prevent wildfires caused by lines disturbances, vegetation, downed lines.

For more information visit us at [www.aclara.com](http://www.aclara.com) • e-mail: [info@aclara.com](mailto:info@aclara.com)

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