

News > Environment & Science

13

## Wine Country fires: Could a better power grid save us?

California's outdated power poles and lines need upgrading, say critics



People walk past fallen transformers along Parker Hill Road in Santa Rosa, Calif. on Tuesday, Oct. 10, 2017. (Nhat V. Meyer/Bay Area News Group)

By **LISA M. KRIEGER** | lkrieger@bayareanewsgroup.com | Bay Area News Group

PUBLISHED: October 23, 2017 at 10:08 am | UPDATED: October 24, 2017 at 3:34 am

California's first power pole was erected in the 1880s, soon after Thomas Edison's light bulb. Now we have 4.2 million of them, carrying a spider web of fickle and fire-triggering lines that hang in drooping catenaries for 210,000 miles — enough to wrap around the world eight times.

With downed power lines now under scrutiny as the suspected source of the devastating Wine Country fires, many experts say the country's electrical grid is due for a costly overhaul, making it safer and more reliable in our increasingly digital world.

"The future is electric. Improvements have been too slow," said electrical engineer Massoud Amin, director of the Technological Leadership Institute in Minnesota, who studies safe infrastructures.

The obvious solutions include undergrounding more wires or better insulating them, in addition to retiring old wooden poles. We could also turn off power during dangerous weather, or install new tech tools to detect incipient line failure.

Those potential solutions — while pricier than tree-trimming — are well within reach for one of the world's most advanced and innovative economies, experts say.

In calm weather, power lines are insulated by at least several feet of air. But wind changes everything: Exposed lines ignite wind-tossed branches. Transformers explode. Wooden poles tip over. Brush ignites — and embers fly.

Yet the electric power sector is second from the bottom of all major U.S. industries in terms of research and development spending as a percentage of revenue — only the pulp and paper industry spends less, according to Amin. Research investment represented a meager 0.17 percent of sales revenue from 2001 to 2006, according to his analysis. And it's stayed low ever since.

Fires aren't the only risk from our old-fashioned power grid. The Northeast's 2003 blackout — the biggest in American history, cutting off power for 50 million people, killing 11 and costing \$10 billion — was triggered when a single power line in Ohio sagged into trees.

Power lines are responsible for about 9 percent of California wildfires. When they do cause problems, typically in high-wind events, the fires turn deadly quickly because they spread so fast. They've caused four of the 20 largest fires in California history.

They're triggered in multiple ways. A falling tree can tear down a line, electrifying nearby vegetation. A branch that's tossed on a group of wires can close a circuit and spontaneously ignite. High winds can cause lines to slap together, making them arc and spark.

While the cause of the Wine Country blazes remains under investigation, a review of emergency radio traffic by the Bay Area News Group showed that in the first hours of the fires, Sonoma County dispatchers sent out fire crews to at least 10 different locations to respond to 911 reports of sparking wires and problems with the county's electrical system.

California regulators and utilities say they're striving to reduce risk. After nearly a decade of work, the Public Utilities Commission is finally completing its mapping project aimed at showing where power lines pose the greatest wildfire danger, which will help them plan and deploy resources. PG&E says that it spent nearly \$200 million in 2016 on aerial inspections of poles, lines and tree-trimming.

Critics, however, say that bigger fixes are needed.

Undergrounding lines is one old-fashioned remedy. Manhattan buried its wires after the Great Blizzard of 1888. After World War II, the lines went underground in Germany and most of the rest of Europe. Power lines were buried when Oakland hills neighborhoods were rebuilt after a catastrophic 1991 fire.

In almost all of California's new developments, power lines are underground. Some older cities like Anaheim are burying their lines. San Francisco put about half of its lines underground, before it ran out of money.

The process is really expensive. Utilities say it costs five to 10 times as much to bury a line as it does to run it overhead. Undergrounding costs about \$1 million per mile — and the cost soars in remote and rocky areas. And when there's an outage, an underground line takes more time to repair.

Consumers, utilities and regulators tend to balk at the steep price tag, said Ted Kury, director of energy studies at the University of Florida's Public Utility Research Center. For instance, North Carolina utilities abandoned an undergrounding plan after concluding it would increase rates 125 percent. The District of Columbia also backed off after discovering it would cost \$5.8 billion and only benefit a third of its customers.

"At the end of the day, it is the people who pay," Kury said. "It is incumbent on the utility and regulator to make sure customers are receiving value for the money they're asked to spend."

PG&E undergrounds only 30 miles of line each year — and the waiting list is 40 years long. That's because the Public Utilities Commission limits the amount of ratepayer money that can be used to underground wires.

Not every line needs to be buried, but fire-prone areas are no place for live wires, said Laguna Beach City Councilman Bob Whalen. The city is removing poles along major roads after four fires were ignited by downed power lines in one decade, including one that blocked the main road in and out of town for an entire Labor Day weekend.

"It's an obvious solution in many of these high-risk fire areas," he said. "There are hundreds of miles of lines that are not at risk — and should not go underground. But where you've got a topography that is prone to fire and can trap people, we should be looking at undergrounding."

Experts, however, say there are other strategies that could help protect the grid.

One is to replace old wooden poles with materials such as steel, concrete or composite materials that are designed to endure winds and last longer.

That's the approach taken by San Diego Gas & Electric, which is installing tall, fire-resistant steel poles capable of withstanding winds of up to 85 mph through Cleveland National Forest.

Another option is to wrap lines in polymer insulation such as polyethylene, said Andrew Phillips of the Electric Power Research Institute.

The insulation reduces the risk of outages caused by electrical wires coming into contact with trees.

With insulated lines, “when the tree makes contact, it doesn’t result in outages and arcing activity which could ignite dry vegetation. Even if it falls down and touches the ground, the probability of arcing is lower,” Phillips said. But the price tag is higher than bare lines, and regulators feel pressure to reduce costs to keep rates low.

Innovation could go a long way in improving the nation’s patchwork electrical system, experts say.

For instance, “smart grids” could do real-time monitoring, scanning for problems such as high wind speeds, low humidity and risky vegetation, Amin said. Localized and automated, such a system could alert us days ahead of time to the risks of bad weather so we could better prepare.

And when a network on the grid goes down, it could isolate the damage, limiting the spread of disruption and speeding up power restoration. The Oakland hills fire caused numerous power failures and ruptured water service lines, making it hard for first responders.

It’s impractical to submerge neighborhoods in darkness during every “red flag warning” because such days are too common, experts say. But Patrick Mantey, professor of technology management at UC Santa Cruz, imagines a better high-tech scenario: battery backups in rural homes in targeted fire-prone areas. In this “microgrid” concept, a substation would quickly cut off local power — and each home’s small, self-sufficient power system, costing \$5,000 to \$10,000, would take over.

Dry and windy Texas, where power lines caused 4,000 fires from 2010 to 2014 and scarred more than 1,000 square miles, is testing an early warning system that detects aberrant waveforms at transformers, signaling trouble.

“With these tragedies, we need a strong coalition of citizens, counties and local governments to get involved in this process — putting pressure on the PUC, legislators and the governor — to say ‘enough is enough,’” Whalen said. “Let’s come up with solutions that protect people from losing their lives and their property.”

Experts put it this way: The upgrades are expensive, but so are burned homes and broken hearts.

---

## Which lines cause fires?

Power lines come in two basic types: transmission and distribution.

Transmission lines are large lines on bigger utility poles and towers with large insulators between the poles and wires. They carry large volumes of power from generation facilities to substations in local communities.

Distribution lines are smaller, transmitting power down city streets from local substations to specific buildings.

Fires typically aren’t caused by high-voltage transmission lines, which are mounted on tall towers. They tend to be caused by lower-voltage distribution lines, which are closer to vegetation.



SPONSORED CONTENT

### Apache Pilot, Artist and Musician: Meet the Employees of Amazon

By 

Apache pilot. Artist. Magician. Amazon employees bring diverse experiences to the workplace. Meet three people behind the Amazon smile.

Tags: [California Wildfires](#), [Fires](#), [PG&E](#), [Regional](#), [Wildfires](#)

Lisa Krieger, science and research reporter, San Jose Mercury News, for her Wordpress profile. (Michael Malone/Bay Area News Group)

**Lisa M. Krieger** Lisa M. Krieger is a science writer at The Mercury News, covering research, scientific policy and environmental news from Stanford University, the University of California, NASA-Ames, U.S. Geological Survey and other Bay Area-based research facilities. Lisa also contributes to the Videography team. She graduated from Duke University with a degree in biology. Outside of work, she enjoys photography, backpacking, swimming and bird-watching.

[f Follow Lisa M. Krieger LisaMKrieger](#) [t Follow Lisa M. Krieger @lisamkrieger](#)

**SUBSCRIBE TODAY!**  
ALL ACCESS DIGITAL OFFER FOR JUST 99 CENTS!

