

THE TRUTH EXPOSED

California Wildland Fires

By Raul Angulo

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After a 38-year career as a Seattle (WA) firefighter, I frequently get asked to comment on the massive efforts that go into fighting and managing such multiagency wildland urban-interface incidents. I was trained and served as a member of Seattle's Wildland Firefighting Team, and have a good understanding of the fire dynamics associated with wildland fires.

It's easy to blame wildfires on climate change, but this theory is hard to scientifically prove with consensus, especially when New Orleans (LA) and many parts of Florida are currently experiencing winter snow! Blaming it on climate change also shifts the blame and accountability to something we can't readily identify or control.

After the Maui fire, I reached out to Ed Clark, an electrical utility engineering expert who I met when I inquired about the cause for the 2017 Napa Fires on the Pacific Gas & Electric (PG&E) system. I recently reached out to Mr. Clark again to inquire about the Los Angeles fires that have now destroyed some of the most iconic properties in California.

What I have learned is unprecedented and cannot go without full disclosure to the public in an effort to hold those government officials accountable that were in a position to significantly mitigate California's exposure to wild land fires in the name of public safety and instead made a conscious decision to look the other way protecting the utility companies from excessive liability in lieu of their fiduciary responsibility to protect the public..

To comprehend the explanation to follow as to the possible contributing causes to starting fires, you must understand the experience and expertise of Ed Clark. Mr. Clark has a BS degree in Electrical Engineering from Long Beach State University and spent part of his career working as an Electric Utility Transmission/Substation Division Engineer with Southern California Edison (SCE). With specialized training from SCE and years out in the field, he has

extensive experience in electrical utility operations, engineering, design, and construction. He is an expert utility engineer at understanding the cause and effect of electrical disturbances that happen within a utility power grid, with heavy emphasis on relay protection systems required to protect the public and the effects of transient voltage spikes on the electrical grid. One of his primary responsibilities following a storm, or major interruption event involving multiple locations starting points, was to understand and determine how, and if, each separate event was linked to each other. Clark is also a forensic utility expert who has for the past two decades been called upon to investigate and testify on all types of utility related explosions, accidents, and operational errors, both for and against electrical utilities.

Mr. Clark explained, when the origin of fire looks like it was caused by an electrical utility, the utility company has experienced some type of system disturbance called a fault. A fault can be from an equipment mal function, a lightening strike or something like a car hitting a pole causing lines to come together or even falling to the ground. Anytime you have a system disturbance it generates not only high levels of fault current causing damage and arcing at ground level, but transient voltage spikes.

These transient voltage spikes can exceed the basic insulation level (BIL), or impulse level of all types of utility electrical equipment, like capacitors, circuit breakers, insulators, substation transformers and pole-top distribution transformers, causing failures many miles away from the original point of origin. Depending on the geographical location of a distribution pole top transformer and where it is installed on the line, the length of the line, and how it is protected with relays or fuses, it can become a source of ignition that starts a fire. Especially radial fed lines out in remote areas. This is something the fire investigator cannot see, and most likely doesn't understand, unless they have an electrical engineering and specific utility background, and have experience with electrical system analysis, along with relay protection expertise. The usual conclusion that satisfies all parties was that the fire was started by electrical wires in the trees, or by downed powerlines causing a spark in the brush. But there's more to it than that.

The California Fires

Mr. Clark investigated the 2007 Witch Creek and Rice fires. Upon discovering design problems on SDG&E facilities with the way they supported poles holding up 69kv power lines, he realized, the design had to be the source of other fires. After further investigation concluded the same design that started the 2007 Witch Creek fire existed and contributed to the start of the 2003 Cedar and Paradise fires. The results of his findings can be seen on his website www.theelectricalexpert.com.

California has experienced devastating wildland fires every year. The question is, why are there so many fires and how do they all start simultaneously? Mr. Clark was retained and visited 13 of the 2017 fire locations in and around Napa California: The first point of interest was that the Atlas, Tubbs, Nuns, Cherokee, Sulfur, Redwood, Patrick, Adobe, and Banger fires all started on the same day! On the evening of October 8, 2017, the calls coming into the 911 centers varied slightly, but were all reported at approximately the same time. The only explanation for simultaneous ignition for all these fires are found within the electric utility, in this case PG&E, and the earth.

What happens when there is an Electrical Fault?

Similar to circuit breakers in your house, when an electrical fault occurs, the affected circuit breaker at the source utility substation will sense the fault and open up (separating the connection), de-energizing the line feeding the electrical fault. Electricity cannot flow through an open circuit. It is that small duration in time – from the moment a fault occurs, to the time a circuit breaker opens and deenergizes the circuit, where excessively high electrical current flows from location of fault, through the earth, back to the source substation that is delivering the electricity, that can start a fire.

The Earth

The earth plays a very important role with electrical utilities and their electric power lines in that the earth acts like one big wire or conductor to give electricity a path to flow back to the source power station. People don't feel this or

know when ground current exists because everything around us is grounded. This is the reason a bird can stand on a high voltage wire without getting electrocuted. As long as both feet are on the same wire, there is no difference in electrical potential between the birds' feet. Earth acts the same way; it's one giant wire for us to stand on. When equipment is not grounded properly during a system fault, arcing (sparks) can occur — creating an extremely hot ignition source that can easily start a fire.

Electric Utility Lines

Utilities have different voltage levels for transmitting electricity. The distribution level are the smaller poles you typically see in residential areas; the sub-transmission level is the taller poles with typically 69 KV or 69-thousand-volt lines and the transmission level are the big steel towers with 220KV lines.

Utility failures or faults can be caused during normal utility operations caused from normal utility switching, like switching capacitors on, or from a capacitor failure, or other system faults, all of which create transient voltages i.e. (impulses or electrical spikes — very short in duration,) that sends out an electrical impulse on the electrical system via the power lines. This impulse often exceeds the basic insulation level (BIL) rating on a piece of equipment. The BIL is also referred to as a lightning impulse level. Impulses that exceed the BIL rating of electrical equipment, like transformers, can often fail.

The only way a utility company can have multiple transformers fail in multiple locations many miles apart, simultaneously is to have had a major event somewhere on their transmission or sub-transmission grid that sends out an impulse that causes equipment to fail in multiple locations at virtually the same time.

For the Technical Reader:

In 1988, Clark personally ran tests on the effects of 69kv capacitor switched daily at a utility substation and captured graphically transient impulse spikes that exceeded equipment BIL ratings by more than two times (2x) their rating. The impulse was a very high frequency which lasted far less than a quarter of a cycle which is $1/240^{\text{th}}$ of a second, too fast for most recording equipment to capture. He was able to capture this data by closing-in substation 69 kv capacitors on the sub

transmission system utilizing equipment that recorded data 3-cycles before an operation was triggered. PG&E became fully aware of the effects of transient voltage spikes and how it can affect equipment over a large geographic area, and this was the reason PG&E started installing reactors on all of their 69 kv capacitors — to cut down the impulse to an acceptable level, caused by daily switching of capacitors. It is unknown if other utilities in California have adopted the same design, to protect their customers from high transient voltage spikes that will damage electronic equipment.

This concept of transient voltage spikes proven by Mr. Clark was subsequently experienced by Mr. Clark when 69 KV substation capacitors were switched on at a different transmission substation, then simultaneously causing a 220/66 KV transformer to fail at the same transmission substation and at the same time many miles away, the impulse (transient voltage spike) caused 69KV line Potential transformers to explode at a separate utility generating station.

There are very few utility engineers who understand the actual effects of transient voltage spikes on equipment.

The Second Ignition Source Problem Identified

The second distinct electrical system design problem that Clark discovered in 2007 in his investigation of the California fires igniting in multiple locations simultaneously, and contributing to the fires spreading so quickly, is that PG&E and San Diego Gas & Electric (SDG&E), has been using the wrong down guy cable design to anchor and hold in place sub-transmission wooden poles that suspend the 69 kv power lines.

Mr. Clark identified a CPUC standard for down guy installations that is wrong, and its interpretation by CPUC employees was wrong because they are not electrical utility engineers, nor did they have any on their staff at the time. Mr. Clark informed the CPUC in 2007 of his discovery, the design is starting fires.

The installation placement and procedures are covered in General Orders 95, put out by the California Public Utilities Commission. In Section D, (3), b), 1) Anchor Guys, the order basically states where two (down guys) are attached to the same pole... they shall be separated at the pole by a vertical distance of at least 1

foot (.3 m). For example, if you took a wooden vertical power pole with a down guy attached at the 9 o'clock position, the second down guy at the 3 o'clock position would have to be attached either 12-inches above, or 12-inches below the first connector at the 9 o'clock position — at minimum. This requires two separate connecting bolts into the pole.

However, in Section D, (3), b), 3), the order states: the provisions of this rule do not apply to guys which act in different directions from the pole. Therein the wording lies the problem. #3 can be interpreted that when two down guys are used to support a pole going off in two different directions, the 1-foot (.3 m) vertical separation is not necessary.

That is where the problem starts. Not all the poles have this assembly error, but some do. The diameter width of wooden power poles range between 12 to 18 inches (30 cm to 46 cm). CPUC employees (incorrectly) interpret this width measurement as meeting or exceeding the 12-inch spacing requirement listed in General Orders 95. But that's not how electrical science works — a bolt is a conductor allowing electricity to flow. So had California Public Utilities Commission corrected this problem, informed all utilities, General Order 95 so it is clear without confusion, most of the 2017 Napa fires, if not all, would have been prevented.

A demonstration of why this design causes fires can be seen on Mr. Clark's web site.

The Quick Fix

Mr. Clark informed the CPUC, SDG&E already knew of the problem and had a construction standard installing a shunt, that would have prevented arcing at ground level, thus preventing the 2003 Cedar and Paradise fires in San Diego and the 2007 Witch Creek fire from ever starting. Hence SDG&E was not in compliance with their own standard.

Had the CPUC acted in accordance with its fiduciary responsibility to protect the public, in lieu of catering to the utilities, most of the Napa fires in 2017 would have been prevented. Mr. Clark was not retained to investigate the 2018

Camp Fire or Paradise fires, but since he found the design error so widespread throughout the PG&E system, suspects it would have been a contributing factor.

Seeing is Believing

After numerous explanations, I finally understood what he was talking about. So when Ed Clark showed me his demonstration video he created on you tube to demonstrate how these fires were starting, everything made sense. You can see for yourself on you tube Ed Clark 2007 Witch Creek Fire or go to his website and watch video.

When the shunt is applied across the connection points, the cable puts the same electric potential between the down guy and the grounding rod preventing an arc at ground level that would start a fire if dry grass were present.

Transmission Steel Towers

The gigantic steel transmission towers that traverse the foothills and carry high-voltage 220,000 volt power lines long distances are rarely the problem, though when there is an event on the transmission grid, it is catastrophic and can cause equipment failures on the grid and multiple fires, some 300 to 500 miles away, so they must be examined as a possible source of ignition after a significant wildland fire.

Though it's rare for these towers to be the cause of ignition, in the preliminary investigation of the Eaton fire in Altadena, attorney Jay Edelson of Edelson PC and the legal advocacy group LA Fire Justice, a group of attorneys who represent victims of wildland fires against the utility companies, have uncovered a January 7th security video of an Altadena ARCO gasoline station that shows SCE tower #3 arching and throwing sparks falling onto the dry ground cover during the windstorm in Eaton Canyon. Within a few minutes, there is a flash of light, and within 10 minutes, the hillside starts to burn. 17 people were killed in the Eaton fire. It burned 14,000 acres and burned down 9,418 structures. Currently, the Los Angeles County Fire Department (LACFD) is the lead investigating agency to determine the cause and origin of the Eaton fire. This is an active ongoing investigation. They have asked SCE to preserve and lock down access to these transmission towers and facilities near the site. High energy

electrical faults on an overhead system will always cause arcing at ground level in multiple locations if the facilities are not engineered and installed properly, or wherever ground connections are not secure.

Legal Liability

Political and legal liability at the top state level is complicated. There will always be finger pointing and shifting of blame between federal, state, county, and city officials. No one wants to accept responsibility for the multi- billion dollar losses of California's wildland fires. That's the nature of politics in any organization. Back in 2018, Clark offered on multiple occasions to travel to San Francisco to train the CPUC and their fire investigators on utility grid system failures, and to offer substantial remedies that would mitigate fires from starting by the electrical utility resulting from a system disturbance. He offered this training free of charge in the interest of public safety, but his offer was refused multiple times by then the Program Manager of the Electric Safety and Reliability Branch, under the Safety Enforcement Division of the CPUC. The emails between Mr. Clark and the CPUC can be seen on his website.

It is hard to comprehend when you look at all the government officials and commissioners Mr. Clark reached out to and sent an e-book he wrote just to tell the story, went without one returned phone call or inquiry.

When looking at the aftermath of the Palisades and Eaton Fires, it is incomprehensible to understand how or why the California Public Utilities Commission has continuously chosen to ignore Mr. Clarks efforts to protect the public in favor of instead protecting the utilities from excessive liability prompting this article.

When in reality, had the CPUC accepted Mr. Clarks help, according to Mr. Clark, many of the major infernos since 2007 like all the 2017 Napa fires and possibly the 2018 Camp fire and Paradise fires, as well as recent Palisades and Eaton fires may never have happened or the size of the fires dramatically reduced.

Equally troubling for me is hearing Mr. Clark explain, following a meeting where Mr. Clark was requested to attend a meeting by the then San Diego city attorney that included SDG&E executives and several SDG&E employees to share how the 2007 Witch Creek fire started. He was subsequently informed by the city

attorney, after the meeting that at a separate meeting at SDG&E corporate offices, he and SDG&E came to an agreement (settlement) that included preventing Mr. Clark from attending an all hands site investigation scheduled for the following week with all Defendant attorneys, preventing the public and all Defendants from learning what started the 2007 Witch Creek fire.

Follow the Money

There's a lot of money involved at every level in these annual disasters. With the refusal of the CPUC accepting help from a utility expert to mitigate fires in California, a city attorney colluding with SDG&E executives to conceal the cause of the 2007 Witch Creek fire, it looks as though subsequent 2017 Napa fires, 2018 Camp Fire and Paradise Fires and now possibly the Eaton and Palisades fires may have all been preventable but for a cover up, that originated with the San Diego City attorney, SDG&E executives and the California Public Utilities Commission and spread to include PG&E. *see* CPUC correspondence file on Mr. Clarks website.

It's time to take a step back and understand annual fires in California is a multi-billion dollar revenue stream (business) for the State of California. Where is all the money going? We must ask who is giving directions to the CPUC to ignore public safety.

Too Close to Home to Ignore

Concluding my visit with Mr. Clark, he expressed his frustration towards all California government top officials, conceding they have done everything in their power to avoid protecting the public. His efforts included notifying all the public officials including the governor and then attorney general, the CPUC and its Commissioners, and Cal Fire were all noticed on multiple occasions and informed a lost hunter was falsely prosecuted for starting the 2003 Cedar fire. All who have ignored his plea are shown on his website. At what point can government officials be legally liable for all the death and destruction and participating in concealing the cause of these fires from the public.

It should be obvious the State OF California will not police itself, prompting the need for a Federal investigation who will enforce the remedies to mitigate forest fires in California.

End note: an e-book "Circle the Wagons" the correspondence and email responses from the California Public Utilities Commission, Governor Gavin Newsome's Head Project Manager over the Electrical Safety and Reliability Division, and all the supporting documents for this article can be found on Ed Clark's website at www.theelectricalexpert.com.

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Raul Angulo is retired from the Seattle Fire Dept. and is Captain Emeritus of Ladder Co. 6 with over 40 years of experience. He is the author of the new textbook, Engine Company Fireground Operations 4th Edition, (Jones and Bartlett Learning and NFPA) and is on the Editorial Advisory Board for Fire Apparatus and Emergency Equipment magazine. He is an international fire service instructor and has authored numerous articles for Fire Engineering and Fireengineering.com. He has been teaching at FDIC International since 1996.