The Electrical Expert
Forensic Analysis & Expert Witness

Northern California FIRES

By: Ed Clark
April 4, 2018

Messrs: Michael Picker, President CPUC
Carla Peterman, Commissioner CPUC
Liane Randolph, Commissioner CPUC
Martha Guzman Aceves, Commissioner CPUC
Clifford Rechteschaffen, Commissioner CPUC
Nicholas Stavropoulos, President and COO PG&E
Geisha Williams, CEO and President
Ken Pimlott, Cal Fire Director
Dennis Mathisen, Cal Fire State Fire Marshal

SUBJECT: ***CHARLOTTE TERKUEURST CPUC PROGRAM MANAGER RESPONSIBLE FOR INVESTIGATION 2017 NAPA WILD FIRES*** **REFUSES TO LEARN HOW SO FIRES STARTED SIMULTANEOUSLY IN NAPA VALLEY IN 2017.**

INUSTRY EXPERT REVEALS HOW SO MANY FIRES STARTED AT THE SAME TIME SPANNING 8-COUNTIES AND OVER 300 MILES APART IN THE 2017 NORTHERN CALIFORNIA WILDFIRES

The following report will layout the fundamental and basic outline identifying and explaining the source of the 2017 Wild fires in Northern California.

The question of why so many fires? How did they start? How come so many fires at the same time? and what Started the fires have gone unanswered by PG&E, the California Public Utilities Commission, Cal Fire and hundreds of investigators, calling these fires a mystery. There has not been any explanation of how so many fires can start at the same time up to 300 miles away from each other that have devastated the lives of so many.

My name is Ed Clark a former utility Transmission/Substation Engineer with an extensive 37-years of utility operations, maintenance and construction background with an understanding of the cause and effect of disturbances that happen on a utility grid. The root cause of how so many fires start at once is well known in the Utility world. It is just not that complicated, however, because of the liability it is rarely revealed until now.

The key to understanding the root cause of a large number of simultaneous fires in Northern California Fires is to first ask yourself some very basic questions: How can so many fires start at the same time? Is it likely that these fires can start with trees falling at the exact

same time in eight different counties up to 300 miles apart? How do these fires spread so quickly in so many areas?

In my efforts to explain the big picture and get down to the root cause, I along with seasoned fire expert FROM Cal-Fire , visited 8-counties and 13- fires including Tubbs, Atlas, Nuns, Cherokee, Sulphur, Redwood Potter, Partrick, Adobe, Norrbom, Banger, La Porte and Cascade. These fires ranged as far as 300 miles apart.

I should note in my past experience working as a Transmission/Substation Division Engineer for Southern California Edison, one of my primary responsibilities following a storm or major interruption or event that involved multiple locations was to understand and determine how or if each separate event was somehow linked to each other.

How do I do that? First, we look at the geographical location of each event and understand what is the common link between all of them.

The first point of interest is to recognize the Atlas, Tubbs, Nuns, Partrick, Cherokee, Sulfur, Redwood, Banger, Adobe appear to have "ALL" started in the evening of October 8, 2017 in and around the same time. The times vary slightly because they are based on when people called in to report a fire. Consequently, from the point of ignition to the time somebody sensed the fire and called in explains a small deviation in the times reported for the various fires..

The common link to each of these fires that could explain simultaneous ignition in so many locations are PG&E Electric lines and the Earth, both of which are common to each fire.

Ironically, each fire location had the same multiple reports, flickering lights, wire down and transformer failures, fallen trees, all discovered and found from social media, the internet and 911 phone logs.

Although most locations had a lot of trees, it just wouldn't make sense to the normal mind to think you had trees fall at the exact same time in so many locations several hundred miles apart covering thirteen separate fires.

Each of the fires, except two locations I visited revealed a pole top Transformer that had been replaced resulting from a failure. One location on the Tubbs Fire was on private property, however there were multiple other ignition points on the Tubbs fire. One ignition point on the Atlas fire was a Communications box, however the Atlas fire also had multiple ignition points. Consequently, these pole top transformers are many miles apart. The questions is why and how come so many Transformers fail in different locations at the same time?

I recognized two separate, distinct design problems on the PG&E system that started all of the fires simultaneously, and contributed to the fires spreading so quickly. A utility Engineer from PG&E specifically with a relay protection background, who has experience physically putting settings on ground relays and understanding ground protection will understand the following explanation of each problem found.:

A. ***Electrical Utility Lines***

It is very common and a normal occurrence for an electrical utility during a lightning storm or following a major interruption ("FAULT") on their system to have, and record, a large number of pole top distribution transformer failures spread out many miles apart. This is caused or can be caused from a variety of issues ranging from utility operations caused from switching, a utility system fault or disturbance, 69kv capacitor switching or capacitor failure. All of these

scenarios can create Transient voltages i.e. (impulses or electrical spike, very short in duration, that sends an electrical impulse out on the electrical system via the electrical lines. This impulse sometimes exceeds the BIL rating of a piece of equipment. The BIL rating is referred to as Basic Insulation Level or sometimes Lightening impulse level. Impulses that exceed the BIL rating of equipment like transformers often fail. A transient Impulse or Spike is very similar to a Lightning Strike.

The only way a utility can have so many transformers fail in so many locations at the same time is to have had a major event somewhere on their Sub-Transmission or Transmission Grid that would have sent out a Transient IMPULSE voltage, or surge out over their system causing a lot of transformers to fail at the same time. It is a common occurrence in an Electrical Utility during a storm or resulting from a system disturbance to suffer an event that causes several distribution transformers to fail and often many miles away. An event that can cause Transient voltage spikes on utility lines can come from system faults on the utility grid like equipment failures, 69kv capacitor switching, car hit pole, switching in general causing ferro resonance, system parallels, just to name a few. These types of events can also affect residential or commercial level by way of causing computers, Televisions, appliances, Electrical services, etc. to fail.

The problem is: once a Distribution Transformer fails, the wire feeding the faulted transformer acts like a fuse, falls to the ground and starts fires. This happens because the wire feeding the transformer, in most cases are sized to carry normal load current feeding a residence. The line is not sized to carry high current (FAULT CURRENT) caused when a transformer fails internally. Therefore, the line melts, opens and falls to the ground. The lines falling to the ground catches the trees or nearby vegetation on fire.

The trees then fall down giving the appearance the tree caused the fire. In high winds, a tree falling or making contact with an energized line could happen, however not at all locations spanning eight counties several hundred miles away at exactly the same time. Typically, when there is nothing else around, the Utility will report the lines came together.

By the time most people sense, smell or see the fire, the trees are already on the ground. So, you can understand why so many reports of trees falling into power lines.

Although an expensive fix, the resolution for this problem is the Utility (PG&E) could install primary wire large enough to carry fault current so that if a transformer fails, the wire would not melt (or burn open) before the primary fuses on the transformer could blow, thus clearing and preventing the line from falling down starting fires. Another possible resolution could be to install more down line field automatic switches that could operate out on the end of the line during a transformer fault to trip off line sections before the line burns open. Without a study, I am not sure if this idea would be practical. The primary fuses on the transformer are sized to blow slow resulting from an overload condition at the home(s) it is feeding, therefore will not blow fast enough for high fault current before the line burns open. Additionally the utilities can upgrade their design specifications on their transformers to raise the BIL level of a transformer during manufacturing which would make the transformers more expensive to buy, but would be less susceptible to a voltage spike on the system.

For the technical reader: it should be noted that I personally have run tests and captured graphically transient impulse spikes that exceed equipment BIL ratings of equipment by more than 2x their rating. The impulse last for a quarter of a cycle which is $1/240^{th}$ of a second. Too fast for most recording equipment to capture. I was able to capture this data by closing in 69kv capacitors on the sub-transmission system in 1988 utilizing equipment that recorded data 3-cycles before an operation was triggered., hence the reason utilities like PG&E started installing reactors on all of their 69kv capacitors was to cut down the impulse to an acceptable level below the BIL rating. I share this with the reader to demonstrate PG&E is fully aware of the effects of transient voltage spikes and how it can affect equipment over a large geography. I personally have experienced these transient voltage spikes, destroy 220kv, 69kv and a lot of distribution transformers simultaneously many miles away from the original fault.

B. ***The Earth***

What does the earth have to do with the Utility and a Utility Fault?

The earth plays very important role with Electrical Utilities and their electric lines in that the earth acts like one big wire or conductor to give Electricity a path to flow during a system ground fault or interruption discussed above from the faulted location back to the source transformer that was delivering the electricity thru the ground (called ground current). We as humans don't feel it or know when ground current exists because everything is grounded around us. I would say as an example, the same concept and reasons a bird can stand on a wire without getting electrocuted. As long as both feet are on the same wire, there is no difference of potential. Earth acts the same way. Earth acts like one big wire.

Now, the problem we have with these fires, is that PG&E has a (WRONG) design for their sub-transmission wood poles used to help hold their poles up in high winds called Down Guys. The design I found on the PG&E system in many locations allows (when ground current exists) current to flow in a down guy anchor, up thru a bolt on the pole and down another down guy to ground on the other side. If the down guys are loose, the wind, can cause the connection to make and break contact causing electrical arcing when ground current is present at ground level in and around dry grass causing fires to start. *This problem is independent of the Transformer problems previously addressed.*

I discovered this design problem in San Diego I investigating the cause of the 2007 Witch Creek Fire and as a result discovered this same design problem started the 2003 Cedar and 2003 Paradise fires on the SDG&E system. In my travels investigating the Northern California Fires I witnessed and documented "MANY" location with this same bad design throughout the PG&E service territory, a couple of which were sources of ignition in the 2017 fires.

In an effort to get the word out to all utilities in California. On January 16, 2008 I met with Raffy Stepanian, Mahmoud (Steve) Antabli, P.E., Fadi Daye, P.E., and Raymond Fugere, P.E. from the CPUC. The California Public Utilities commission was presented reports, pictures and lab results verifying the existence of electrical arcs at ground level.

The meeting prompted a cite visit (investigation by CPUC). Ironically the PUC sent only one engineer Mr. Antabli, who did not have a utility Engineering back ground. Following the investigation, Mr. Antabli confirmed with Jeff McDonald a reporter for the San Diego Union Tribune via telephone that he confirmed the existence of Electrical arcing at ground level caused by the down guy design described. Since that date, Mr. Antabli could not take a phone call from me or Mr. McDonald when we would inquire about status of CPUC investigation.. I was informed by Mr. Day of the CPUC, that an inquiry was made to PG&E to get an opinion at the time from a third party, since the CPUC did not have anyone with the background to understand my findings.. I was not invited to attend and was told the PUC could not share the investigation with me. Ironically, PG&E had the same design problem throughout its service territory making it problematic to agree with the CPUC.

I was invited to attend as a guest speaker a large private Cal FIRE MEETING IN San Diego on April 5 2008 by Howard Windsor of Cal Fire. The presentation prompted another cite visit with Cal Fire with what I originally thought was now finally going to be a big investigation on April 16,2008. Again, only one-person Jim Garrett from Cal Fire showed up for the investigation. Jim Garrett is the officer from Cal Fire who prosecuted the lost hunter in the 2003 Cedar Fire. I was unaware when I announced at the Fire Chiefs meeting the repercussions of stating my opinion ,the lost hunter was falsely prosecuted for the 2003 Cedar Fire on circumstantial evidence. Consequently, the tone of the investigation with Mr. Garrett is clearly documented in published minutes and was a waste of time. Mr. Garret refused to let me show him where and how the 2003 Cedar Fire started, only about ¼ of a mile away and would not go to the start of the 2003 Paradise fires, about 30-miles away.

Both Cal Fire and the CPUC had full knowledge of how the Witch Creek fire started for many months. Both government organizations failed to disclose my undisputed findings in their reports published to the public. The Cal Fire report was signed on July 1,2008 by Mathew Gilbert, ID#22 of Cal Fire. Mr. Mathews never contacted me prior to publishing his report. I provided Mr. Mathews a detailed response that went unanswered.

Subsequently, the CPUC did not publish their report until September of 2008. at http://www.cpuc.ca.gov/NR/rdonlyres/9FA2FC3F-4BCE-47E1-85B1-F29ABA878519/0/CalFireReportMainDoctfinal.pdf.

Ironically, neither organization, the CPUC or Cal-Fire made any mention of the undisputed evidence of the deficirnt design by SDG&E that started the 2007 Witch Creek Fire, the 2003 Cedar Fire and the 2003 Paradise Fire. I made several requests without success to meet with Cal Fire and the CPUC together to get this issue resolved by all utilities. Due to the resistance from the CPUC and Cal Fire to have any desire to have a meeting of the minds with all of the appropriate utility technical personnel, I created a website to document my efforts for fear more fires would start. You can go to www.theelectricalexpert.com and review all of the exhibits along with a book I self published, not to sale, but to send to those for free who I thought would read and take action in an effort to help solve this problem of Wild Fires in California. You cans see all of the politicians in California who received a copy.

More disturbing is the resolution to fix this down guy problem and completely remove it as an issue that can start fires or help fires spread are three separate in-expensive resolutions. 1-separating the down guy attachment on the pole by 12" by installing a $20 bolt, similar to the design published in an SCE standard for Construction, or 2- add insulators like you see driving

down the street on distribution poles, equally as inexpensive and 3-install a shunt across the connection similar to what now is done in San Diego.

CONCLUSION

As shown above PG&E has two major problems and are responsible for starting the Northern California Fires that Started on October 8, 2017. You cannot understand this if you look at causation of an individual fire. You have to understand how a utility works, operates and how the utility is designed and is interconnected. We know a major event on the utility grid is the only way you can have so many transformers fail at the same time, so many miles away from each other. During that major event, there is ground current flowing thru a flawed down guy design starting fires at the same time transformers are failing with lines dropping on the ground starting fires.

Yes the winds are blowing hard, but the reason the fires all appear to grow so fast, making it impossible for the fire department to keep up, is BECAUSE MULTIPLE FIRES ARE ALL STARTING AT THE SAME TIME, in this case ***across 8-different counties***, hundreds of miles apart. You have, simultaneously, transformers failing with lines falling down and arcing in the grass at ground level on PG&E poles all throughout the PG&E service territory. The larger fires like Tubbs, Atlas, and Nunns fires, all have multiple ignition points or points with the same issue.

One last thing, the utilities design and anchor their poles to withstand high winds. The transformers did not fail because of high winds, they failed because of a transient voltage spike exceeding the BIL rating of PG&E Equipment, caused from a major event on the utility grid. ***Discovering that event should be the focus of the PUC investigation to see what started this sequence of events***. Once we compile all of the event recording information from PG&E, we will know what triggered all of these transformers to fail at the same time. It should be noted that PG&E is interconnected with other utilities on the transmission grid, that could also be the source of what caused the initial impulse on October 8, 2017.

My concern is that I pointed out in person to Cal Fire and the CPUC in late 2007 early 2008 that not only did the 2007 Witch Creek fire start because of a wrong down guy design, the same design, started the 2003 Paradise fire and the 2003 Cedar fire where a lost Hunter was falsely prosecuted.

Consequently, the implications are obvious. I did not believe that those organizations would choose silence over correcting their mistake. **I warned the CPUC and Cal Fire** that more fires would start if these design issues did not get addressed formally with all California utilities.

Now, in 2017 more deaths and devastation that could and should have been dramatically mitigated if a select few individuals at the CPUC and Cal Fire would have done their job.

I am extremely shocked, disturbed, and utterly floored to come to the conclusion the California Public Utilities Commission would refuse a meeting from a seasoned Utility Engineer with a background and experience that far exceeds their own resources to finally open their minds and learn the reason behind so many devastating wild fires in California. I have attached the email string from **Charlotte f. Terkeurst** at the California Public Utilities Commission. Ms.

Terkeurst is the Program Manager, Electirc Safety and Relaibility Branch in charge of investigating the NAPA fires.

I highly recommend again meeting of the minds with the CPUC, Cal Fire, and representatives from all of the California utilities. I recommend making sure, there are relay protection Engineers with hands on experience understanding how ground faults work and the path ground current takes to get back to the source. ***I will be happy to attend and put on a presentation if invited to help educate all who are interested.***

For background information, please look up Ed Clark, Witch Creek fire on **you tube** to see a video of how the down guy design starts fires. My website www.theelectricalexpert.com shows the history of my efforts to bring this design problem to the appropriate parties following the 2007 Witch Creek Fire

Edward L. Clark Jr.
w/attachments

Ed Clark - The Electrical Expert

From: TerKeurst, Charlotte <charlotte.terkeurst@cpuc.ca.gov>
Sent: Friday, March 23, 2018 8:33 PM
To: Ed Clark - The Electrical Expert
Subject: RE: 2017 Northern California Fires - Follow Up

Hello Mr. Clark,

I've shared your concerns with the engineers who are investigating the northern California fires. We are undertaking extensive investigations and fact gathering that will address the issues you've raised, along with many other issues. We don't see a need to have a meeting, and want to focus on the investigations that we have underway. However, I appreciate that you've brought your concerns to our attention.

Best regards,
Charlotte

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From: Ed Clark - The Electrical Expert [mailto:ed@theelectricalexpert.com]
Sent: Friday, March 23, 2018 11:45 AM
To: TerKeurst, Charlotte
Subject: FW: 2017 Northern California Fires - Follow Up

Good morning Ms. Terkeurst,

Early last week you had mentioned you would get back to me within a couple of days to let me know if the CPUC was interested in meeting with me to hear my findings regarding what started the 2017 fires in Northern California. Can you please advise me one way or the other if a meeting will get scheduled. If I don't hear back from you, I will presume the CPUC is not interested in a meeting to learn and understand what is causing so many large fires in California

Thank you

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From: Ed Clark - The Electrical Expert [mailto:ed@theelectricalexpert.com]
Sent: Monday, March 12, 2018 2:01 PM
To: 'charlotte.terkeurst@cpuc.ca.gov' <charlotte.terkeurst@cpuc.ca.gov>; 'CFT@CPUC.CA.GOV' <CFT@CPUC.CA.GOV>
Subject: FW: 2017 Northern California Fires - Follow Up

Ms. Terkeurst,

On February 23, 2018 we spoke regarding causation of the 2017 Northern California fires. We spoke about scheduling a meeting so I could put on a presentation in order for me to explain to the CPUC how so many fires started at the same time. You indicated you would need to wait to let others you would like to have attend return from vacation. As I indicated if the CPUC is interested in my presentation I would need a couple of weeks to prepare.

Please advise if the CPUC is interested in my findings that started the fires listed in my previous email. If you are going to schedule a meeting at some point, then I will proceed with putting my presentation together.

You can also call me at 714 448-7145

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From: Ed Clark - The Electrical Expert [mailto:ed@theelectricalexpert.com]
Sent: Friday, February 23, 2018 5:28 PM
To: 'CFT@CPUC.CA.GOV' <CFT@CPUC.CA.GOV>
Subject: 2017 Northern California Fires

Ms. Terkeurst,

Thank you for the time on the phone today. I will look forward to scheduling a date late March for me to present to the California Public Utilities Commission the source of what started the 2017 Northern California Fires. Please allow me about three weeks' notice for scheduling as I have a busy calendar. I will travel to Northern California to present my findings.

For your information,
I investigated the Tubbs, Atlas, Nuns, Cherokee, Sulphur, Redwood, Potter, Partrick, Adobe, Norrbom, Banger, Laport and Cascade fires. I would suggest personnel with the following background to attend if possible.

1. A relay protection Engineer with Ground Relay Protection and Ground fault analysis background
2. Transmission Design Engineering for wood pole Sub-Transmission lines
3. Distribution Pole Top Transformer Design Engineer
4. Transient Voltage Analysis Engineer
5. Management background running a utility Distribution yard following a major storm, lightning strike or system disturbance.
6. Strong Utilities Operations Back Ground.

Please be advised, although I was retained to perform the investigation, and PRIMARILY BECAUSE OF SUCH A LARGE PUBLIC SAFETY ISSUE,, the firm agreed to let me present my finding directly to the CPUC to allow your discovery and investigations to focus on the issues that started the 2017 fires. I am doing this on my own without counsel as I did with

the CPUC for the 2007 Witch Creek fire that allowed the CPUC to obtain the discovery necessary from the utility for its own internal investigation.

I will outline:

1. Why so many fires?
2. How come so many fires at the same time?
3. Root Cause (TWO MAJOR DESIGN PROBLEMS) of what started the fires as far as 300 miles apart from each other?
4. How did they get so large so fast?
5. ***The remedies to take corrective action prior to the next fire season before another fire starts***.

You can reach me on my cell phone at 714 448-7145 or via email.

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