Diane Conklin
Spokesperson
Mussey Grade Road Alliance
PO Box 683
Ramona, CA 92065

April 7, 2020

Ms. Caroline Thomas Jacobs
Director, Wildfire Safety Division
California Public Utilities Commission, Wildfire Safety Division
505 Van Ness Avenue
San Francisco, CA 94102

Ref: R.18-10-007

Transmittal via email: wildfiresafetydivision@cpuc.ca.gov and R.18-10-007 service list

RE: MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2020 WILDFIRE MITIGATION PLANS OF SDG&E, PG&E, SCE

Dear Ms. Jacobs:

The Mussey Grade Road Alliance (MGRA or Alliance) serves these comments pursuant to Resolution WSD-001,[1] which authorizes public comment on investor-owned utility (IOU) Wildfire Mitigation Plans (WMPs) by April 7, 2020. MGRA is circulating these comments on April 7, 2020 so this submission is timely.

The Alliance is pleased to have the opportunity to provide feedback on the most extensive and sophisticated fire plans that the California IOUs have so far produced, thanks in great part to the detailed templates provided by California Public Utilities Commission staff. The quality of the record has further been enhanced by detailed and exhaustive data requests by the Wildfire Safety Division (WSD) and other parties.

The Mussey Grade Road Alliance is a grass-roots citizen-based organization located in Ramona, California, established in 1999. It became involved in CPUC wildfire issues in 2006 when opposing the SDG&E application for the Sunrise Powerlink transmission line on the basis of potential fire ignitions. The proposed route passed through large swaths of San Diego County

[1] RESOLUTION WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to Public Utilities Code Sections 8386 and 8386.3; January 16, 2020.

backcountry, through California's largest state park, and through our own community located in the wildland-urban interface. Our intervention was the first to highlight wildfire issues for a transmission project, resulting in 300 pages of the project EIR devoted to wildfire issues, and finally resulting in a rerouting of the line.

MGRA has demonstrated a deep commitment to the issue of wildfire safety in California and is likewise dedicated to the success of this project. The Mussey Grade Road area was devastated in the 2003 Cedar fire, losing two thirds of the homes within the fire perimeter.[2] In 2007, we were surrounded by fire, this time the Witch fire, ignited by SDG&E equipment. In 2009, MGRA proposed as part of a CPUC rulemaking that utilities develop fire plans that would allow them to react to the contingency of extreme winds in their service areas. Our sole support in this effort came from Los Angeles County, and we were opposed by every IOU and communications company during a years-long effort. Nevertheless, the Alliance prevailed, and the Commission adopted our proposal requiring utilities to develop fire prevention plans.[3] While utilities complied with the new requirement, the plans did not undergo substantive technical review by the Commission. The legislature made an attempt in 2016 (SB 1082, Hill) to require more substantive review of utility fire plans, but this law was not implemented by the Commission.[4] It took the power line fire disasters of 2017 and 2018 to prompt government action and the passing of SB 901 and AB 1054. While these bills and the laws they enacted had a number of significant flaws, not the least of which is a ridiculously short review time, they at the least called for comprehensive fire plans and for their formal expert review.

MGRA took part in the review of the first utility fire plans developed under SB 901 last year. The 2019 WMPs were much more detailed than the plans that had come before, and the 2020 WMPs being reviewed presently are far more detailed still. More important are the utility and regulatory underpinnings of these plans. In 2008, utility departments devoted specifically to

---

[2] Prior to the 2003 Cedar fire, Dr. Joseph Mitchell, now the Alliance fire expert, developed a novel fire prevention system that saved our home. This success provided his initial entrée into fire science and enabled his contributions to Commission proceedings since 2007.
http://www.mbartek.com/weeds-info/7-engineering-a-miracle-the-story-of-weeds
Mitchell, J.W., 2006. Wind-enabled ember dousing. Fire Safety Journal 41, 444–458.
https://doi.org/10.1016/j.firesaf.2006.04.002

[3] D.12-01-032; pp. 45-55; A-26.

[4] "State utility regulators delayed implementing 2016 law aimed at preventing wildfires"; Jeff McDonald; San Diego Union Tribune; December 10, 2018. https://www.sandiegouniontribune.com/news/watchdog/sd-me-powerline-wildfires-utility-mitigation-plans-20181210-story.html ; Downloaded 12/30/18.

wildfire prevention were small or nonexistent. Today, all the major IOUs support large groups dedicated to fire prevention, with experience ranging from meteorology to fire science, and this expertise deeply informs the WMPs. Furthermore, there is now a Wildfire Safety Division, soon to be independent of the Commission, specifically dedicated to ensuring that these plans are accurate, effective, and implemented. These results are far beyond anything we would have dreamed possible when we started down this road more than a decade ago.

This journey is nowhere near complete, however. The problem is to some extent growing faster than the solution. The years of 2017 and 2018 saw more than 140 people die in power line sparked fires, and 2019 saw extensive utility power shutoffs affecting millions of Californians. This is no time for complacency. Furthermore, this year's plans finally allow more of a direct apples-to-apples comparison of utilities and while we find agreement on some approaches to the fire problem, in other aspects the plans are sometimes wildly divergent, leading us to question which is the "best" approach. Finally, the sheer size of the WMPs and their accompanying data, and the hard legislative limit on the time available for review, force any review to be cursory. It will take some time for WSD, which is still staffing up, to get their arms around this information. And for intervenors such as MGRA, we necessarily need to be very focused on specific topics and issues of immediate concern to us. This year's WMPs should, therefore, be seen as a first step in a multi-year process of continuous improvement. Accordingly, we would suggest that WSD make the yearly reviews of the WMPs a more rigorous process than would be required in an annual update. It should target specific areas that need additional work and revision, and require updates in those areas. And, in light of the short time available for review and plan approval, we would suggest that WSD continue its analysis of the utility submissions after the completion of the current review, and in preparation for next year's review.

As with so many life and death issues, the sense of urgency – nay emergency – required to save lives and improve the safety of electrical provision in California can unintentionally become a bureaucratic exercise with even the words used to describe and fix the problem unintentionally masking the human suffering and destruction of the natural world that occurs when things go very wrong. California is an engine of economic prosperity, technological advances, creative initiatives and the largest state population in an absolutely gorgeous natural environment. Yet California, known for all of this, is even more widely known for catastrophic, destructive, and killing fires ignited by utility equipment. These two visions of California are at odds with each other. Either we

are a state of innovation, leading the nation, or we are as state of disasters that in our most recent history are man-made. If we do not get this problem solved, one of the state's greatest challenges, we will not be ready for an even more uncertain future, which includes increasing frequency of catastrophic fires due to climate change.[5] We must get ahead of this problem so we can deal with the doubling of fall fire-threat days, which will only be amplified in the future absent a major national shift to deal with global climate issues.

In conclusion, we hope that the Wildfire Safety Division has adequate time and staff to evaluate not only the plans themselves but the significant effort we and other reviewers have put into the evaluation of these plans. We thank WSD in advance for the Herculean effort that the short deadlines will require of them, and anticipate that they will include these and other recommendations submitted by the public in their Draft Resolution on the 2020 WMPs and in any recommendations they make for future actions.

Respectfully submitted this 7th day of April, 2020,

By: __*/S/*___***Diane Conklin***_____

Diane Conklin
Spokesperson
Mussey Grade Road Alliance
P.O. Box 683
Ramona, CA 92065
(760) 787 – 0794 T
(760) 788 – 5479 F
dj0conklin@earthlink.net

[5] See for instance: Goss, M., Swain, D.L., Abatzoglou, J.T., Sarhadi, A., Kolden, C., Williams, A.P., Diffenbaugh, N.S., 2020. Climate change is increasing the risk of extreme autumn wildfire conditions across California. Environ. Res. Lett., Accepted Manuscript March 26, 2020; https://doi.org/10.1088/1748-9326/ab83a7

TABLE OF CONTENTS

WILDFIRE MITIGATION PLAN COMMENTS ON BEHALF OF THE MUSSEY GRADE ROAD ALLIANCE

The Mussey Grade Road Alliances' (MGRA or Alliance) Wildfire Mitigation Plan comments are authored by MGRA's expert witness Joseph W. Mitchell, Ph.D.[6]

1. INTRODUCTION

1.1. Overview, Organization, and Summary

The Wildfire Mitigation Plans (WMPs) provided by the IOUs are broad in scope and detailed in content, and combined with the accompanying data request responses from the Wildfire Safety Division (WSD), MGRA, and other parties, along with accompanying data, represent a massive volume of information that is difficult for a single expert to ingest, process, and provide useful feedback on in the limited time available for review. Rather than provide shallow content on the plans in general, these comments represent deeper dives and analysis into specific topics that are of specific interest or in which MGRA has been actively involved in the past. The comments are also restricted to the WMPs for Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric Company (SDG&E), which serve the greatest number of customers in California and who also have all had experience with catastrophic utility-sparked fires.

The topics are organized according to the SED/WSD templates used for the WMPs. Single topics are addressed for all utilities within the same section to allow comparison and contrast to utility approaches to each topic. Every section has one or more accompanying recommendations, usually for utility improvements or actions, but also often for WSD improvements to the WMP process or templates. This is a new process, especially in its current form, and naturally there are pieces that don't fit together properly, need optimization, or are simply incorrect for the job. A recommended urgency is also given, usually immediate (plan approval contingent), next yearly update, or next major revision (if this is more than a year).

---

[6] M-bar Technologies and Consulting, LLC; http://www.mbartek.com; Email: jwmitchell@mbartek.com. Dr. Mitchell is also a board member of the Mussey Grade Road Alliance.

Comment highlights include:

- Very significant differences in the results of IOU weather modelling when applied to the same geographic area.
- Insufficiency of the current fire hazard metric (Red Flag Warning circuit miles) when applied to outages, wires-down, and vegetation contact data.
- Gaps regarding utility engineering for known local conditions and issues regarding the application of GO 95.
- The criticality of incorporating extreme wind speed estimates into fire risk metrics.
- The existence of two independent utility risk calculation domains, one used for internal prioritization and the other presented in the utility's RAMP.
- Dramatic differences in the methodology and results between utilities in their application of MAVF for risk and risk/spend efficiency calculations.
- Variance of MAVF results, especially for wildfire risk, from other risk estimation methodologies, suggesting the need for the initiation of an S-MAP OIR to resolve inconsistencies.
- Limited benefit of SDG&E's 25 foot trim EVM program for healthy native oaks.
- Incorrect risk/spend efficiencies for PSPS mitigation.
- Potential issues with utilities discouraging customer complaints during PSPS events.

Regarding urgent issues regarding plan approvals, no fundamental issues with the plans were found that would unambiguously block plan approvals. However, there are a number of issues that were highlighted that should require resolution prior to plan approval, particularly in the case in which a utility has not provided data required by WSD or the Commission (specifically, PG&E and ignition data, SDG&E regarding trim criteria). Additionally, in the case in which a major Commission action is going to be undertaken soon, for instance PG&E's RAMP, SDG&E's RAMP, and potentially and S-MAP OIR, more urgent remediations are requested for the WMPs.

Unfortunately, it was necessary to gloss over or entirely skip other topics of value. Some of these were touched upon in the MGRA data requests (attached as appendices). Topics for which utilities provided data which there was insufficient time to adequately analyze include:

- Customer refusals for vegetation trimming.
- Anomalies in utility inspection results and tagging.
- Technical details of utility weather modeling.

WSD should review the utility responses to MGRA data requests in these areas if it is investigating them as part of its own review.

One topic which would be of great general interest for WSD to investigate is an overview and analysis with comparison between utility advanced technology programs, particularly since these may provide some long-term reduction in the need for de-energization.

1.2. WMP Template and Capability Maturity Model Issues

SCE notes that there are issues with the current version of the capability maturity model (CMM), particularly as regards higher levels of the maturity model: "…we do not believe some of the higher levels of capabilities provided in the maturity model survey should be the highest priority for advancing wildfire safety. For example, there is limited value in increasing the frequency of weather data update from every 10 minutes to at least every minute."[7] This is not the only example of irregularities in the CMM – MGRA pointed out a number of other issues in its template comments. SCE attributes this to the rapid pace of the WMP template approvals: "We understand and appreciate that the maturity model was developed under a compressed time constraint for the purpose of including in the ALJ Ruling to evaluate utilities' wildfire mitigation capabilities. The inaugural process with shortened timelines did not allow for incorporation of participant comments or the benefit of receiving detailed clarifications from the WSD."[8]

We strongly agree with Edison on this point. A fraction of the data being collected is off-point, or just incorrect. Another example of is question B.III.b of the survey, which requires accurate weather forecasting in excess of two weeks in advance, which is beyond not only current technology, but which exceeds theoretical limits. Currently, the maximum accurate forecast lead time for a "skillful forecast" is 10 days, with potential for scientific and technological improvements

[7] SCE WMP; p. 7.
[8] Id.

to perhaps 15 days.[9] However, scientists have long suspected that there is likely to be an absolute limit to weather predictability due to power-law growth of initial uncertainties over time,[10] known popularly as the "butterfly effect". Other CMM survey questions also seem to be poorly calibrated to their domain as well.

The goal of the WMPs and their capability maturity model is to collect useful trend data that allows us to ascertain whether the measures that the utilities are applying are measurably improving wildfire safety. Collecting incorrect data can be worse than collecting no data at all: Wrong data can be used to reach wrong conclusions, and this can compromise fire safety. Therefore, it is important that gaps and mis-steps in the templates and models be addressed as soon as possible so that future WMPs are not compromised. SDG&E notes similar issues and suggests that WSD host workshops to address shortcomings in the CMMs and templates.[11]

Recommendation:
WSD should arrange workshops to re-examine the templates and address quality issues. Should COVID-19 issues persist through the summer, WSD should examine what kind of online conferencing might support such workshops.

Urgency:
Within the next year.

1.3. General Comment on Utility Approaches to Wildfire Mitigation

While California in general faces a steeply increasing threat of catastrophic wildfire, and of utility-ignited wildfires, and while general techniques across all electrical utilities are similar, the emphasis and, importantly, investment in mitigation measure varies considerably from utility to utility. The major IOUs have generally tried to explain this variation as being due to differences in the vegetation and climate in their respective service areas, and to differences in their equipment.

---

[9] Zhang, F., Sun, Y.Q., Magnusson, L., Buizza, R., Lin, S.-J., Chen, J.-H., Emanuel, K., 2019. What Is the Predictability Limit of Midlatitude Weather? J. Atmos. Sci. 76, 1077–1091. https://doi.org/10.1175/JAS-D-18-0269.1

[10] Lorenz, E.N., 1969. The predictability of a flow which possesses many scales of motion. Tellus 21, 289–307. https://doi.org/10.3402/tellusa.v21i3.10086

[11] San Diego Gas & Electric Company Interpretive Guide to 2020 Wildfire Mitigation Maturity Model Utility Survey; p. 2.

While there may be differences between climactic and vegetation regions in California, these regions span utility service areas, so it is difficult to understand why the approach to the same problem changes across a utility service area boundary. In general, we see the following general trends in place at SCE, SDG&E, and PG&E:

- SCE has initiated an extensive program to harden infrastructure and deploy covered conductor in High Fire Threat District (HFTD) areas where vegetation contact is possible.
- SDG&E is continuing its established infrastructure hardening program, including use of steel poles and more stringent design requirements. It also has adopted an aggressive tree trimming program (25 foot trim radius). Finally, it has pioneered the sectionalization of its distribution network to enable targeted PSPS[12] (Public Safety Power Shutoff).
- PG&E has deployed PSPS on a broader and more massive scale than the other utilities, and infrastructure improvements are currently focused on improved sectionalization to reduce customer PSPS impacts.

Questions regarding a number of these elements are addressed in detail in this report. The question of whether other utilities should be more aggressively adopting covered conductor deployment is addressed in Section 5.3.8.1. The value of SDG&E's 25 foot trim requirement is analyzed in Section 5.3.5.1. Utilities also have a completely different approach to calculating fire potential index (FPI), as shown in Section 4.6.1. Utility reliance on PSPS as a go-to strategy is discussed in Sections 4.4.1 and 5.3.8.1. And the fact that substantial portions of utility infrastructure are not built to withstand known local conditions in their service areas is examined in Section 7.3.2.

In summary, the fact that utilities seem to be approaching the wildfire problem in drastically different manners is problematic. It is problematic for WSD and any interested stakeholders, because while it would be difficult to analyze a single approach during the short time allotted for WMP reviews analyzing a slew of them is onerous and will lead to important items being

[12] MGRA, along with other intervenors, has objected to the term "Public Safety Power Shutoff" (PSPS), since it is not proven that public safety is the primary motivation or effect for power shutoff in all circumstances. However, the Commission has adopted the term, so we use it with this caveat. The terms "shutoff" and "de-energization" are used synonymously in these comments.

overlooked. It is also problematic for California residents and ratepayers, because all Californians have an expectation that they will be provided equal access to safe and reliable electrical service. If one approach is leads to greater safety and cost-effectiveness, it should be widely adopted.

Recommendation:

WSD should identify areas where utilities should work toward a common set of principles and approaches, and they or the Commission to drive programs to develop these approaches. Areas to be examined should include:

- Identification of climactic and vegetation zones requiring different utility wildfire mitigation approaches, and general agreement on these approaches.
- Examination of covered conductor in terms of effectiveness and risk/spend efficiency and means to accelerate deployment if it is advantageous.
- Factors driving proper tree trimming protocols.
- Common approach to Fire Potential Index calculation.
- Approaches to catalogue the age, condition, and characteristics of all utility assets to be included in prioritization and risk analysis.

Urgency:

Prior to next major WMP revision.

2. METRICS

2.3. Recent Performance on Outcome Metrics

2.3.1. Correlations of outcome metrics with fire risk

In order to estimate "outcome metrics", WSD/SED asked the utilities to provide a number of metrics that are related to ignition, metrics such as outages, wires down, and ignitions. This is provided in Table 2 of the utility submissions. WSD also requested a wildfire-related variable that could be potentially correlated with the outcome metrics in order to measure utility sensitivity to that driver over time. For this purpose, WSD/SED chose "Red Flag Warning" (RFW) days, and specifically the number of circuit miles experiencing Red Flag Warning conditions.

To enable direct comparison between the IOUs these metrics are summarized in Table 1, below. I have added 95% and 99% wind gust data to the table as well, since this is also used to provide a risk metric in Section 3.1.

Utility	Metric	2015	2016	2017	2018	2019	RFW Correlation	Sign.
SCE	RFW-circuit-miles	85,329	299,452	500,940	299,006	212,518		
SCE	Outages	12,371	13,062	13,570	15,506	22,538	-0.135	
SCE	Wires Down	1,532	1,865	1,639	1,216	1,346	0.239	
SCE	HFTD Ignitions	45	42	33	37	32	-0.587	
SCE	95% Gust-ct-mile	57,494.94	86,430.92	112,328.68	76,476.08	105,300.77	0.738	
SCE	99% Gust-ct-mile	7,778.63	12,816.67	26,595.14	13,223.86	15,947.22	0.904	97%
PG&E	RFW-circuit-miles	63,304	89,832	471,375	522,855	360,281		
PG&E	Outages	38,250	37,079	50,711	34,066	46,105	0.321	
PG&E	Wires Down	3,853	4,355	7,288	3,628	6,327	0.412	
PG&E	HFTD Ignitions	4	6	18	20	5	0.840	90%
PG&E	95% Gust-ct-mile	1,033,719	1,324,577	1,790,954	1,026,773		0.307	
PG&E	99% Gust-ct-mile	162,809	179,614	480,997	131,966		0.404	
SDG&E	RFW-circuit-miles	6817	25733	57730	45604	26533		
SDG&E	Outages	1,509	1,841	1,751	1,594	1,558	0.426	
SDG&E	Wires Down	59	138	129	96	108	0.583	
SDG&E	HFTD Ignitions	19	18	15	13	11	-0.476	
SDG&E	95% Gust-ct-mile	27449.61	30047.93	32220.56	30511.59	31338.92	0.845	93%
SDG&E	99% Gust-ct-mile	7788.81	4454.58	10260.31	9995.22	9283.79	0.559	

Table 1 - Metrics correlation for outages, wires down, ignitions, and 95/99% wind gust exceedance to red flag warning circuit miles over a five year history. For metrics showing a correlation with RFW days, a level of significance is estimated.[13]

Red Flag Warnings take a number of variables into account, and wind speed is only one of these. Others are temperature and humidity. Additionally, RFWs are binary: on or off. They do not indicate the severity of the environmental conditions once the threshold for a Red Flag Warning is exceeded. And there are many Red Flag Warnings per year. In Phase 1, MGRA argued that variables such as Fire Potential Index (FPI) that dilute the effects of wind would not provide an adequate indicator of environmental hazard that would drive utility output metrics,[14] and this is doubly so for RFW-days, since Red Flag Warnings are a binary metric with a low threshold.

The statistical analysis shown in Table 1 demonstrates that almost all of the selected metrics are uncorrelated with Red Flag Warnings, as shown in the "RFW Correlation" column. This statistic does show a statistically significant excess, except possibly for PG&E ignition data (to be discussed below). Even if the correlation over these variables is averaged over all variables (to get stronger statistical power), the average correlation is 0.10, with an error on the mean of 0.15, which is not statistically different from zero. Hence, the outage, ignition, and wires-down variables provide no observable correlation with Red Flag Warning circuit miles.

Regarding the one variable that does show a statistical correlation with RFW, PG&E's ignitions, it is important to note that PG&E reports vastly fewer ignitions than SCE, and even fewer than those reported by much smaller SDG&E. This is because PG&E has decided only to report ***wildfires***, not ***ignitions***.[15] This is not correct, and it is not the intent of the metric, which is to obtain potential leading indicators. That this restricted data set should correlate with Red Flag Warnings is not surprising – Red Flag Warnings are when major wildfires start.

---

[13] Correlations were determined using the Excel CORREL function, which calculates a Pearson product-moment correlation coefficient. Statistical significance was determined assuming that degrees of freedom = # of year samples – 2 (3 for 5 year data and 2 for four year data). Significance (Sig.) was determined from the following table:
https://researchbasics.education.uconn.edu/r_critical_value_table/#; Del Siegle; University of Connecticut; 2015.

[14] R.18-10-005; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE PROPOSED DECISIONS ON 2019 WILDFIRE MITIGATION PLANS; May 20, 2019; p. 9. (OIR Phase 1 PD Comments)

[15] MGRA PG&E Data Request Response 4 Question 2: "For Table 2, Items 4a, 4b, and 7-10f, PG&E provided the requested information by providing data on utility-ignited wildfires, which PG&E interpreted as a fire greater than 10 acres consistent with CAL FIRE's definition and available data."

With regard to what metric to use instead of RFW-circuit-miles, we quote below from our filing on the WMP templates:[16]

"*MGRA has long been advocating that data for near misses, outages, and wire downs should be collected along with wind speed at the nearest or most appropriate weather stations. This allows a "resilience" leading indicator metric to be determined by putting looking at "near misses" above one or more cutoff thresholds (for example all outages/wire-downs with local wind gusts greater than 40 mph, and greater than 60 mph). It is expected that wildfire hardening, vegetation management, and remediation programs will lessen the impact of dangerous weather events. This signal would be most obvious at higher wind speeds.*

The importance of the relationship between wind speed and outages is seen in Figure 1, which shows a ten-fold increase in outage rate for every 15-20 mph increase in wind speed. As MGRA has described in a number of its previous filings,[17] the utility-specific fire index does not allow a similar resilience metric to be established. Also

FPI-filtered data is restricted to narrow windows of time, lessening its statistical value. Collecting outage data during high wind events not associated with fire threat will allow a much larger data sample to be collected. More importantly, FPI-filtered outages will be affected by PSPS events, causing key data to be lost, since near-miss events may not be recorded during PSPS.

Proper use of wind data to measure resilience has been a cornerstone of MGRA submissions over the past decade, and we urge WSD to pay close attention to this critical metric.

[16] R.18-10-005; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON WILDFIRE MITIGATION PLAN TEMPLATES; December 30, 2019; pp. 13-14.
[17] R.18-10-005; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON PHASE 2; August 21, 2019; pp. 8-10.

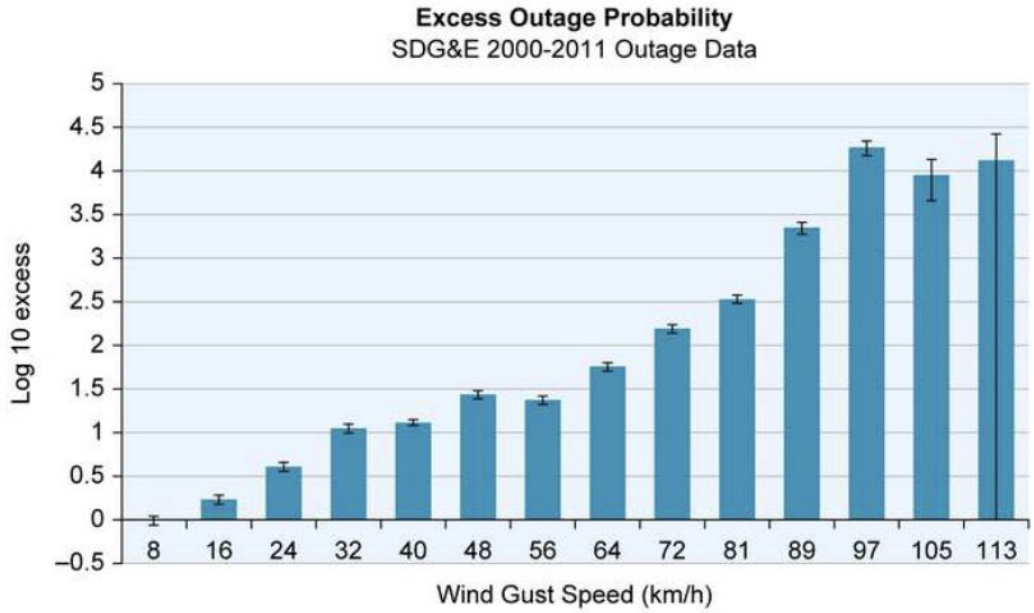


Figure 1 - Outage rate as a function of wind speed[18]

End quote"

A better metric is suggested in Section 3.1.1 of this document (wind-speed miles above specific intervals).

Recommendation:

PG&E should report ignitions, not wildfires, in the same manner as SDG&E and SCE.

Urgency:

Immediate. Table 2 is missing required data and provision of this data should be a condition for plan approval.

Recommendation:

Outages/wires down/vegetation contact during high wind days (regardless of fire weather) is an indicator of system resiliency. This is especially true in light of the fact that PSPS will suppress these metrics during RFW days. WSD should suggest that outage / wires down / vegetation contact occurring for nearest weather station above a wind gust threshold be collected. Ideally, this could be collected for several thresholds (40-80 mph in 10 mph increments).

[18] Mitchell, Joseph W.; Power line failures and catastrophic wildfires under extreme weather conditions; Engineering Failure Analysis; Volume 35, 15 December 2013, Pages 726–735 (ICEFA V, The Hague, The Netherlands, July 3, 2012) http://www.sciencedirect.com/science/article/pii/S1350630713002343 (Mitchell, 2012)

Urgency:

Next plan update.

Recommendation:

Remove Red Flag Warning – day – miles as a tracking metric, or supplement it with a wind speed metric.

Urgency:

Next major revison.

3. IGNITION AND FIRE RISK EXPOSURE

3.1. Recent Weather Patterns

3.1.1. The wind exceedance (95/99th percentile) metric must not use local values

Utilities are instructed in Table 10 to calculate the 95th and 99th percentile wind conditions in circuit mile days. They have all done as instructed:

- "SCE's 95 th and 99 th percentile wind values for each circuit were determined by looking at the historical modeled wind gust data (taken at the centroid of each circuit) from 2009-2014. Then, SCE determined the number of days that an overhead distribution and transmission circuit in HFRA reached or exceeded its 95th or 99th percentile wind gust speed. The number of days is multiplied by the length of the associated HFRA overhead circuit to get 95th and 99th percentile wind conditions in circuit mile days."[19]
- SDG&E calculates its "[p]ercentile wind conditions were calculated using the measured 95th and 99th percentile winds at SDG&E weather stations."[20]
- PG&E does not specify its methodology, but we assume it is similar to SCE's since the two companies use a similar approach in determining their 95th and 99th wind speed gust data.

[19] SCE WMP; Section 3.1.
[20] SDG&E WMP; Table 10.

Unfortunately, while the IOUs have carried out the instruction provided in the template, the result obtained from this effort is at best valueless and at worst potentially harmful, since it will artificially amplify or minimize dangerous weather conditions at each location.

The following ersatz example illustrates why:

Consider two circuits, circuit A and circuit B, each 10 miles in length.
- Circuit A has 500 circuit-mile-days exceeding 99th percentile wind speeds.
- Circuit B has 30 circuit-mile-days exceeding 99th percentile wind speeds.

Which of these circuits is at greater risk? From the metric, it seems obvious that Circuit A presents a substantially greater risk of being exposed to extreme winds. However, this is an incorrect deduction. In our ersatz example, here is more detail about wind conditions for each circuit:
- Circuit A has a 99th percentile wind gust speed of 20 mph, and it exceeds this value 50 days a year.
- Circuit B has a 99th percentile wind gust speed of 95 mph, and it exceeds this value 3 days a year.

Clearly, Circuit B is a circuit at far greater risk of being exposed to extreme winds (475% higher winds) than Circuit A, despite having a 99% exceedance circuit-mile-day metric that is only 6% of Circuit A's. This illustration shows why use of the use of this metric in its current form is incorrect and potentially dangerous.

What is important is not so much how many days a circuit exceeds a maximum value *locally*, since the local value may be very small, but rather how much it exceeds the value *globally*. An alternative metric would dispense with percentile exceedance altogether and measure exceedance by absolute values, i.e. 50 mph, 60 mph, 70 mph, 80 mph.

A comparison of 95% and 99% wind gust exceedance data from utilities can be seen in Table 1, which also shows Red Flag Warning (RFW) days. Fire hazard is known to correlate with Red Flag warnings, so a correlation analysis of the wind gust exceedance data against the RFW circuit-mile-days was performed. As can be seen, while correlation is generally positive it is statistically significant (greater than 95% confidence level) only for the SCE 99% wind gust exceedance data. However, as an ensemble the correlations do show a statistically significant

deviation from zero, with a mean and standard error of 0.47 ± 0.13 for 95% exceedance and 0.62 ± 0.12 for 99% exceedance. From this we can conclude that any given location along a circuit is more likely to have its most intense wind gusts at that particular location during a red flag warning day than on typical days. However, this doesn't tell us anything about what wind gust values may be expected.

MGRA has supported the requirement that utilities know the extreme wind gusts in their service areas for many years. It is essential that this information is incorporated into utility risk modeling, hardening prioritization, engineering standards, and power shutoff decisions. The reason underlying wind speed's importance is that outages and faults, which can lead to ignitions, have been shown to increase with wind gust speed as a power law, increasing by a factor of 10 for every 15-20 mph increase in wind speed.[21] This greatly multiplies the risk of catastrophic fire ignitions, particularly since fire spread rate is generally modelled with only a quasi-linear dependence on wind speed.[22] MGRA originated the idea of statewide fire hazard maps,[23] and attempted to have local winds be incorporated into them as a greater risk indicator.[24] As a strong wind function was not incorporated into the statewide utility fire hazard maps, we additionally proposed the development of a "fire-wind" map to be used to develop wind-loading standards, and the Commission sent this proposal to CALFIRE and SED for evaluation.[25] CALFIRE and SED decided not to move forward with the development of wind maps, opting instead to support the widespread deployment of utility weather station mesonets to obtain data on local weather conditions.[26] Since that time, hundreds of weather stations have been installed by SCE and PG&E, following the earlier lead of SDG&E. Additionally, the major IOUs have run WRF-based weather modeling based on

[21] Mitchell, J.W., 2013. Power line failures and catastrophic wildfires under extreme weather conditions. Engineering Failure Analysis, Special issue on ICEFA V- Part 1 35, 726–735. https://doi.org/10.1016/j.engfailanal.2013.07.006.
[22] Rothermel, R.C., 1972. A mathematical model for predicting fire spread in wildland fuels (No. INT-115), U.S. Department of Agriculture, Intermountain Forest and Range Experiment Station. Ogden, UT; p. 6. (Rothermel 1972)
[23] D.12-01-032; pp. 135-149.
[24] R.15-05-006; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE MAP 2 WORKSHOP REPORT; July 31, 2017; pp. 2-5. It was MGRA's concern that by broadening the definition of extreme risk to incorporate non-wind-driven wildfires, such as the Butte fire, the ability of the utility wildfire hazard map to identify ignition points related to extreme wind was reduced.
[25] D.17-12-024; p. 68-72.
[26] California Public Utilities Commission; Rulemaking 15-05-006; SED-CAL FIRE Joint Assessment and Recommendation Report; September 19, 2018.

historical data to obtain maximum wind speeds.[27] So to a large extent, the IOUs have been left on their own to identify areas where extreme winds are likely and have made efforts to do so.

It is therefore encouraging that the Commission and WSD are trying to gather metrics regarding such a critical factor driving utility infrastructure failure, vegetation contact, and fire spread. SED's/WSD's intent in developing the 95/99% wind gust exceedance metric was to identify the exposure of utility infrastructure to extreme winds. Unfortunately, their metric as currently defined and implemented does not achieve this goal.

Recommendation:
WSD should replace the current 95th / 99th percentile wind gust exceedance metric with metrics tied to absolute wind scales. I would suggest 50 mph – 90 mph in 10 mph increments. Alternatively, the 95th/99th percentile values could be for the entire IOU service area. Since this will vary from utility to utility, though, results for different utilities would not be directly comparable. Regarding the current metric, it is prone to misinterpretation and should be removed.

Urgency:
Next plan update. A reliable wind speed metric would be very useful to have for a direct comparison between utilities, and it should not wait until the next major plan revisions.

4. INPUTS AND DRIVERS

4.2. Major Trends Impacting Ignition Probability and Wildfire Consequence

4.2.1. PG&E's MAVF implementation will suppress wildfire risk

PG&E provides a reasonably detailed technical description of its implementation of the Multi-Attribute Value Function analysis used in its estimation of risk and risk-spend efficiencies, and thereby complies with the instructions provided in the template. However, some of the methodologies it has chosen to implement its MAVF will lead to underestimation of wildfire risk and to other biases or inefficiencies in its risk scoring. Issues are discussed below:

[27] PG&E WMP, p. 2-35; SCE WMP, p. 10; SDG&E WMP, p. 19.

Scaled Units – PG&E rescales its units from "natural" units to "scaled units".[28] The net effect of this scaling is to suppress risks at the very low end of its scale (by a factor of 10) and at the high end of the scale (natural units at 10% of the range suppressed by a factor of 2, those at maximum risk range not suppressed). This has the net effect of suppressing the risk score high risk events below the maximum range and may have the effect of de-prioritizing wildfire mitigation.

Capped Risk Scores – MAVF requires that a maximum range be assigned to a risk. PG&E assigns its maximum scaled value of 100 at $5 billion. It argues that "it is immaterial to consider one risk to be 'more' or 'less' catastrophic than another (e.g., a financial loss of $5 billion or $5.2 billion) when evaluating alternatives."[29] Wildfire risks, however, are best represented as power law distributions, and for power law distributions losses over time are driven by events in the extreme tail. PG&E has seen this demonstrated to the great detriment of its customers and itself. While there may be little difference in $ 5 billion and $5.2 billion, there is a very substantial difference between $5 billion and $20 billion. The maximum scale for PG&E's MAVF calculation should be based on the maximum negative outcome event possible, and determining the appropriate maximum scale and statistical distribution will require accurate modeling of the wildfire outcomes.

Risk Tranches – PG&E's six risk tranches[30] do not represent actionable divisions of PG&E assets, since many of them represent sets having negligible risk compared to others. Substations are generally cleared from fuels and present little to no wildfire risk. Also, calculating risk for non-HFTD assets provides no value. The purpose of risk tranches is to identify sets of assets where risks and mitigations can be compared. PG&E instead should be dividing its HFTD distribution and transmission assets into tranches, possibly based on internally calculated risk ranking, and determining risk and RSEs for those tranches.

Wildfire Consequences and Outcomes – PG&E uses a Monte Carlo method to generate incidents from a size distribution of known fires. While this is generally a valid technique, the statistical distribution it is using – PG&E ignitions from 2015-2019 – is both too small and highly biased. A four year history, especially considering how remarkable the last four years have been, may have little predictive power for future outcomes. And, containing the 2017-2018 data, it will

[28] PG&E WMP pp. 4-5.
[29] Id.; p. 4-6.
[30] Id.; p. 4-8.

represent a probability of multiple catastrophic ignitions per year (since there were many PG&E ignitions during the 2017 power line firestorm). This is driving looking in the rear view mirror. It is fine as long as the future is the same as the past, but will be woefully unpredictive of changes.

Additionally, the outcome classifications have what will effectively be null entries, specifically catastrophic wildfires without fire weather warnings. All catastrophic fire outcomes will have associated Fire Weather Warnings, so creating classifications for Non-Fire Weather Warning outcomes makes no sense and provides no value.

One final note: One reason that PG&E is singled out for special attention is that they are the only one of the three largest utilities that has described their risk estimation and MAVF in significant and clear detail, and it is this very detail that allows us to point out areas for improvement. SDG&E and SCE are lacking in this regard, and doubtless had they presented their calculation methods in any detail it would likely to have been possible to point out issues with their risk estimation processes as well. Regardless of the fact that the risk estimation process may have been described in more detail in their respective RAMP filings, it should also be described adequately in the WMPs also because risk estimation and risk-spend efficiencies are a key input to the wildfire mitigation plans. Furthermore, the difference in approaches taken by the three large IOUs begs the question of what the correct way to estimate risk is, and this provides further motivation to open an S-MAP OIR proceeding as per OP5 of D.18-12-014.

Recommendation:

PG&E's MAVF risk estimates should represent real measured risk, and they should be limited by maximum foreseeable loss, not an arbitrary cap.

Urgency:

Needs to be addressed in PG&E's RAMP proceeding.

Recommendation:

PG&E would benefit by a predictive model for its loss distributions that uses a combination of 1) fire weather Monte Carlo selecting extreme weather event conditions from historical data 2) its OPW model to help predict increased ignition likelihood 3) fuel conditions informed by latest climatological data and fuel measurements, and 4) a "match-drop" simulation of fire spread for ignitions. PG&E can then compare results to its historical ignition for validation.

Urgency:

Immediate. PG&E's MAVF model has severe shortcomings and these should be remedied prior to its upcoming RAMP proceeding.

Recommendation:

All utilities, especially SCE and SDG&E, should describe their MAVF and risk estimation process in adequate detail as part of their WMP filings. PG&E currently provides sufficient explanation.

Urgency:

Next plan update.

Recommendation:

WSD should request that the Commission initiate an S-MAP OIR proceeding according OP5 of D.18-12-014 to address inconsistencies of utility approaches, and deviations between MAVF and other risk estimation methods. Full justification for this proposal can be found in Section 5.3.8.2. That section goes into technical detail regarding the inconsistencies that utilities are encountering between MAVF risk calculations and those using other methods, different methodologies used by different utilities, and it discusses the implications of power-law loss dependency and extreme tail risk.

Urgency:

Immediate, since sixteen months have elapsed since the issuance of D.18-12-014 and processes developed in S-MAP need urgent review.

4.4. Directional Vision of Necessity of PSPS

4.4.1. IOUs must set aspirational goals to eliminate or drastically reduce PSPS

The WMP template for Section 4.4 instructs utilities to "*Describe any lessons learned from PSPS since the utility's last WMP submission and expectations for how the utility's PSPS program will evolve over the coming 1, 3, and 10 years*." All three major IOUs set modest 10 year goals:

PG&E: "In the 10-year timeframe, PG&E expects a significant reduction in PSPS impacts. In addition to ongoing PSPS program efforts, the long-term completion of PG&E's other wildfire

mitigations described in this plan will create a more hardened system over time with the expected result of less extensive PSPS execution over time."[31]

SDG&E: "Looking forward over the next 10 years, SDG&E's long-term vision is to reduce the risk of wildfires, as well as the customer impacts of PSPS. It is expected that to minimize the use of PSPS, overhead hardening with bare wire will decline in future years in favor of undergrounding and covered conductor options."[32]

SCE: "Because of the grid hardening, improved situational awareness and additional sectionalizing that will take place over the next decade, SCE feels that total customers will decrease."[33]

The Commission has provided clear direction that de-energization should be a measure of last resort:

"*De-energization has far reaching and significant impacts on affected communities. As such, although de-energization is a valuable tool to promote the public safety, it must be deployed by the utilities as a measure of last resort, and the utilities should continue to strengthen their infrastructure to minimize the need for and size of de-energization events. Under no circumstances may the utilities employ de-energization solely as a means of reducing their own liability risk from utility-infrastructure wildfire ignitions, and the utilities must be able to justify why de-energization was deployed over other possible measures or actions*."[34]

However, behavior of the utilities during 2019 indicates that PSPS been a go-to option rather than a last resort. A number of intervenors have noted that the IOU justification for PSPS as opposed to alternative strategies is lacking in their PSPS after-action reports. There are several reasons for this. The first reason is that no Commission admonition can eliminate the inherent moral hazard that arises from liability-shedding. Until and unless utilities are held liable for substantive regulatory or civil damages due to harm arising from shutoff, it is good business policy for them to rely on shutoff as a workhorse mechanism to reduce wildfire risk and liability. A second factor is that the risk-spend efficiencies (as the IOUs calculate them) show PSPS as a highly efficient way to reduce wildfire risk. The flaws in their approaches are discussed in some detail in Section 5.3.8.1.

---

[31] PG&E WMP; p. 4-27.
[32] SDG&E WMP; p. 74.
[33] SCE WMP; Table 20.
[34] D.19-05-042; p. 68.

Nevertheless, if one accepts the utility approach to RSE calculation, it leads to the conclusion that PSPS is good for ratepayers as well. Finally, PSPS is highly effective in preventing wildfire ignition,[35] whereas many other strategies may substantially reduce ignition risk but do not eliminate it. As a result, the IOUs pay lip service to the "last resort" requirement and quietly ignore it. It should be no surprise, then, that looking 10 years down the road the utilities continue to see power shutoff as a significant wildfire prevention tool.

In R.18-12-005, MGRA has questioned the "last resort" criterion as well, as it supports a cost-benefit approach to setting de-energization thresholds.[36] In order for a cost-benefit approach to be effective, however, the true "costs" of PSPS – in terms of economic costs to residents and additional risk arising from numerous sources related to loss of power – need to be incorporated into the calculation. While the Risk-Spend Efficiency calculations are a good start towards weighing the cost of shutoff against other long term options, the RSEs do not take what the IOUs term "secondary" costs into account, in other words costs that ratepayers and residents assume.[37] In order to place PSPS in its proper place within the wildfire prevention toolbox, costs and risks arising from shutoff need to be estimated, with the effort led either by the Commission or WSD.

Finally, if WSD wishes to enforce the Commission's "last resort" requirement, one place to start is to require that utilities acknowledge the unacceptability of PSPS as a long term strategy. That would mean that in their 10 year plan they would need to envision how the need for PSPS would be eliminated or drastically reduced. As none of the current mitigation options afford cost-effective protection across the grid, this aspirational vision will need to incorporate the commitment to develop and deploy new technologies that will reliably prevent ignitions. With PSPS as an acceptable crutch, the IOUs will lack motivation to propose and drive major programs that will substantially move the needle for both reliability and safety in tandem.

---

[35] Though ignitions and impacts from other causes during may increase during PSPS; see D.09-09-030; pp. 43-47.

[36] R.18-12-005; MUSSEY GRADE ROAD ALLIANCE PHASE 2 TRACK 1 DE-ENERGIZATION PROPOSALS; September 16, 2019; pp. 2-5.

[37] Data request response MGRA-SCE-005; Question 9. Also Robert LeMoine response during WMP technical workshop, February 2020.

Recommendation:

WSD should determine whether the development of cost/benefit or RSE methodology that incorporates customer additional harm and risk due to PSPS should be developed within the WMP framework or through Commission mechanisms. If it is still a Commission matter, then WSD should request that the Commission act to drive the development of the cost estimation framework.

Urgency:

A cost framework incorporating all customer costs, harm, and risks from PSPS should be in place prior to the next major WMP revision.

Recommendation:

Utilities should be required in their 10 year plan for PSPS to set aspirational goals to eliminate PSPS as a go-to tool for eliminating wildfire risk, and should commit to the development and deployment of technologies that can reliably eliminate ignition risks.

Urgency:

Next WMP update.

4.6. Trends Impacting Ignition Probability and Wildfire Consequence

4.6.1. Fire Potential Index (FPI)

During the 2019 WMP review process and subsequent Phase 2 of R.18-11-007, MGRA supported the development of a common utility approach Fire Potential Indices (FPI).[38] There are several reasons that this would be beneficial:

- A common approach makes for a transparent process. The current FPI calculations are detailed and arcane, and it is not likely that a reviewer will be able to successfully gauge accuracy or quality.
- All utilities are solving the same problem, and allowing them to solve it using different methodologies is duplicative and wasteful of resources.
- All Californians have a right to safe and reliable electrical service. If one of the utility FPIs represents a best practice it should be adopted by other utilities.

[38] R.18-11-007; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON PHASE 2; August 21, 2019; p. 4.

- There should be a straightforward way to compare fire risks across the state during major weather events spanning utility service area boundaries.

Utilities have argued that their FPIs are unique to their service areas. This is not a reasonable argument. FPIs may vary based on climate and vegetation type, but climate and vegetation types span utility boundaries.

The WMP and data request responses show that the major IOUs are already heavily invested in the development of their FPIs. SDG&E and PG&E describe their Fire Potential Index methodology in some detail in Sections 4.2 and 5.3.2. SCE's description is more terse, but it appears that they have adopted an integer index and sum model similar to SDG&E's.[39] PG&E applied a machine learning algorithm to optimize variables to be used in the FPI calculation based on fire histories. SDG&E plans to adopt artificial intelligence as well in 2020.[40] SDG&E also performed a historical analysis and found a "strong correlation" with fire severity,[41] but did not perform the optimization in the PG&E analysis.

All of the IOUs use FPI as an operational tool, primarily to determine when to conduct proactive de-energization. In addition, PG&E also uses it for risk calculations "PG&E is also using historical PSPS events and their calculated expected risk to develop mitigations through either repairs, replacements, or sectionalizing plans. The calculated risk is a combination of the Asset Health predictive failure model with the event FPI and REAX fire spread model."[42]

PG&E was requested to provide the dependency of its FPI on wind speed, and provided the following data:[43]

[39] Data request response to MGRA-SCE-005 Q2.
[40] SDG&E WMP; p. 22.
[41] Id.; p. 21.
[42] PG&E WMP; p. 4-12.
[43] Data request response PG&E MGRA_005-Q02.

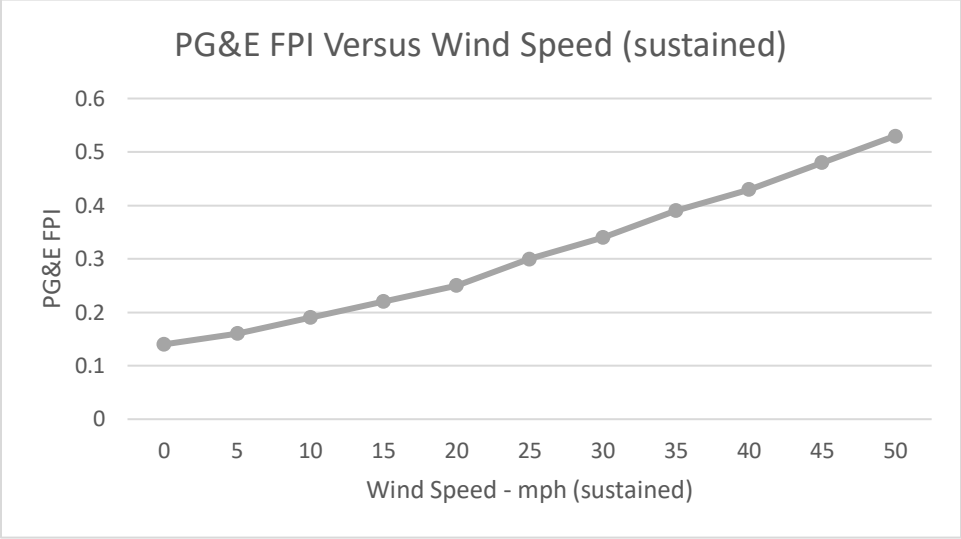


Figure 2 - PG&E Fire Potential Index dependency on wind speed for RH 20%, T 80F, Forest, DFM10 hr 6%.

As can be seen, this is a quasi-linear relationship, which might be expected on theoretical grounds since traditional fire modelling predicts a linear relationship between wind speed and fire area spread rate.[44] SDG&E's model, in contrast, is more coarse grained, having only 2-3 tiers for wind speed at any given temperature.[45] Based on the presentations in the 2020 WMPs, it is tempting to say that PG&E has the most sophisticated approach to calculating FPI, however without delving into the details, which WSD has the opportunity to do, it would not be good to reach firm conclusions. SCE is the laggard and should improve its discussion of its FPI calculation in its WMP.

Recommendation:

WSD should set a goal to move toward a common approach to FPI calculation, and identify best practices among the current utility approaches. To accomplish this, it should arrange workshops at which utilities would present and support their approaches.

Urgency:

Prior to next major WMP revision.

Recommendation:

SCE should improve its presentation and discussion regarding its FPI calculation so that it is comparable to the PG&E and SDG&E presentations.

[44] Rothermel, 1972; p. 6.
[45] SDG&E; p. 22.

Urgency:

Next WMP update.

5. PROGRAMS

5.3. Wildfire Mitigation Programs

5.3.2. Situational Awareness

5.3.2.1. Satellite Wildfire Detection and Alerting

PG&E states that its Wildfire Safety Operations Center "developed and deployed an industry-leading satellite fire detection system in 2019 that uses remote sensing data from five geostationary and polar orbiting satellites to detect fires."[46] It discusses its satellite wildfire detection system in Section 5.3.2.1. A more detailed description of PG&E's program can be found in a presentation posted on the 'calchiefs.org' website.[47] To the extent that PG&E is defining this product as a detection system, only the GOES data (from the two geosynchronous satellites) provides coverage frequent enough to detect new ignitions.[48] According to the US government website for the GOES-R fire detection product, "GOES-R Series satellites frequently detect fires before they are spotted on the ground – often before emergency notifications to 911."[49]

WSD, in its second data request[50] asked PG&E:

"Has PG&E used satellite fire detection to identify a fire connected to a CPUC-reportable incident? If so, list the incidents in which satellite detection was used to identify an ignition related to a CPUC-reportable incident."

PG&E responded that "PG&E's satellite detection system went into production mode in June 2019. To date the system has alerted on over 2,800 incidents from June, 2019 – March 8, 2020.

---

[46] PG&E WMP; p. 11.
[47] https://calchiefs.org/wp-content/uploads/2019/09/PGE-Satellite-Fire-Detect-Alert-System1.pdf
[48] Geosynchronous satellites are in a stationary orbit at a distance 22,000 miles and maintain a constant view of the particular portion of the globe over which they've been stationed. Satellites in polar orbits are much closer to earth (attitude ranging from 4-500 miles for Terra, Aqua, and Suomi satellites) and therefore provide much better image resolution. However, they only provide imaging for any point on earth once or twice per day, and therefore aren't useful for wildfire detection.
[49] https://www.goes-r.gov/education/docs/fs_fire.pdf
[50] PG&E DR Response WSD_002-Q006-PGE-43895-D-286

During the same time span, PG&E satellite detection information was gathered and utilized for the following fire-related CPUC reportable incidents.

10/23/19: Kincade Fire

- Kincade Road and Burned Mt. Road: Cloverdale, Sonoma County
    - Satellite Detection: 10/23/19 20:55 [sic] UTC: 37.543, -120.526

10/27/19

- Santiago Fire: Gateway Road: Bethel Island, Contra Costa County
    - Satellite detection (within 5km): 10/27/19 12:21 UTC: 37.97776, -121.638931
- Glen Cove Fire: Vallejo, Solano County
    - Satellite Detection: 10/27/2019 17:26 UTC: 38.04314, -122.217"

MGRA provides independent start times below.

Kincade fire:	9:27 p.m. PDT	4:27 UTC (following day)[51]
Santiago fire:	3:09 am PDT	10:09 UTC[52]
Glencove fire:	~ 9:00 am PDT	14:00 UTC[53]

PG&E corrected its start time for the Kincade fire to 10/24/2019 4:36 a.m.[54] Hence, the Kincade fire was detected less than ten minutes after its official ignition time. The other two fires, however, were not detected for 1 ½ hours after the fires were originally ignited.

While PG&E's program may be of value, both for early detection and for real time fire perimeter mapping, this has not yet been demonstrated through the response it made to WSD's question. In particular, it raises the question of how many of the 2,800 incidents were actual wildfires, and of these how many of these were detected promptly by PG&E's analysis of the GOES data.

Recommendation:

PG&E should provide the following data regarding its satellite wildfire detection system:

---

[51] https://www.fire.ca.gov/incidents/2019/10/23/kincade-fire/
[52] https://www.mercurynews.com/contra-costa-county-wild-fires-the-worst-situation-ive-ever-seen
[53] https://www.kqed.org/news/11783200/glen-cove-fire-in-vallejo-closes-carquinez-bridge-and-portion-of-i-80-evacuations-ordered
[54] PG&E DR Response; WildfireMitigationPlans_DR_MGRA_005-Q16.

How many alerts are false alarms, or a non-wildfire source.
How many wildfires (not just utility-related wildfires) were detected by PG&E's satellite detection system before and after the official reported incident time.
Urgency: Next update.

5.3.3. Hardening

5.3.3.1. Steel Poles – Cost/Benefit

As part of the 2019 WMP review, MGRA questioned whether SDG&E's wooden pole to steel pole hardening program[55] could claim justification based on survivability of poles during a fire. MGRA pointed out that pole replacement costs were essentially an economic initiative, rather than a safety initiative, and as such should be justifiable based on historical losses of poles to wildfire.[56] The Commission left SDG&E the discretion to choose appropriate pole materials but stated that "in future WMPs shall continue to make a showing that its selections for pole replacements are reasonable."[57] In its 2020 WMP, SDG&E's survivability justification for steel poles remains qualitative, rather than quantitative, as it has been in all its previous claims and filings on this subject. Note that MGRA does not contest that there may be safety benefits from infrastructure hardening, or that steel poles might be a reasonable choice to achieve this hardening, but a showing that this choice of material is optimal has not yet been made.

Recommendation:
SDG&E should provide a cost and safety justification for its choice of steel pole over other pole hardening mechanisms that achieve the same engineering standards, including wind loading.
Urgency:
Immediate. Since SDG&E was requested to provide this justification in the Commission's 2019 WMP review, and it fails to do so in the current WMP, it should be required to do so as a condition for 2020 WMP approval.

[55] SDG&E 2019 WMP; Section 5.3.3
[56] R.18-11-007; MGRA Comments on the Proposed Decisions on 2019 Wildfire Mitigation Plans, Appendix A § 1
[57] D.19-05-039; p. 8.

Recommendation:

SDG&E should provide a cost/benefit analysis for steel pole survivability, using historical wildfire data to estimate what fraction of wooden poles will be lost to fire over pole lifetime and how much savings could potentially be gained by using steel poles instead.

Urgency:

Next cycle, or immediate. Ideally, this kind of cost calculation should be performed as part of SDG&E's RAMP and GRC cycle. However, since choice of pole materials has safety implications it properly belongs under the WMP review, and it affects the RSE for this type of hardening. Note that it might be in SDG&E's interest to perform this calculation for the 2020 WMP, since if steel pole replacement makes sense from a purely economic standpoint (aside from any possible safety benefits) it would demonstrate reasonability as per the Commission's requirement in D.19-05-039.

5.3.3.2. Egress Issues – Hardening and Undergrounding

Neither the utility plans nor the WSD templates[58] make the definition of "egress risk" clear enough with regard to fire hardening or undergrounding. While a community with limited egress options needs special consideration for any wildfire planning, there needs to be a particular concern for utility infrastructure adjacent to the evacuation route. Burning wooden poles can fall onto highways during a wildfire (whether the wildfire is utility-caused or not), blocking evacuation, as happened in and near Paradise during the Camp fire.[59]

The IOUs take egress into account in different ways. PG&E includes egress score in its electric line risk scoring, which is used for distribution system hardening prioritization.[60] It also constitutes 20% of its "Tag Risk score".[61] SDG&E takes egress into account as a factor in system hardening.[62] It has now deployed steel poles for 65% of its 69 kV transmission system (4800 poles), as well as considerable portions of its distribution system, and is planning to continue this program. SCE takes egress into account when it prioritizes its undergrounding program. They explicitly take

[58] Attachement 3; C.II.d and C.III.d.
[59] Los Angeles Times; "Must Reads: Here's how Paradise ignored warnings and became a deathtrap"; December 30, 2018; Page St. John, Joseph Serna, Rong-Gong Lin II; https://www.latimes.com/local/california/la-me-camp-fire-deathtrap-20181230-story.html
[60] PG&E WMP; Section 5.3.1.1, 5.3.3.17.2.
[61] Data request response WSD_002-Q019-PGE-43895-C.
[62] SDG&E WMP; Section 5.3.3

into consideration "pole removal from egress routes". However, they project that they will complete only six miles of undergrounding in 2021 and eleven miles in 2022.[63]

Off the three largest IOUs, then, only SCE explicitly calls out infrastructure adjacency to the evacuation route as a major consideration in prioritizing its program, but the impacts on evacuation will be de minimis due to the limited extent of its undergrounding program. PG&E and SDG&E do not state explicitly in their WMPs whether their hardening programs specifically target threatened evacuation routes. From our own familiarity with the SDG&E service area, however, a significant portion of its wood-to-steel program is for lines adjacent to roads. However, this should be quantified.

Recommendation:

WSD should require utilities to state 1) how many wooden are poles adjacent to evacuation routes for limited egress communities 2) whether these poles are specifically targeted by hardening and undergrounding programs 3) how many poles they are removing and plan to remove as part of their hardening or undergrounding programs.

Urgency: Next plan update

5.3.5. Vegetation Management and Inspections

5.3.5.1. SDG&E vegetation management and 25 foot trim

MGRA noted in its review of the 2019 WMPs that SDG&E's 25 foot trim distance is unique and much more aggressive than the approach taken by the other IOUs. MGRA noted that historically it has opposed a 25 foot trim radius (SDG&E's original 25 foot trim proposal was in 2009), concerned about environmental, cultural, and aesthetic impacts to the historic Mussey Grade Road corridor. However, it also noted that the Mussey Grade area had suffered firsthand the impacts of catastrophic wildfire and that its spokesperson had worked collaboratively with SDG&E arborists as they conduct their annual trimming operations in the area.[64]

[63] SCE WMP; Section 5.3.3.16.
[64] R.18-10-007; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE WILFIRE MITIGATION PLANS; March 13, 2019; p. 15.

As part of its 2019 WMP review, MGRA additionally requested data with regard to tree species that were likely to be "at risk" or "reliability" trees and inquired to the total fraction of outages caused by these species, especially as it relates to the total number of trees of that species along the conductor route.[65] SDG&E keeps track of the total fraction of trees that pose potential conductor contact risk. Their result is noteworthy in that it indicates how short-sighted it is to gauge risk solely on number of outages or ignitions. The results are reproduced below, and show that when normalized for the total fraction of trees, eucalyptus and sycamore are ten times more likely than other tree species, such as oaks, to cause ignitions:

Species	Percentage of total outages	Percentage of ignitions	Percentage of inventory
Eucalyptus	15.5	.07	15.7
Palm	2.8	0	9.8
Pine	2.8	0	6.5
Oak	1.7	.03	17.8
Sycamore	1.0	0	1.3

Table 2 - SDG&E Top Five Outage Tree Species[66]

In response, the Commission put requirements in place regarding SDG&E's 25 foot clearance program:

"*SDG&E is clear that it will not be implementing the 25-foot post-trim clearance in the entirety of its HFTD; however, it will be doing so in the portions of the HFTD where the increased post-trim clearance is necessary and feasible. In SDG&E's next WMP, it shall propose, in detail, guidelines for where a 25-footpost-trim clearance for vegetation management is both feasible and necessary. If SDG&E plans to create a 25-foot clearance during this WMP cycle, it may only do so if such a practice is supported by scientific evidence or other data showing that such clearance will reduce risk under wildfire conditions*."[67]

In its 2020 WMP, SDG&E does *not* provide detailed guidelines for how it will determine that a 25 foot trim distance is both feasible and necessary. It provides rather vague guidelines: "*The criteria for determining target species include factors such as growth rate and characteristics,*

[65] MGRA-SDGE-DR-ALL; MGRA-SCE-DR-ALL; MGRA-PGE-DR-ALL; DR-01-Q14.
[66] Id; SDG&E.
[67] D19-05-039; p. 10.

failure potential, outage history, and other environmental factors. Targeted species include eucalyptus, palm, oak, pine, and sycamore… SDG&E's vegetation data indicates these species have the highest relative frequency of tree-related outages. Many of these trees, such as eucalyptus and sycamore, are fast-growing and have a propensity to shed branches during wind conditions."[68]

When asked whether it was SDG&E's plan to trim all trees meeting the species criteria to the 25 foot trim radius, it states: "*SDG&E does not intend to achieve a 25 feet clearance in a consistent, linear fashion. The clearance will be applied where applicable, primarily on targeted species and where site-specific conditions warrant*."[69]

SDG&E so far hasn't complied with last year's decision requiring a full description of its detailed guidelines. As to data, SDG&E provided its tree outage data in response to an MGRA data request.[70] This data consisted of approximately 240 tree outage records spanning the years 2015 and 2019. This data contains tree species, and at MGRA's request also includes distance of the tree from the conductor and last trim distance. Outages that have geolocation data are plotted in the map below:

[68] SDG&E WMP; p. 113.
[69] Data request response CALPA-SDG&E-02 Question 4. Similar verbal statements were made to the MGRA expert witness by Don Akau and Mike Daleo during the WMP workshops.
[70] Data request response MGRA-SDG&E-02 Question 10 and accompanying Excel spreadsheet.

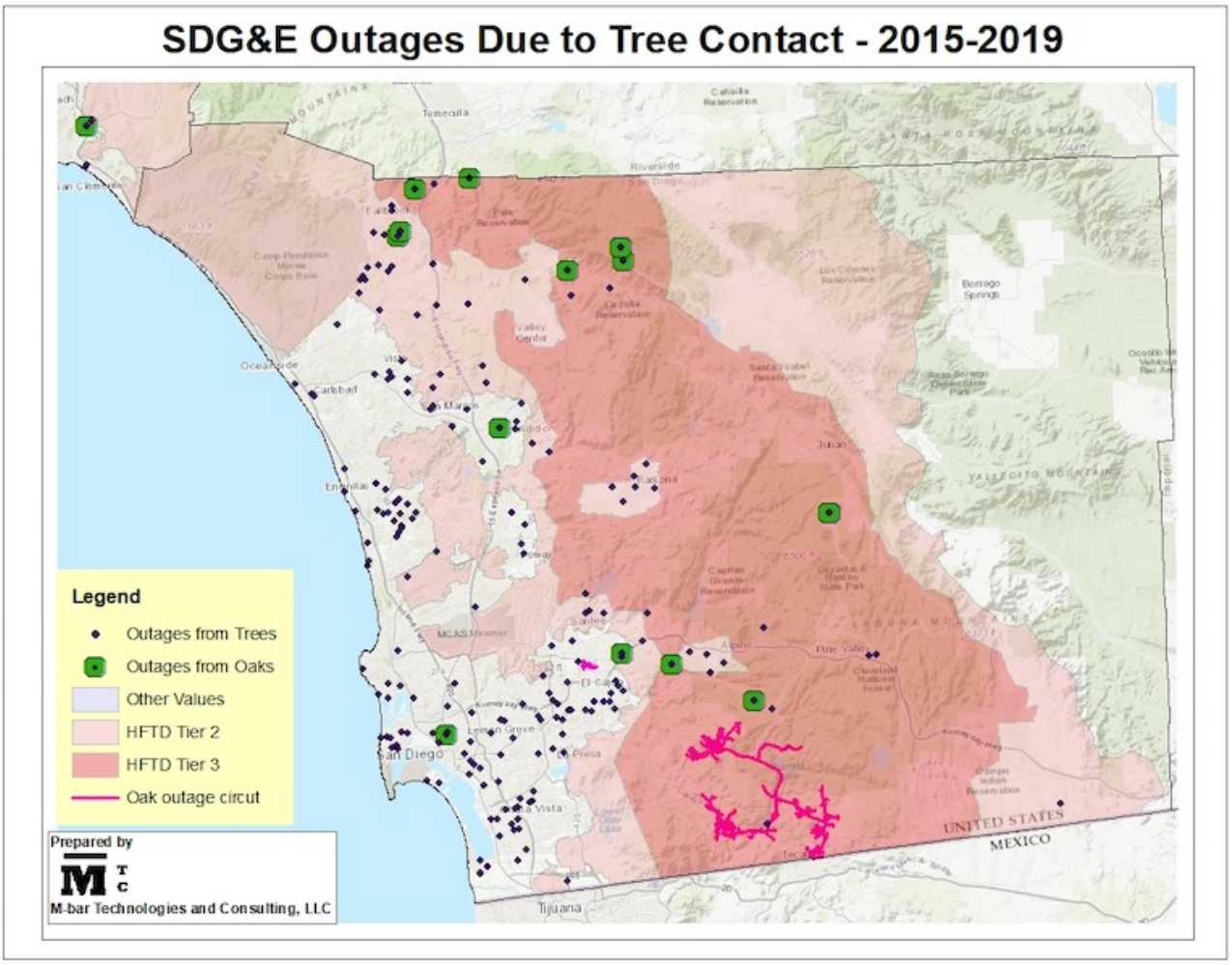


Figure 3 - SDG&E tree-caused outages between 2015 and 2019. High Fire Threat District Tier 2 and Tier 3 are indicated by pink and rose shaded areas. Tree outages are indicated by small dots, larger green circles indicate oaks. Circuits tied to oak outages without georeferencing data are indicated by magenta lines. Note that this data does not include tree strikes during PSPS events.

The map shows the High Fire Threat District Tier 2 and Tier 3 areas in the SDG&E service area. All tree-related outages are indicated by small dots. Additionally, specific outages caused by oak trees are indicated by larger green circles. Oaks are specifically called out because they are the only significant native tree in the SDG&E service area aside from sycamores. Sycamores are not given special consideration, however, due to their greater relative likelihood of causing ignition.

Using the SDG&E data, it is possible to analyze the merit of the 25 foot SDG&E trim distance. Looking at the data in more detail, two of the oak incidents shown in the figure were due to non-SDG&E trimming crews, and one was a de-energization for trim. If we exclude these from the sample, there are 10 total oak-related outages in the HFTD Tier 2 and Tier 3 areas in SDG&E's 5 year outage history. For each of these, given the trim distance, tree height, and tree distance from

the conductor it is possible to ascertain whether an increase in trim from 15 feet to 25 feet would have provided protection from detached branch contact or tree fall-in, which are the two scenarios of concern. The remaining outage incidents are listed below:

Date/Time	Cause	Last Trim	Tree Height	Last Clearance	Tree-Line Distance	Defects	Trim 12->25?	Comments
6/20/2016 0:00	Branch	10.0 to 11.9 ft	40.1 to 50 ft		6.1 - 8	Decayed Branch	N	Within 12' Noticeable defect
6/27/2016 0:00	Fall-in	10.0 to 11.9 ft	0.0 to 5.0 ft (???)		10.1 - 12	Root Rot	N	Within 12' Strike distance
7/31/2016 0:00	Fall-in		40.1 to 50 ft		20.1 - 30	Heart Rot	?	Strike distance
1/20/2017 0:00	Fall-in / Storm		60.1 to 80 ft	40.1 to 50.0 ft	40.1 - 50		N	Strike distance
4/23/2017 0:00	Fall-in	10.0 to 11.9 ft	60.1 to 80 ft	10.0 to 11.9 ft	30.1 - 40	Root Rot	N	Strike distance
5/6/2017 0:00	Fall-in		30.1 to 40 ft	20.0 to 30.0 ft	30.1 - 40	Dead	Y	Noticeable defect
5/7/2017 0:00	Branch / Storm		40.1 to 50 ft		15.1 - 20	Co-dominant Branch	Y	Noticeable defect
8/6/2017 0:00	Branch	10.0 to 11.9 ft	50.1 to 60 ft		20.1 - 30	Weak Branch Attachment	Y	Noticeable defect
3/1/2019 22:15	Branch	10.0 to 11.9 ft	20.1 to 30.0 ft	8.0 to 9.9 ft	8.1 - 10	Weak Branch Attachment	N	Within 12' Noticeable defect
7/11/2019 1:56	Branch	10.0 to 11.9 ft	30.1 to 40 ft	8.0 to 9.9 ft	8.1 - 10	Decayed Branch	N	Within 12' Noticeable defect

Table 3 - SDG&E outages caused by oak trees in the HFTD Tier 2/3. Current trim and clearance distances and tree-conductor distances are shown. Defects noted in SDG&E data are noted. The 12-25 and Comment columns are provided as analysis as to whether an increase in trim distance to 25 feet would have prevented the outage. “Strike distance” indicates tree height is greater than separation distance, “within 12’” indicates that the tree is already in SDG&E’s trim zone, and “noticeable defect” was noted by SDG&E staff or contractors.

Table 3 shows data provided by SDG&E regarding time of the outage, trim distance, clearance distance if known, and tree height. The type of failure – fall-in or branch – and any defects seen by SDG&E personnel are noted. The two final columns are provided as analysis as to whether increasing the trim distance from 12 to 25 feet would have made a difference in the case of the particular outage.

In the case of fall-ins, if the tree height is greater than the tree-line separation, then tree-line or tree-pole contact is possible. If the tree is higher than 25 feet and its trunk is 25 or more feet from SDG&E equipment, then the increase in SDG&E's trim distance to 25 feet would not eliminate the risk that the tree will contact the line or pole if it falls, though the probability might be reduced somewhat depending on the direction of tree fall. In the case of branch contact, there are several examples showing that an increase in trim distance might have prevented the branch-line contact causing the outage. However, in all of these cases, SDG&E staff noted visible issues with the branch that failed. Finally, in a number of cases the tree-line distance is already less than 12 feet, and SDG&E had the ability to trim or remove the tree.

It does not appear that SDG&E's outage data would support the assertion that it needs to have the ability to trim healthy oak trees out to 25 feet. In five years, there were only ten cases of oak-line contact in the HFTD, and in almost all cases there were visible tree defects, the tree was already in SDG&E's 12-15 foot trim distance, or the tree may have fallen onto SDG&E equipment even if a 25 foot trim had been applied. In one case (7/31/2016), if the heart rot had been detected the tree might have been removed with a larger treatment zone, but no evidence is presented that it would have been seen.

Nevertheless, caution is in order. Oak-equipment contact was implicated in many of the ignitions during the 2017 power line firestorm in Northern California.[71] The fact that the data so far collected by SDG&E doesn't make a definitive case that 25 foot trim of healthy oaks would reduce outages (and ignitions) doesn't mean a branch between 15 and 25 feet from a line cannot theoretically break off and cause an outage or fire. There is no contention that an expanded trim may be beneficial with faster growing and failure-prone trees, such as eucalyptus and sycamore, or that trimming or removal out to 25 feet or more is appropriate to address defects for oaks or any

[71] I.19-06-015; Safety and Enforcement Division, California Public Utilities Commission; Report on October 2017 Fire Siege, October 2017 Wildfires in Northern California; June 13, 2019

other tree species. In any case, SDG&E has stated that it intends to apply its 25 foot trim "where applicable, primarily on targeted species and where site-specific conditions warrant,"[72] though it needs to define what those terms mean.

It should be noted that tree contact occurring during PSPS events are not included in the SDG&E outage data, since circuits that are de-energized will not have outages. An equivalent analysis should be performed using post-event damage data that SDG&E collects from PSPS events. SDG&E's PSPS reports list a number of oak contact events, and these should be scrutinized to see whether a more aggressive 25 foot trim would have prevented contact with SDG&E equipment.

Regarding PSPS, and other fire prevention measures, MGRA contended in its 2019 WMP comments that simultaneous application of aggressive EVM, PSPS, and covered conductor is a "belt and suspenders" approach and is at some level redundant.[73] If we examine the oak-related outages in Table 3, other mitigation might be more effective than a 25 foot trim radius. Covered conductor is expected to be highly effective in preventing ignitions due to branch contact, and half of the reported oak contact events were of this type. Oak trees occasionally topple. Covered conductor may be less effective with a catastrophic tree strike, but will provide more protection than bare conductor. New technologies that can detect broken conductors and de-energize them before they land, such as SDG&E's Falling Conductor Protection (FCP) and Sensitive Ground Fault Protection for high impedance faults[74] may, if successful, prevent ignitions in the case of fall-in. Until such measures are in place, PSPS is the only guaranteed mitigation for potential fall-in. However, post-event damage after PSPS needs to be closely studied to ascertain what mitigations will allow raising of PSPS thresholds, and to study the effect of SDG&E mitigation, whether it is EVM or covered conductor.

[72] Data request response CALPA-SDG&E-02 Question 4.
[73] MGRA 2019 WMP Comments; pp. 16-22.
[74] SDG&E WMP; p. 69.

Recommendation:

SDG&E should meet the requirements laid out in D.19-05-039 that it "*shall propose, in detail, guidelines for where a 25-footpost-trim clearance for vegetation management is both feasible and necessary*."[75]

Urgency:

Immediate. This is a Commission requirement for the 2020 WMP and should be provided prior to plan approval.

Recommendation:

SDG&E should analyze its 2019 and 2020 PSPS damage data, collecting information on last trim distance, last clearance distance, tree-line distance, species, tree health, and tree height for every case of vegetation-line contact or damage occurring during PSPS events. It should perform contingency analysis to determine what mitigations would have prevented ignition in each case had the line been energized, including covered conductor and advanced technologies. It should also analyze wind conditions accompanying these contacts to determine appropriateness of de-energization threshold.

Urgency:

Prior to next plan update. As this will affect its mitigation strategy, SDG&E should perform this analysis as soon as possible.

Recommendation:

SDG&E should expand its covered conductor program, especially in the light of the fact that its RSE presented in its WMP is favorable (next section). SDG&E should concentrate deployment of covered conductor in areas with large concentrations of native trees (such as oaks) and areas where a 25 foot trim will not be sufficient to mitigate branch-equipment contact.

Urgency:

Immediate. WMPs should be updated with more aggressive covered conductor strategy, or conversely a detailed explanation of why such a strategy would be unfeasible or inappropriate. This should be a condition of plan approval. This commitment needs to be in place prior to SDG&E's May 2021 RAMP filing.

[75] p. 10.

Recommendation:

SDG&E should concentrate its 25 foot radius EVM trim and removal program on trees that are particularly fast-growing, particularly prone to ignition-causing failure (such as eucalyptus and sycamore), and those that show signs of disease or structural defects.

Urgency:

Immediate. This is the process that SDG&E suggests that it is currently following, but confirmation by WSD and SDG&E as part of plan approval would provide clear direction.

Recommendation:

WSD should request that SDG&E aggressively investigate alternative technologies that could be more effective in addressing tree fall-in risk and might thereby reduce or eliminate long term need for PSPS.

Urgency:

Immediate. WSD recommendation should be part of plan. SDG&E should be required to provide metrics from its R&D and pilot projects by its next plan update.

5.3.8. Resource Allocation Methodologies (Including Table 23)

5.3.8.1. Risk/Spend Efficiencies (RSEs) – Utility Comparison

A point raised by the MGRA expert during the WMP workshops was that not only is there significant variation between utilities in the methodologies and scales that they are using to generate their risk/spend efficiencies, but also that there is an enormous divergence in their relative results. Major initiatives are summarized and their Risk Reduction and RSEs presented for the three major IOUs in Table 4, below.

Table 4 – Comparisons of Risk and RSE Across Utilities[76]

Initiative Area	SDG&E		SCE		PG&E	
	Risk	RSE	Risk	RSE	Risk	RSE
Hardening	0.0158	22.5	0.2	9.1	5791	4.12
Covered Conductor	0.0042	20.7	41.6	23.4		
Undergrounding	0.0518	21.6	0.3	4.8		
Tree Trimming / EVM	0.5	122.5	3.4	30.4	202	0.15

[76] Tables 21-30 from SCE, SDG&E, PG&E WMP table (Appendix B) submissions.

PSPS	0.5	118	8.3	56.3	12100	26

Normalized						
Hardening	1.00	1.00	1.00	1.00	1.00	1.00
Covered Conductor	0.27	0.92	208.00	2.57		
Undergrounding	3.28	0.96	1.50	0.53		
Tree Trimming / EVM	31.65	5.44	17.00	3.34	0.03	0.04
PSPS	31.65	5.24	41.50	6.19	2.09	6.31

There are two sections comprising the table, the first showing the raw risk and RSE scores for SDG&E, SCE, and PG&E. The second section shows the various programs normalized to the Risk and RSE assigned to "hardening" for each utility. This allows a direct comparison between utilities with regard to how they estimate risk reduction and RSEs. Some choices needed to be made when picking which risk and RSE scores to assign to each major category. Where initiatives were broken into individual sub-programs, the values chosen were from the most representative initiative for that program. Risk Reduction and RSE scores are for the 2020-2022 time frame. Some observations are below:

Methodological Differences in RAMP Risk Calculations

One of the goals of the S-MAP process was to get risk and risk/spend estimations from utilities that could be compared across utilities in an apples-to-apples fashion. The WMP process, by probing the state of each utility's programs, has provided a forum for making this comparison. And, as can be seen, the scales used by the IOUs, particularly with regard to risk reduction, don't bear any apparent relation to each other, varying by scale up to 20,000X. Clearly, each utility has its own unique interpretation of what its obligations are in its RAMP process, and has a different methodology for obtaining these numbers. This should be addressed in each utility's RAMP proceeding, in the pending S-MAP OIR and in future WMPs.

Recommendation:

WSD should recommend that a common approach to calculating risk be pursued in the upcoming S-MAP OIR proceeding.

Urgency:

Immediate, since a new S-MAP OIR may begin soon.

Granularity of Programs

The utilities also varied in the granularity of projects for which they did their risk reduction and RSE calculations. SDG&E led in this regard, with calculations for individual projects, whereas PG&E had one bucket for all infrastructure improvements. This is why the 'covered conductor' and 'undergrounding' entries are blank for PG&E: PG&E subsumed both of these projects into its "System Hardening" entries. PG&E's RAMP submission is due to start in a few months, and will have an opportunity to address this issue.

Recommendation:

PG&E should be required to provide a more granular breakdown of its programs into individual initiatives.

Urgency:

Immediate, in time for PG&E's RAMP proceeding.

Tree Trimming Programs and EVM

Both SCE and SDG&E show their trimming and EVM programs as yielding a much greater risk reduction (17X – 32X) and risk spend efficiency (3-5X) than hardening programs. PG&E, however, shows exactly the opposite, showing that its EVM program is reducing only 3% of the risk its hardening program does. Also, its RSE for vegetation management is more than 100X less than SDG&E's & SCE's VMS RSEs.

PG&E's results are hard to understand. The interpretation is likely that PG&E is limiting its estimate to a very narrow VM program and subsuming the rest of its vegetation management risk into "control" or "foundational" categories, and not calculating a risk or RSE score for it. PG&E needs to include a risk and RSE score for its general VM activities. It should adopt a "world of hurt" methodology in which it assumes an incremental reduction in spending for the program and calculates the increase in risk that would cause. In fact, during the WMP workshops SDG&E indicated it had adopted a similar approach for calculating its VM scores.

Recommendation:

PG&E needs to do a full risk/RSE analysis for its full vegetation program. It can do this by estimating risk increase that would accompany a cut in program funding.

Urgency:

Immediate, in time for PG&E's RAMP proceeding

Covered Conductor

SCE and SDG&E have a very different approach and interpretation of the role of covered conductor. SCE is using it extensively in its hardening programs, and plans to accelerate its usage further. SCE finds the RSE for its covered conductor program 2.6X higher than for other hardening practices. SDG&E finds it to be roughly the same as other hardening, but then its covered conductor program is not nearly as advanced as SCE's. Covered conductor has other advantages, and being more resistant to vegetation contact it could help reduce the need for SDG&E's aggressive 25 foot trim program. SDG&E's RAMP will begin next year and should include a covered conductor program of greater scale than shown in this WMP. PG&E should include covered conductor risk/RSE in its upcoming RAMP.

Recommendation:

SDG&E should attempt to expand its covered conductor program, especially in areas where it could help reduce risk otherwise requiring a 25 foot trim distance.

Urgency:

Next revision cycle and SDG&E RAMP in 2021.

Recommendation:

PG&E should conduct a risk/RSE calculation for its covered conductor program.

Urgency:

Immediate, in time for PG&E's RAMP proceeding.

Undergrounding

Major utilities have long maintained that undergrounding infrastructure, while almost completely effective at reducing wildfire risk, is an expensive undertaking and has a poor cost efficiency. SCE's risk/RSE calculations support this argument, with the RSE for undergrounding being less than 1/5 that of covered conductor. Surprisingly, though, SDG&E's risk/RSE finds nearly equal RSEs for standard hardening, covered conductor, and undergrounding. If this is actually a true interpretation of SDG&E's position, it raises the question of why SDG&E is not more aggressively pursuing a more expanded undergrounding program. SDG&E should be asked to justify why it is not doing so in its next WMP and RAMP, or adjust its RSE accordingly. PG&E should include undergrounding risk/RSE in its upcoming RAMP.

Currently, SDG&E is planning to deploy 120 miles of underground cabling by 2022. 85 miles of this will be in the HFTD, with 63 miles planned for Tier 3 and 22 miles in Tier 2.[77]

Recommendation:

PG&E should conduct a risk/RSE calculation for its undergrounding program.

Urgency:

Immediate, in time for PG&E's RAMP proceeding.

Recommendation:

SDG&E should explain why its undergrounding program has an RSE equivalent to other hardening. If there is a legitimate reason for them being equal, SDG&E should seek to expand its undergrounding program in HFTD areas.

Urgency:

Next update and in time for SDG&E's RAMP proceeding.

De-Energization

Utilities are required by the Commission to use de-energization as a measure of last resort. As MGRA pointed out in its comments on the R.18-12-005 quasi-legislative guidelines, "the IOUs have little direct incentive to analyze their data to estimate the benefit of alternative mitigations if they consider deenergization to be the lowest cost option. If the Commission really wants to drive the utilities to use deenergization as a 'last resort', the other options need to be evaluated, and the Commission should take the lead for this analysis. This work should be a part of a Commission proceeding so that staff and party experts have a chance to analyze utility results and check utility claims."[78]

Regardless, de-energization or PSPS is a cornerstone of utility wildfire prevention strategy, and remains so even in their long-term planning.[79] From the RSEs for PSPS in Table 4, it is obvious why: The only RSE that is in close agreement between all utilities is that for PSPS. For all of them, it falls between 5 and 6 times the risk/spend efficiency for hardening. However, these RSEs are not being calculated correctly.

In order to fully incorporate the cost of PSPS into an RSE, it is necessary that the full costs be included. In the case of de-energization, the full costs are externalized – they are levied on the

[77] SDG&E MGRA DR Response; MGRA-SDGE-02; Response 9.
[78] R.18-12-005; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON QL TRACK PROPOSED ADDITIONAL AND MODIFIED DEENERGIZATION GUIDELINES; February 18, 2020.
[79] For example, see SDG&E WMP, p. 17.

IOU customers as economic costs, inconvenience, and an increase in risk. The IOUs consider these risks "secondary impacts" and do not include them in their RSEs.[80] This is why the Commission has decided that the fully rigorous way to determine proper PSPS thresholds is to do a cost/benefit analysis.[81]

As MGRA stated in its comments on the early October utility shutoff reports (filed under R.18-12-005), "power shutoff is a dangerous tool that has the potential to cause significant harm to customers, and has negative impacts on safety. One of the challenges faced in balancing this harm against the potential for preventing catastrophic fires is that there is no mechanism in place to accurately collect and assess the harm done to customers. Tallying complaints to utilities does not adequately represent the harm done to customers, particularly vulnerable customers. The Commission needs to engage with utilities, community groups, and first responders to accurately determine what the costs of PSPS are so that they can be balanced against the reduced risk of wildfire ignition."[82]

Recommendation:

In lieu of a full understanding of the harms and risk arising from PSPS on customers, the RSEs calculated by utilities for their PSPS program should be ignored. A utility needs to demonstrate that its RSE incorporates external harm and risk before it is accepted.

Urgency:

Next full WMP. This is a difficult issue and the Commission or WSD should lead its resolution.

Recommendation:

The Commission or WSD should initiate a project to determine customer harm and risk so that costs of de-energization can be estimated and used in utility RSEs. This should not be utility-led, since utilities would face moral hazard to favor ignoring or downplaying risks, since they are unlikely to be held liable for secondary harms.

Urgency:

Within 6 months. MGRA has been advancing this proposal for some time, and it may take significant investment of time and effort to implement it properly. The sooner it is started the sooner it will be completed.

---

[80] SCE Response MGRA-SCE-005; Response to Question 9; also stated at workshops.
[81] D.09-09-030; p. 2.
[82] R.18-12-005; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON PG&E POST-PSPS EVENT REPORT FOR OCTOBER 5, 2019, PG&E POST-PSPS EVENT REPORT FOR OCTOBER 9, 2019, SCE POST-EVENT REPORT FOR OCTOBER 2, 2019, AND SDG&E POST-EVENT REPORT FOR OCTOBER 10, 2019; December 30, 2019.

5.3.8.2. Circuit risk ranking versus RAMP/MAVF risk-spend efficiencies

All utilities have methodology to rank their circuits and/or assets according to estimated risk:[83]

- SDG&E has its WRRM (Wildfire Risk Reduction Model) developed in collaboration with Technosylva. It incorporates numerous inputs: vegetation, weather, fire, outage, and equipment failure history, fire simulations and other factors. This model provides a relative risk ranking for each circuit and can calculate risk reduction based on individual project completion.[84]
- SCE has a WRM (Wildfire Risk Model) that analyzes risk at the specific circuit level, and which it uses to prioritize work on its circuits.[85]
- PG&E has developed an electric line risk scoring methodology that uses likelihood of failure, likelihood of fire spread, and egress to rank circuits.[86]

These are generally sophisticated models using a combination of predictive failure analysis and wildfire spread and impact modeling.

The utilities use an entirely different methodology to calculate risk reduction scores for projects during their RAMP proceeding. This is done via a Multi-Attribute Value Framework analysis, as directed by D.18-12-014.[87] As seen in the previous section, these rankings are usually provided at a coarse program level. Each of the three major IOUs provides an explanation that their RSE calculations are performed in a different way than their circuit risk ranking:

SCE: “Both the RAMP model and the asset level wildfire risk model (WRM) are used in this 2020-2022 WMP. SCE intends to improve both models in the coming year. As required by the ALJ Ruling, the RSEs presented throughout this WMP are calculated using a modified RAMP

[83] See MGRA Data Request 4 to PG&E and SCE (DR 2 for SDG&E), Questions 1,2 3,4.
[84] SDG&E WMP Section 5.3.1.
[85] SCE WMP Section 4.3. “SCE’s WRM quantifies wildfire risk at a granular level (i.e., down to specific circuits and circuit segments across the HFRA). It enables SCE to identify potential high-risk circuits and segments where mitigation considerations, such as covered conductor, targeted undergrounding, equipment replacement, or other strategies may be considered.”
[86] PG&E WMP Section 5.3.1.1.
[87] PG&E, SCE, SDG&E WMP Section 4.2.

MAVF (SCE's MARS), as described in the next section. The WRM is currently being used to target mitigation deployment to higher risk locations based on structure level ignition risk and circuit segment level consequence risk."

SDG&E: "SDG&E's Risk Quantification Framework, presented in its 2019 RAMP, utilized three attributes – Safety, Reliability, and Financial. Using these three attributes as well as scales and weights, SDG&E calculated a risk score."[88]

PG&E provides a lengthy and detailed description of its MAVF model and its assessment of risk and consequence, particularly for wildfire.[89]

A question that intervenors have raised is why there is a separate methodology for ranking risk for circuits and the risk used to calculate risk-spend efficiencies. After all, isn't the overall risk the aggregate of the risk over all circuits? And shouldn't it be possible to have an RSE for individual circuits? MGRA sent data requests to the utilities to probe this possibility. They were asked to divide their circuits into two tranches: one representing the half of circuits having highest risk (according to their internal ranking methodology) and the other half having the lowest risk, and then to obtain an RSE for both groups.[90] None of the utilities was willing or possibly able to perform this calculation. PG&E offered the following non-sequitur: "Currently, mitigation effectiveness in HFTD is the same across all circuits, even though some circuits may have higher/lower risk levels."[91] SCE objected that the recalculation was outside of the scope of a data request and restated that "SCE calculated RSEs at the system level."[92] As a result of a meet-and-confer, SDG&E offered the following amended response to MGRA DR 2, Question 5:

"*Currently, SDG&E undertakes two distinct risk assessments for wildfire risk. The first assessment attempts to estimate the overall risk due to wildfire from all triggers at all locations. The second method of assessments considers risk at more granular levels such as circuits or assets. Currently, the two methods of risk assessment are not fully integrated with each other, and do not lend themselves to comparisons across approaches. The Risk Assessment Mitigation Phase (RAMP) and WMP use the first method of overall risk to identify risk spend efficiencies (RSEs). Historically, once a program has been approved, SDG&E uses the second method to determine the prioritization*

[88] SDG&E WMP; Section 4.2.
[89] PG&E WMP; Section 4.2; pp. 4-3 – 4-9.
[90] MGRA DR4, Questions 2-6 and responses (SDG&E DR2) to SDG&E, SCE, and PG&E.
[91] PG&E DR4, Question 5 response.
[92] SCE DR4, Question 5 response.

of projects within the program. For example, Wildfire Risk Reduction Model (WRRM) and other tools have been used to prioritize particular circuits or parts of circuits to harden."

Reporting of risk scores and RSEs is prescriptively defined in the S-MAP Settlement Agreement as defined in D.18-12-024. There appears to be a disconnect between the risk estimates that the IOUs report to the Commission in compliance with the Settlement Agreement and the risk estimates that IOUs use to operationalize safety in their organizations. Possible reasons for this include:

- The IOUs do not understand the full usage and implications of the multi-attribute value framework (MAVF) and how it can be used at a more granular level.
- The MAVF is incapable of analyzing fine-grained risk drivers (for instance at the circuit level), would be unwieldy for such a purpose, or would produce less accurate results than analytical, machine learning, and Monte Carlo models.

That there may be a serious mismatch between risk estimates using MAVF and simulation models was suggested in the SDG&E 2019 RAMP submission.[93]

In its RAMP submission SDG&E performed a Monte Carlo analysis of various risks to determine the correlation between the expected value and the 99th percentile risk.[94] We print the graph of SDG&E's results below.

[93] I.19-11-010-11; JOINT 2019 RISK ASSESSMENT AND MITIGATION PHASE REPORT OF SOUTHERN CALIFORNIA GAS COMPANY (U 904-G) AND SAN DIEGO GAS & ELECTRIC COMPANY (U 902-M); November 27, 2019. (SDG&E 2019 RAMP)
[94] SDG&E 2019 RAMP; pp. C-31 – C33

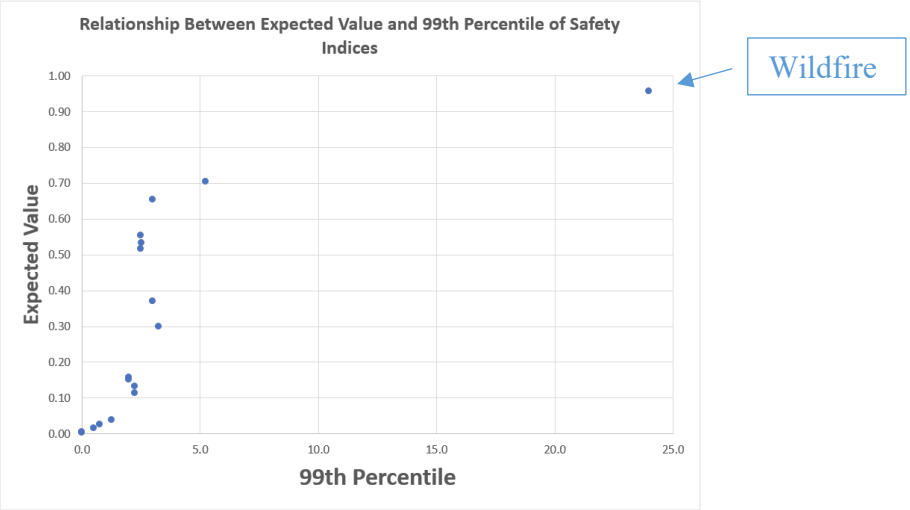


Figure 4 - SDG&E MAVF Expected Value versus 99th percentile safety indices. The point for wildfire risks is an outlier in the top right corner.

The data point for wildfire risk is denoted with an annotation. As can be seen, wildfire presents an extreme outlier when 99th percentile values are compared to expected values for safety indices. This means that the contribution of extreme events to the risk estimate is much higher than for other risk sources. This outsized contribution of extreme events to risk considerations is exactly what MGRA raised as an issue during the S-MAP proceeding,[95, 96] and SDG&E's 2019 RAMP analysis validates our concern. It is precisely the 99th percentile that we need to worry about. The Witch fires, the Camp fires, the Woolsey fires, these are all 99th percentile events and they are the reason for most of the death and damage caused by power line fires, the reason that California's power line fire problem is now known internationally, the reason for intense state government scrutiny of this issue.

Table 17 (SDG&E 2019 RAMP p. C-32) illustrates how this effect skews the MAVF calculation. For instance, based on the "expected value" MAVF approach, the Safety Index value for "Wildfire" (0.96) would be expected to be approximately the same as that for the combination of "Employee Safety" (0.30) and "Contractor Safety" (0.65). However, looking at the 99th percent value of the Safety Index for Wildfire (24.0) is roughly 4 times larger than the combined Safety

[95] A.15-05-002-5; MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE SAFETY AND ENFORCEMENT DIVISION EVALUATION REPORT; April 11, 2016; pp. 8-11. (MGRA SED Report Comments)
[96] A.15-05-002-5; COMMENTS OF THE MUSSEY GRADE ROAD ALLIANCE (MGRA) ON THE INTERVENOR SMAP WHITE PAPER; February 12, 2016; pp. 5-7.

Index for "Employee Safety" (3.3) and "Contractor Safety" (3.0). While SDG&E states that their analysis "supports the case that Expected Values are sufficient in themselves to understand the consequences from infrequent risks," this is clearly not the case for wildfire. In fact, the implication of this analysis, assuming SDG&E correctly implemented both its own Monte Carlo analysis and its MAVF calculation, is that ***using Expected Value of Safety Index for the MAVF may lead to gross underestimation of wildfire risks and dangerous underinvestment in wildfire prevention measures.***

The settlement agreement reached in the S-MAP proceeding A.15-05-003-5 and accepted in D.18-12-014 was signed by SDG&E, PG&E, SCE, TURN, EPUC, and ORA (now Public Advocates),[97] and it agrees to the methodology that would be adopted in the RAMP process in order to determine risk and risk spend efficiencies. During the S-MAP proceeding, MGRA had expressed concerns that the MAVF process might underestimate tail risk, and in response to this the Commission adopted MGRA's suggestion that the MAVF process be given a "test drive" to validate its performance for "extreme event risks".[98] However, the only wildfire-related risk evaluated during the "test drives" were "wires-down" events.[99] While "wires-down" has a wildfire component, utility analyses minimized this risk, as seen in the example from SCE, below:

Table 3: Pre-Mitigation CoF Values

Outcome	Atttribute	Probability	Natural Units	Scaled Units	Attribute Weights	Pr x Weight x Units
Injury	Safety - Death	0.0007271	2	2.00	0.1636	0.00024
	Financial	0.0007271	$16,500,000	1.65	0.0409	0.00005
Wildfire	Environmental (non-sensitiv	0.0000155	19.974	90.00	0.0123	0.00002
	Safety - Death	0.0000155	2	2.00	0.1636	0.00001
	Financial	0.0000155	$1,650,000,000	165.00	0.0409	0.00010
Property Damage	Financial	0.0024722	$165,000	0.0165	0.0409	0.00000
	Safety (Serious Injury)	0.0001454	4	0.4000	0.1636	0.00001
Outage	Reliability	0.3550088	0.132	0.0220	0.0409	0.00032
Freeway/Road Closure	Financial	0.0714791	$165,000	0.0165	0.0409	0.00005
				Pre-Mitigation CoF:		0.00079

[97] MGRA was not able to participate in the test-drive and settlement phases of A.15-05-002-5 due to time constraints.
[98] D.16-08-018; p. 114.
[99] D.18-12-014; p. 29.

Table 5 - SCE pre-mitigation consequence of failure values for different outcomes and attribute, from MAVF test-drive, 2017.[100]

The total consequence of failure score (CoF) for all wire-down events is .00079. For all wildfire-related consequences it is .00013, which represents only 16% of the risk from wire-down events. Likewise, in PG&E's 2020 GRC, wildfire was ranked 8th in its ranking of system risks, though it has since moved that ranking to 1st.[101] Part of this underestimation of wildfire risk is due to the MAVF approach of treating risk as a single scalar product of probability and consequence, and taking the "average" event as typical. As noted by MGRA during S-MAP,[102] this leads to incorrect results for probability distributions with "fat tails", such as power laws, and this is exactly the type of distribution that wildfire sizes follow. In Table 5 SCE gives values for the "average catastrophic wildfire" to obtain its probability and consequence estimates: the "average catastrophic" wildfire kills 2 people and costs $1.65 billion. For "fat-tailed" probability distributions, the overall losses over time are driven by the most extreme events, and the average will always underrepresent the overall losses. With the fires of 2017 and 2018 in hindsight, the gross underprediction of wildfire losses generated by using average values is thrown into stark and tragic contrast. One would never expect a statistical fluctuation of 85 deaths from a mean of 2, nor a $15 billion loss from a mean of $1.65 billion if the loss probability distribution followed "normal" (Poisson or Gaussian) statistics.

As signatories to the Settlement Agreement, the IOUs are obligated to provide risk and risk-spend efficiency estimates according to a prescribed process, and they do, though each interprets the requirements differently. However, for estimating risk to prioritize work, the IOUs use different methods that they state accurately represents the real risk posed to their system. This discrepancy should be resolved. The Commission should open a new S-MAP OIR proceeding this year as per OP5 of D.18-12-014 that can address the inconsistencies between the RAMP/MAVF risk estimates and internal utility risk-ranking processes, as well as issues with the predictive ability of the MAVF process. The outcome of a new S-MAP could potentially be:

- Utilities are provided a methodology to use MAVF in a manner consistent with each other and with Commission, WSD, and stakeholder expectations,

[100] A.15-05-002; JOINT INTERVENOR TEST DRIVE DETAILED REPORT ON SCE OVERHEAD CONDUCTOR TEST DRIVE PROBLEM; p. 13.
[101] PG&E Data Request Response CalAdvocates_021-Q12.
[102] MGRA SED S-MAP Report Comments; pp. 10-11.

- MAVF may be adapted or modified to better represent tail risks, or
- Alternatives to MAVF for use in extreme tail risk outcomes may be identified.

Recommendation:

The Wildfire Safety Division should, in its proposed resolution, suggest that the Commission re-open an S-MAP OIR proceeding this year in accordance OP5 of D.18-12-014 to drive a resolution to the inconsistencies between utility risk estimates using RAMP and internal methods, and to explore mechanisms to better represent the risk of extreme "fat-tailed" risk distributions.

Urgency:

Immediate, since utility RAMP proceedings will be initiated yearly and a consistent and correct process for obtaining risk and efficiency estimates is of the utmost urgency.

6. GIS DATA

6.1. Recent Weather Patterns

The Wildfire Safety Division requested that utilities provide a uniform set of GIS layers for weather, including average number of Red Flag Warning days and average 95th and 99th percentile winds in their service areas. A full vetting of each utility's methodology would be too involved to be completed in the allotted time frame, even assuming access to an expert with the requisite skill set. This is exacerbated by the fact that the three major IOUs use an entirely different methodology to obtain their 95th and 99th percentile wind speeds:

- SDG&E uses point data collected from its weather stations.
- PG&E uses modelled data from a 30 km grid downscaled to 3 km, presented for each year from 2014 to 2018.
- SCE uses modelled data from a 30 km grid averaged over 2014 to 2019.

While we don't have the ability to evaluate the correctness of the models, we can compare them against one another for the sake of consistency and identify any differences. It turns out that SCE's modelled area significantly overlaps PG&E's modelled area, and entirely covers SDG&E's service area. This provides the capability to compare wind speed exceedance values in the same geographic areas and look for systematic differences. What these differences mean – which model,

if either, is "correct", is a matter for further investigation by WSD, stakeholders, and the utilities themselves. Having accurate methods for calculating wind speeds is very important, since values may be used in engineering requirements, fire spread modelling, and PSPS thresholds.

We begin by presenting the GIS data provided in response to the Table 8 reporting requirement in Section 2.7 of each utility's WMP in a human-readable map form. For the sake of brevity only the 99th percentile wind speed data is shown.

6.1.2. SCE 99th percentile wind data

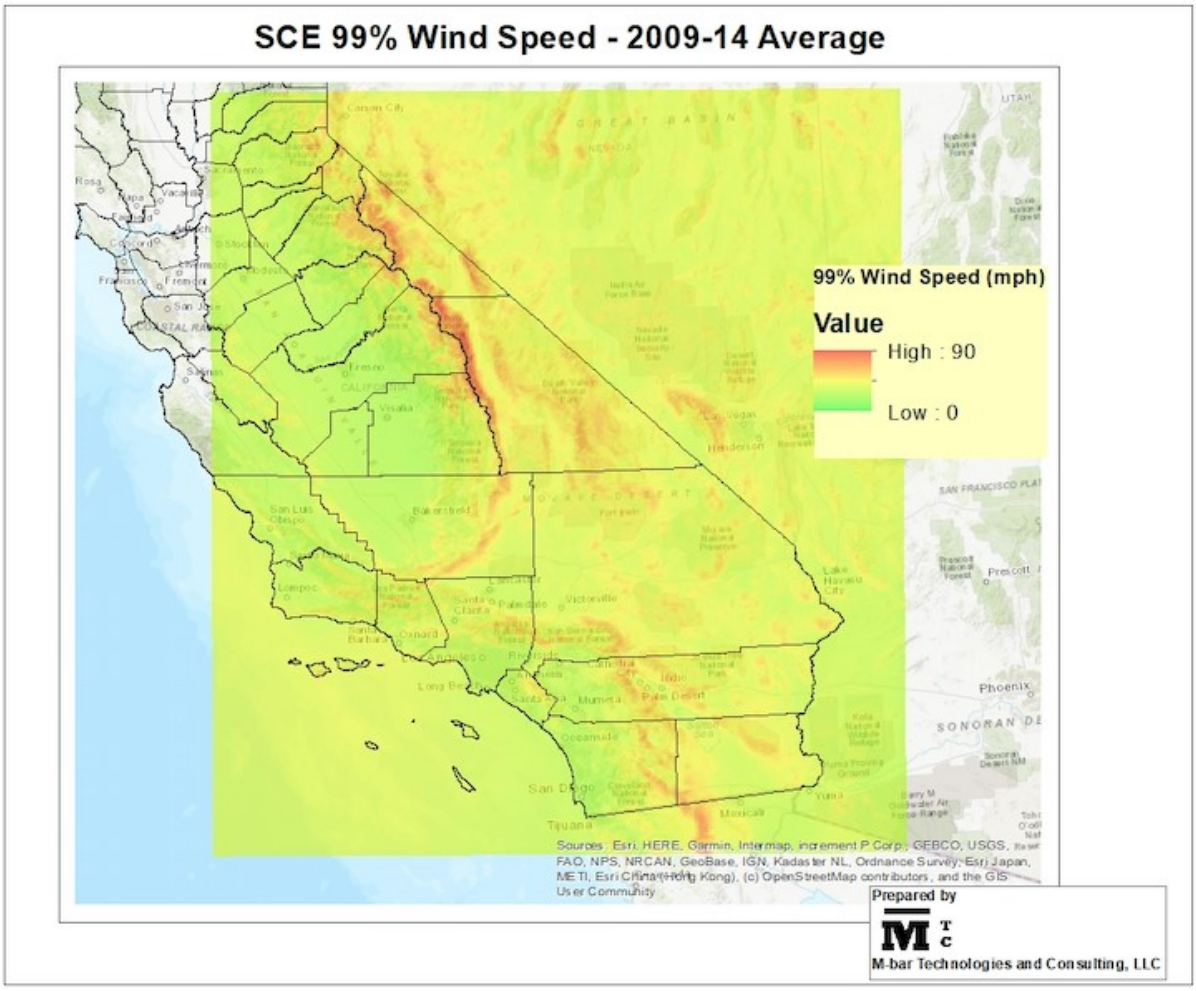


Figure 5 - SCE 99th percentile wind speed using data from 2009 to 2014

SCE calculated its 95th and 99th percent wind conditions using a five year average from 2009 to 2014.[103] As can be seen, highest winds occur over the Sierra Nevada, with lower but significant

[103] SCE WMP, Section 3.1.

peaks over the Transverse, Peninsular, and Coastal ranges. The wind speed range is from 0 to 90 mph.

6.1.3. PG&E 99th percentile wind gust data

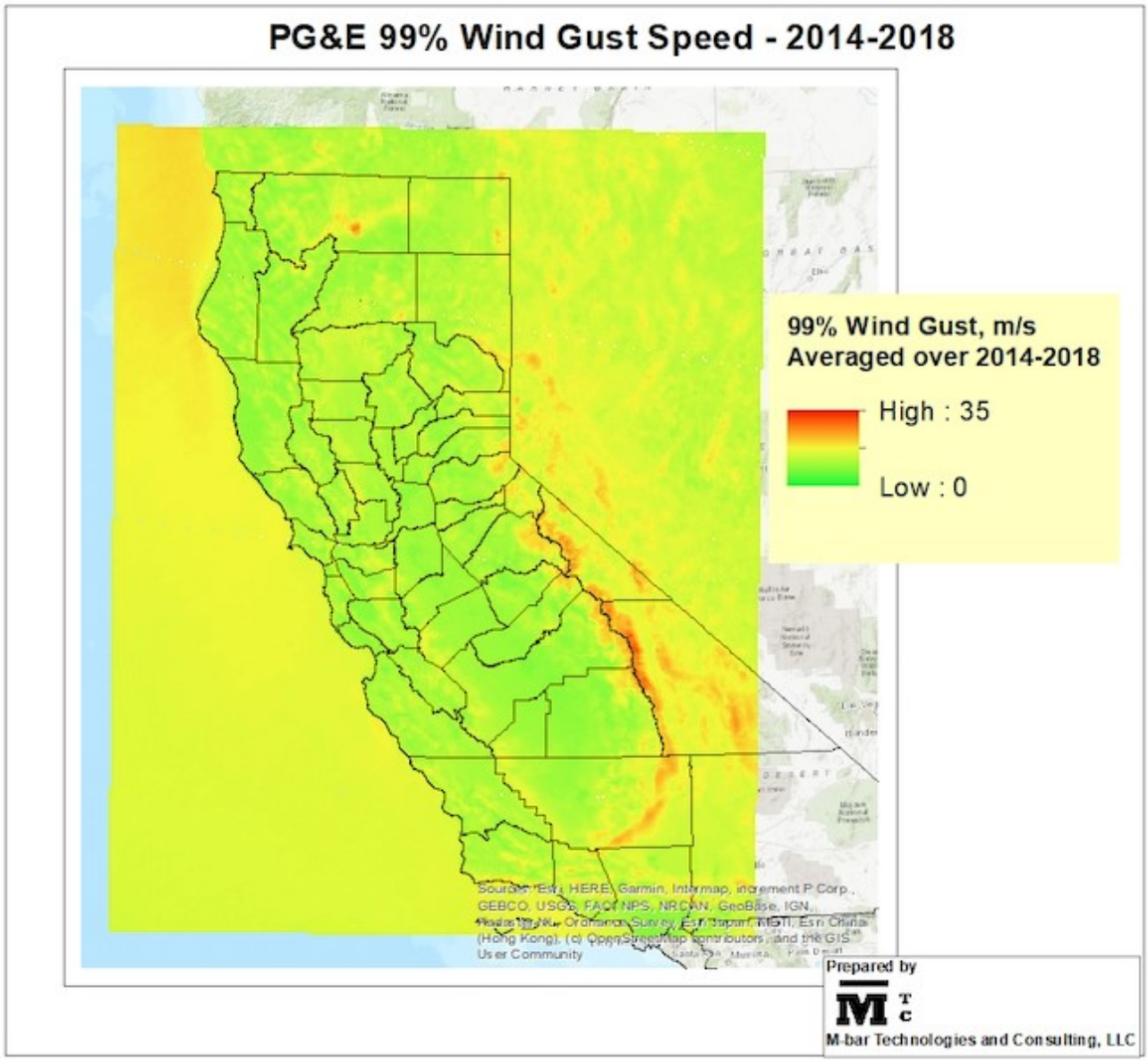


Figure 6 - PG&E 99% wind gust data, averaged over 2014-2018.

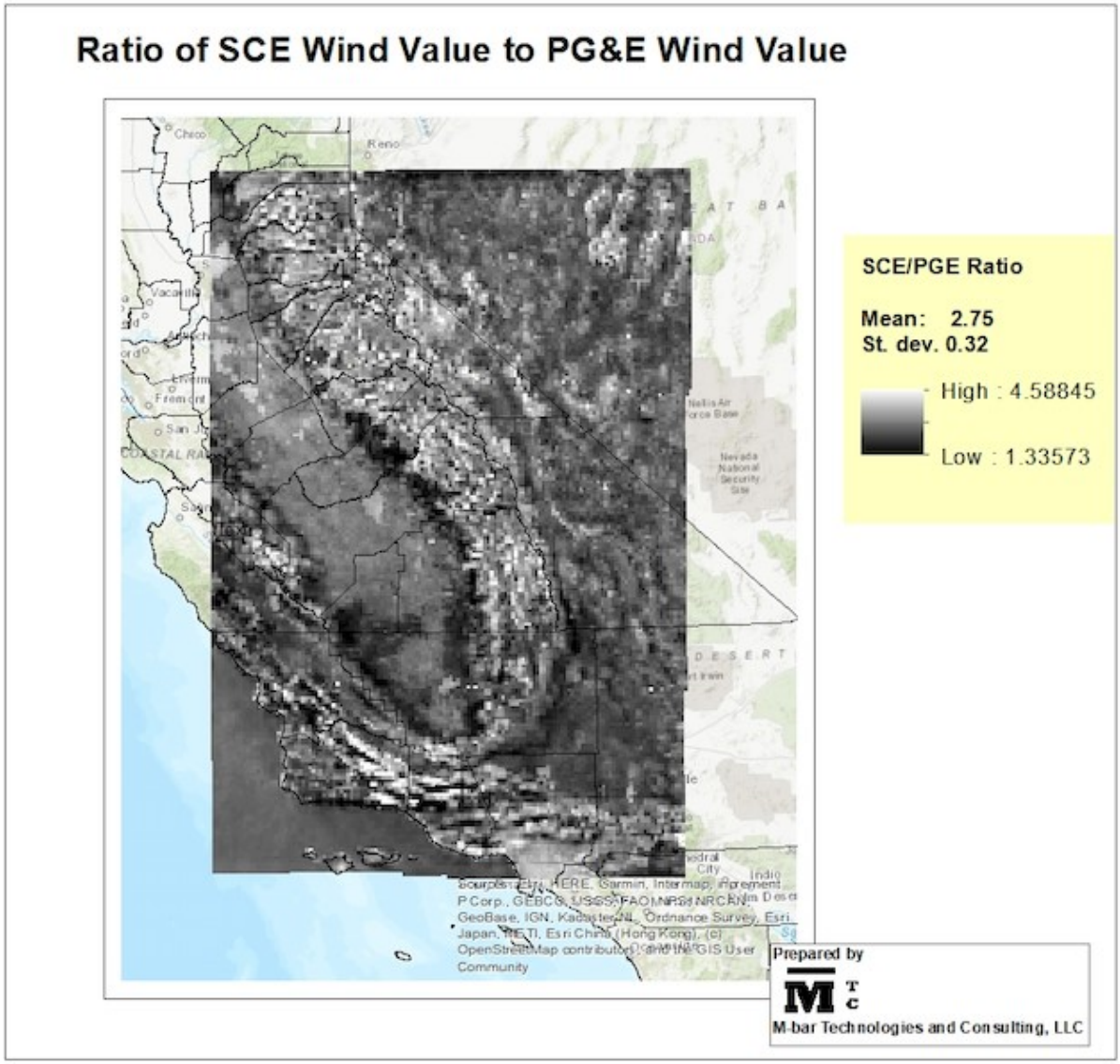
PG&E provided individual raster files for its 2014 to 2018 modelled wind data. The five raster files were averaged to produce the figure above.[104] PG&E's range of raster values is in meters

[104] Averaging was performed by the author using ESRI ArcMap Spatial Analyst.

per second[105] (1 m/s is 2.24 mph) and does not exceed 35. General quantitative agreement between the PG&E and SCE model can be seen, with maximum values over the Sierra Nevada and lesser values over other ranges.

6.1.4. Comparison of PG&E and SCE 99% wind data

Because there is overlap between the geographic range covered by the PG&E and SCE models, it is possible to directly compare them. To do this, the SCE raster values were divided by the PG&E raster values in the overlapping regions.[106] The result is shown below:



[105] Data request response WildfireMitigationPlans_DR_MGRA_006-Q05.
[106] Division performed by ArcMap Spatial Analyst Calculator tool.

Figure 7 - Ratio of SCE and PG&E 99th percentile wind values

Since the PG&E scale is in meters per second, one would expect the ratio between the values to be 2.24 if the results were the same. The mean ratio between the SCE and PG&E 99th percentile wind exceedance speeds is 2.75, which implies that SCE is predicting wind speeds 23% larger than PG&E over the same region. The standard deviation of the distribution is 0.32, with a range of 1.33 to 4.59. Lower values (dark) are where PG&E calculates higher wind values, and the higher values (light) correspond to areas where SCE calculates higher wind speeds. Areas that are grey or a fine-grained "checkerboard" mosaic are places where the values are near the mean of the ratio, indicating general model agreement (aside from the question of overall scale).

While Figure 5 and Figure 6 show a qualitative similarity between the SCE and PG&E wind modelling, taking the ratio reveals distinct differences. Most notably PG&E's model predicts stronger winds on the western slopes of the Sierra Nevada and the eastern slopes of the coastal ranges. It is unlikely that this is an artifact due to geographic coordinate offset, since that would tend to create a pattern that was uni-directional. The fact that PG&E's model predicts higher wind on all sides of the Central Valley is striking. SCE's model predicts higher winds than PG&E's in the mountains of Santa Barbara and Ventura counties, as well as San Benito County. These represent significant differences between the two models, with 33% of the data having values that differ more than 12% from the value expected if the models were identical.

A deeper analysis would be required to ascertain the source of the difference between the SCE and PG&E wind modeling.

As noted earlier, it is not possible to make conclusions regarding "correctness" of the models from the data presented here, but it is important to raise the issue as an important place for WSD and parties to probe more closely. In order for IOUs to provide optimal public safety it is important that they know their local conditions, particularly maximum wind speeds.

Recommendation:

WSD should request additional information from the three major IOUs to help clarify whether there are significant differences between the weather models used and if so what their origin and implications are. If there are significant differences between models, WSD should host weather model workshops where meteorologists from the different utilities, WSD, and external experts can discuss improving the approach to utility weather modeling.

Urgency:

Response on existence and source of potential model differences should be provided prior to plan approval. Subsequent workshops, if necessary, should be held within the next year.

6.1.5. SDG&E 99th percentile wind data

Unlike PG&E and SCE, SDG&E provides 99th percentile wind gust speed measurements from their weather station array rather than modelled data, in the form of point data instead of raster data. SDG&E also performed weather modelling to create their wind loading districts, based on a 50 year return interval. These are shown below:

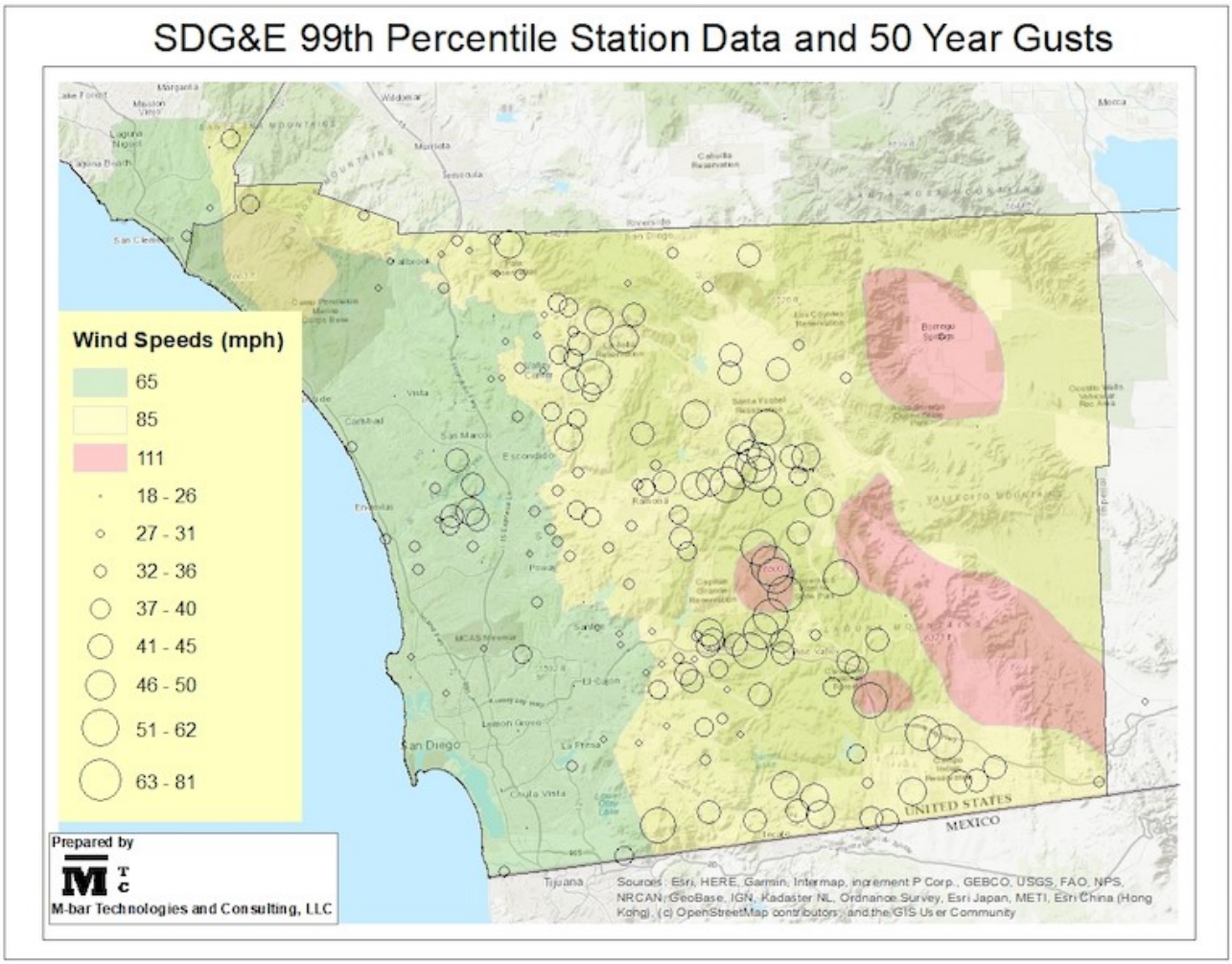


Figure 8 - SDG&E wind gust speeds for 50 year return interval wind loading districts (colored zones) and 2005-2014 weather station 99% exceedance data (proportional circles).

In Figure 1, the colored areas represent SDG&E's modelled 50 year interval wind gust speed that it has used to create its "known local conditions" wind loading districts. Details of the WRF atmospheric model that they used to model 30 years of historical data is described on pp. 19-20 of its WMP and displayed in their Figure 1. In Figure 8, results of SDG&E's model are overlayed with the 99 percentile exceedance wind gust from its weather stations provided as Attachment 6.1 to its Table 8 response.[107] Interestingly, weather stations in SDG&E's highest wind loading district in far eastern of San Diego County show low wind 99th percentile gusts. This could perhaps be because of the sparseness of data in this area (SDG&E concentrates its weather stations in HFTD areas, and the stations in questions are in the desert), or possibly because the weather events

[107] SDG&E WMP; Table 8.

responsible for high winds on the eastern slopes and desert regions did not occur in the 2005-2014 interval used by SDG&E for its 99th percentile wind gust analysis.[108]

6.1.6. Comparison of SDG&E and SCE 99th percentile wind analyses

Since SCE's wind analysis covers the SDG&E service area, it is possible to compare the models for a consistency check. SDG&E 99% wind gust exceedance weather station data is overlaid onto the SCE weather model in below:

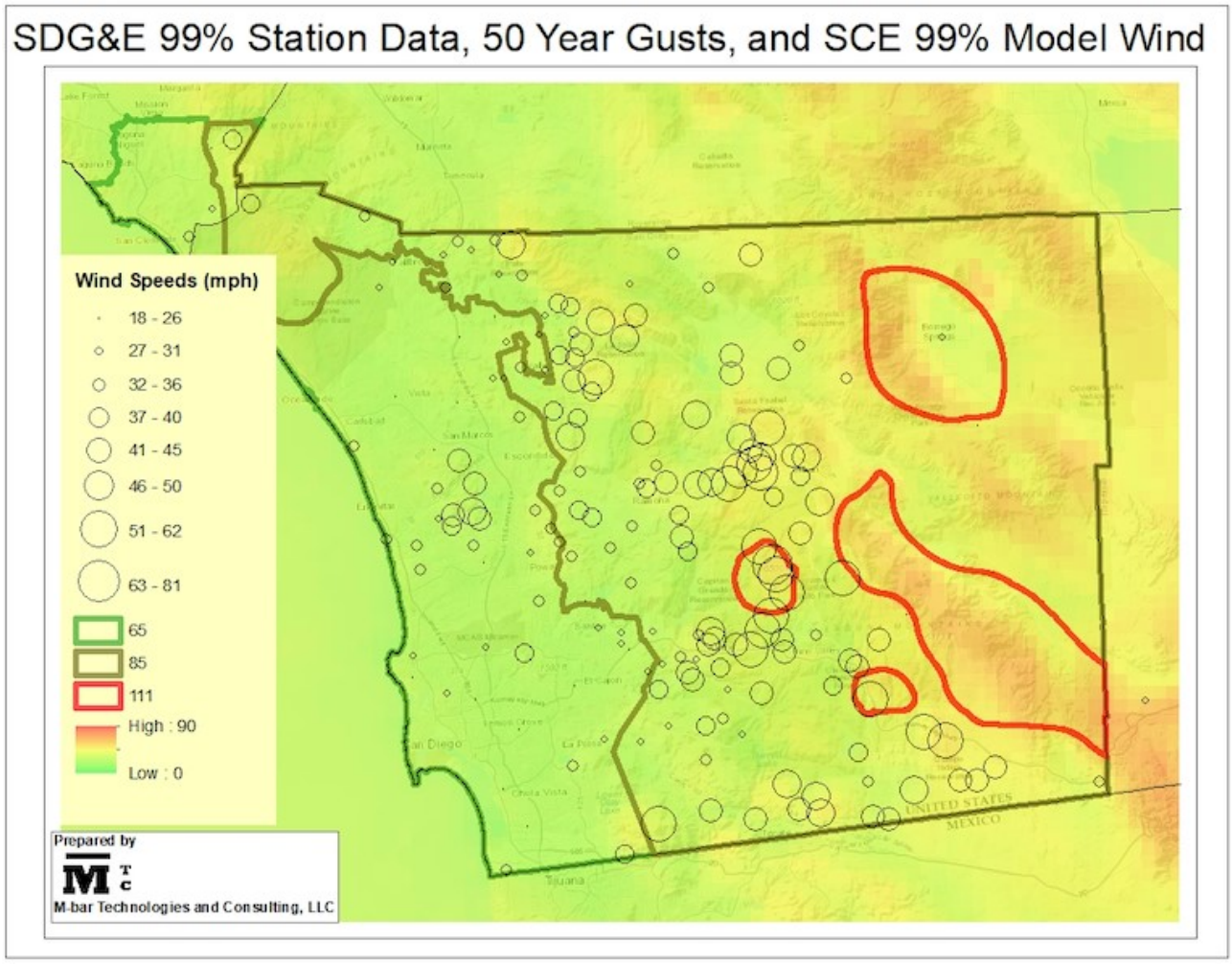


Figure 9 - Comparison 99% wind speed for SCE model (color scale) and SDG&E weather station data (proportional circles). SDG&E "known local wind" conditions for a 50 year recurrence interval are shown by the countours.

[108] SDG&E WMP; p. 6, 34-35, 66; Tables 8&10.

Like SDG&E's mesoscale model, SCE predicts its highest wind speeds on the eastern slopes and desert regions of San Diego County. "Warm" spots further east have a general correspondence to higher measurements from SDG&E weather stations. The cluster of stations with moderate wind gust data in west central San Diego County (slightly inland and west of Escondido) is noteworthy, as neither the SCE nor SDG&E mesoscale models indicate higher winds in that area.

Comparing SDG&E's "known local wind" conditions for a 50 year recurrence interval with SCE's model shows some noticeable differences. There is less of a mismatch between weather station data in the desert regions, but more importantly the SCE model shows an additional "warm spot" that is supported by SDG&E weather data in central San Diego County, in the vicinity of Santa Ysabel – the origin point of the 2007 Witch Fire. An area of equivalent wind intensity to the south of that area was assigned a 111 mph wind loading by SDG&E.

SDG&E's station data and SCE's model can be compared in the same fashion used for the comparison of PG&E's and SCE's model in the previous section. In this case, the 99% wind value for each SDG&E's station was divided by the value for the SCE raster in the same geographic location. This yields the following distribution:

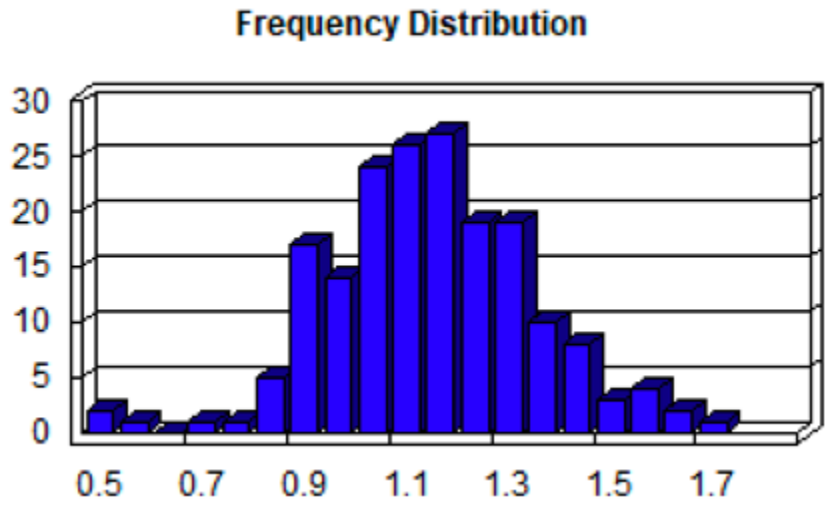


Figure 10 - Ratio of SDG&E 99% wind gust station data to SCE's 99% wind model

The ratio has a mean of 1.16 and standard deviation of 0.21, not dissimilar from the width of the SCE/PG&E comparison. As with the PG&E / SCE comparison, these data show a marked geographical distribution:

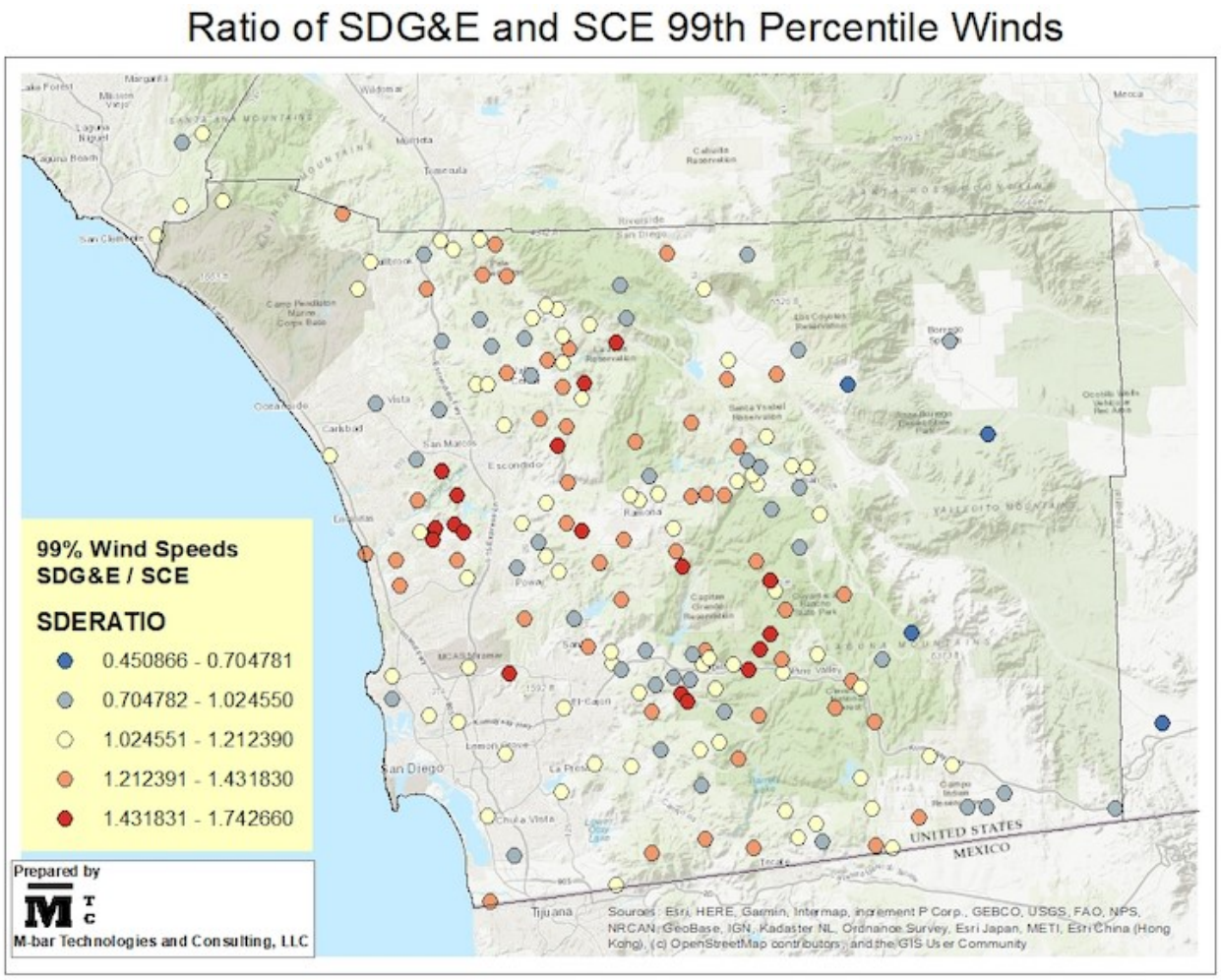


Figure 11 - Ratio of SDG&E 99% wind gust station data to SCE 99% wind model.

Red points have significantly higher SDG&E 99% wind gust measured values than SCE model predictions, while blue points have significantly lower measured wind speeds than the SCE model. All weather stations east of the mountains have significantly lower SDG&E measured values than SCE's model predicts, while all stations having significantly higher measured values are either on the western slopes of the mountains or in the central coastal cluster mentioned earlier. This is significant because the western slopes of San Diego's mountains are typically where catastrophic wildfires ignite, including the 2003 Cedar fire and the 2007 Witch fire.

A common pattern emerges in the comparison of SCE's model with the model of PG&E and the measurements of SDG&E. In both cases, Edison's model tends to yield lower wind speed values on the western slopes of mountain ranges and predict peak values further to the east. This has important fire safety implications, since foehn winds occur on these slopes in both Southern and Northern California.

Recommendation:

WSD should request additional information from the three major IOUs to help clarify whether there are significant differences between the weather models used and if so what their origin and implications are. If there are significant differences between models, WSD should host weather model workshops where meteorologists from the different utilities, WSD, and external experts can discuss improving the approach to utility weather modeling.

Urgency:

Response on existence and source of potential model differences should be provided prior to plan approval. Subsequent workshops, if necessary, should be held within the next year.

Recommendation:

SDG&E should review Edison data and determine whether its 111 mph wind loading district should be extended to the Santa Ysabel area.

Urgency:

Prior to the next plan update.

Recommendation:

All IOUs should be required to provide 95th and 99th percentile exceedance wind data in the form of both modelled data and the form of point data from their weather station network. At first SCE and PG&E will not have the 10 year history that SDG&E has, but their results will improve over time.

Urgency:

Next plan update.

Recommendation:

All IOUs should be required to provide a GIS shapefile showing the wind loading districts that they apply for the sake of engineering, and the equivalent wind gust speed each corresponds to.

Urgency:

Next plan update.

6.1.7. Peak winds and circuit risk ranking

As discussed in Section 5.3.8.2, the three major IOUs have established risk estimation methodologies that they deploy at the circuit level. These risk estimations take into account a

number of factors related to the failure of equipment, fire spread, and potential impact. One factor that is a very strong driver of outages (and hence ignition risk) are winds. Section 2.3.1 showed that outage rates have an exponential dependency on wind speeds. It follows that all other factors being equal, circuits located in areas with high wind potential will be at greater risk for equipment failure during foehn windstorms followed by catastrophic fire ignition. Hence, wind potential should be a factor used in determining risk ranking. While utilities are sometimes general as to the inputs to their risk ranking models, it does not appear that all utilities use anticipated wind speed directly in their risk ranking scores.

SDG&E's WRRM model uses "vegetation, weather, fire, outage, and equipment failure history, fire simulations and other factors."[109] SDG&E incorporates weather into its circuit risk ranking, but it isn't explained what kind of dependency is assumed between wind speed and ignition probability.

SCE provides little detail on the WRM analysis it uses to establish relative circuit risk, but mentions that it includes: "probabilities of ignition by contact from objects, or varying topography and vegetation that can influence fire propagation and consequence."[110]

PG&E has developed an electric line risk scoring methodology that uses likelihood of failure, likelihood of fire spread, and egress to rank circuits. Whether PG&E uses wind as an input to likelihood of failure is not specified. PG&E also has an Outage Producing Wind (OPW), which was developed from its outage database in conjunction with its wind climatology data.[111] PG&E plans to improve the OPW model in 2020: "…once the new 30-year climatology is complete at 2 km, PG&E plans to recalibrate the OPW model to run at 2 km resolution and will also investigate methods to aggregate the model to the circuit or sub circuit level."[112] However, PG&E appears to only use OPW for forecasts to be used in setting PSPS thresholds.[113] It is surprising that PG&E makes no mention of using this key dataset in its circuit risk analysis.

[109] SDG&E WMP Section 5.3.1.
[110] SCE WMP; p. 5-132.
[111] PG&E WMP; p. 5-58.
[112] PG&E WMP; p. 5-106.
[113] PG&E WMP; p. 5-125, Section 5.6.2.2.

While some of the factors used by the utilities to gauge risk ranking have some dependency on local wind conditions, none will show as strong a dependency as outages on windspeed. Fire spread will depend on wind speed as well, but this is a quasi-linear dependency, as discussed in Section 4.6.1. Overall outage history (not filtered on wind) will contain excess outages due to wind, but this dependency will be partially masked by the volume of outages not occurring during high wind events.

The following figures show the top-ranked risk circuits for PG&E, SCE, and PG&E, overlaid on their 99 percentile wind speed maps.

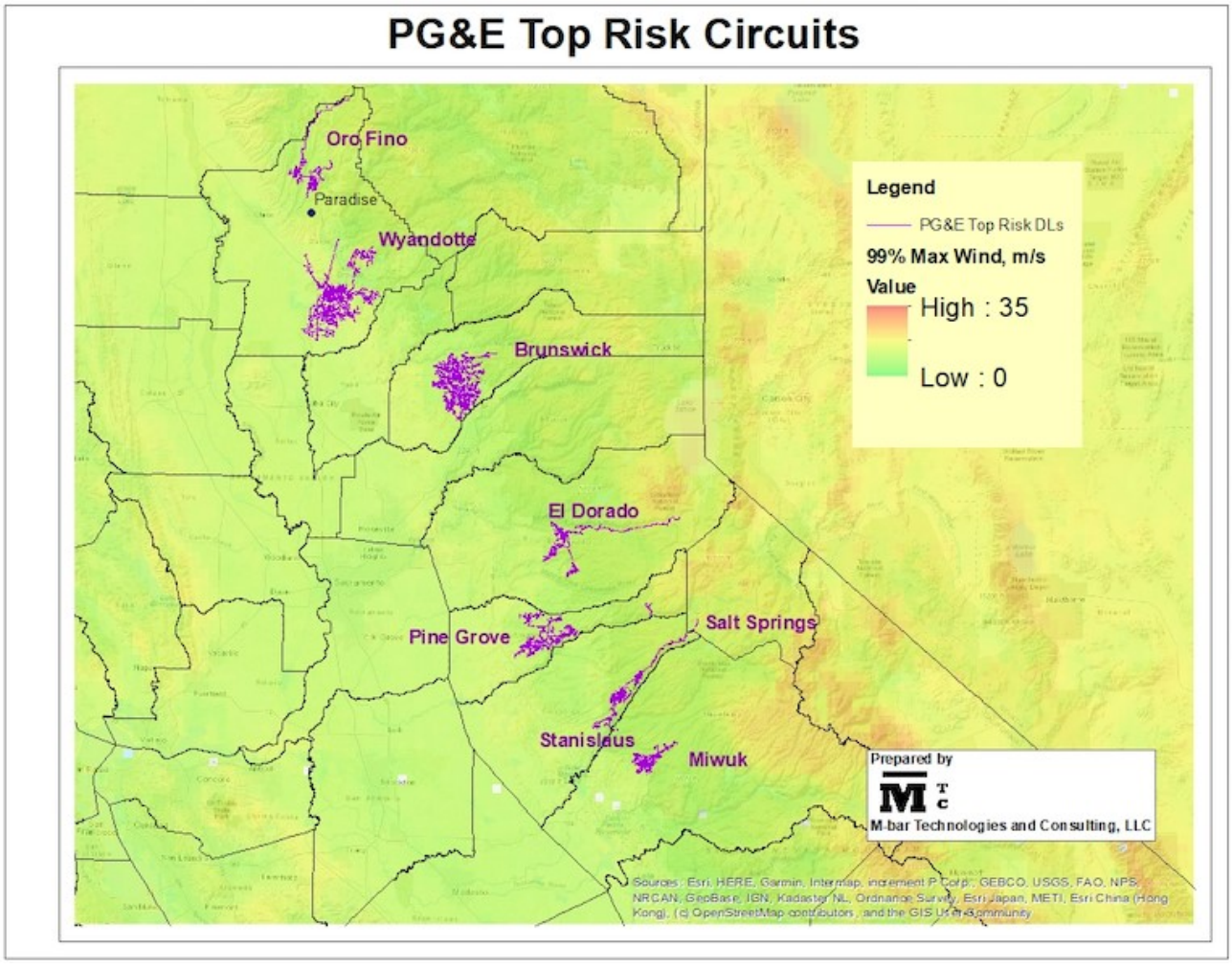


Figure 12 - PG&E top ranked risk circuits[114] overlaid on its 99% wind speed map. The town of Paradise is indicated on the map.

[114] Data request response WildfireMitigationPlans_DR_MGRA_004-Q04; file WildfireMitigationPlans_DR_MGRA_004-Q04-Atch01_Revised.xlsx

PG&E's top ranked risk circuits, while not necessarily in the highest wind districts, are on the western slopes and foothills of the Sierra Nevada. These circuits overlay areas similar in character to the area of Paradise, scene of the Camp fire. While this prioritization is understandable, its notable that areas affected in the 2017 fires have lower risk rankings.

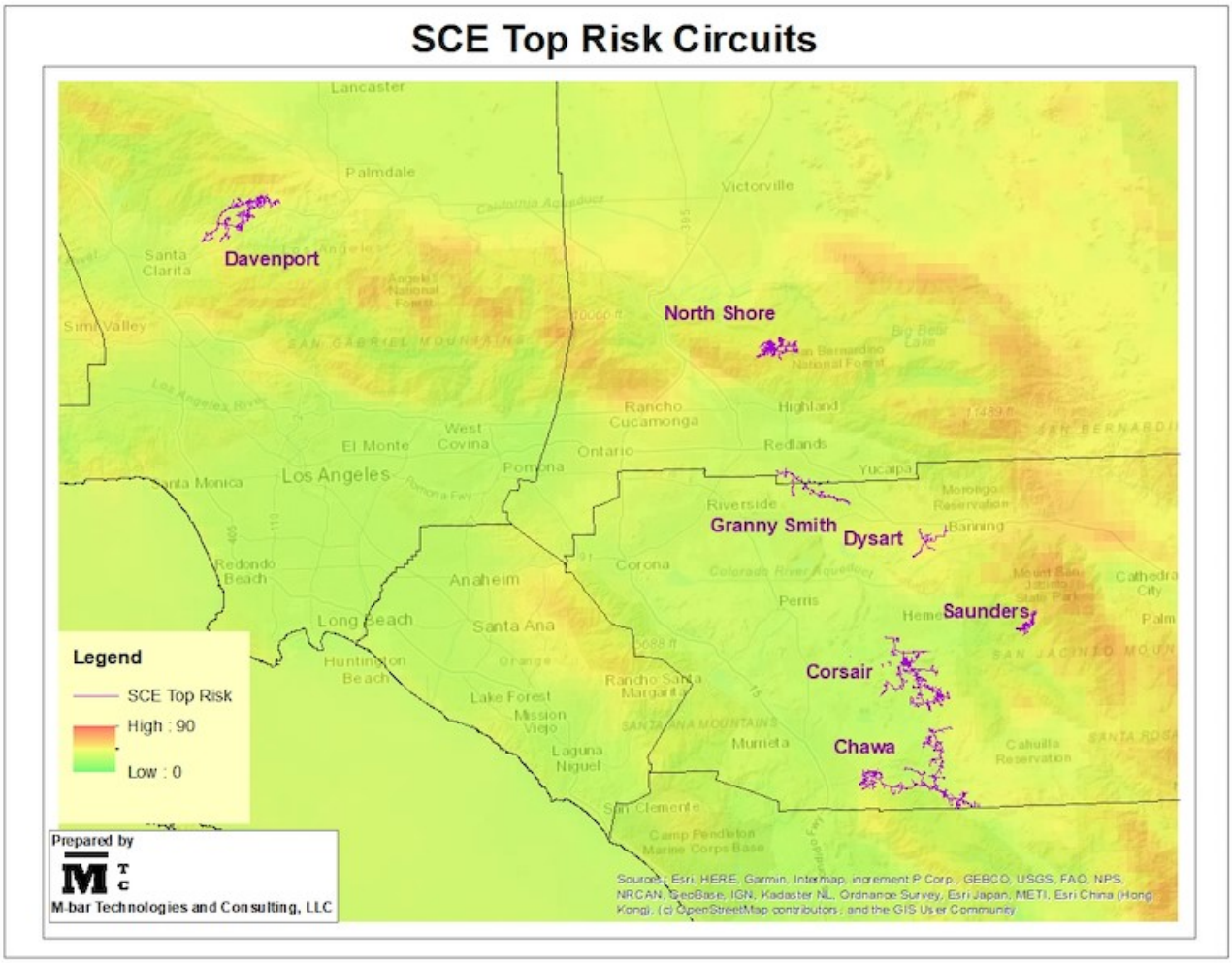


Figure 13 - SCE top risk ranked circuits[115] overlaid on its 99% wind map.

SCE's top ranked risk circuits mostly extend into or abut its predicted high wind areas. The one exception is the Granny Smith circuit, south of Redlands.

[115] Data request response MGRA-SCE-004 Q.004 ;File MGRA-SCE-004 Q.004 Att-Circuit_Segment_Risk_Scores.xlsx

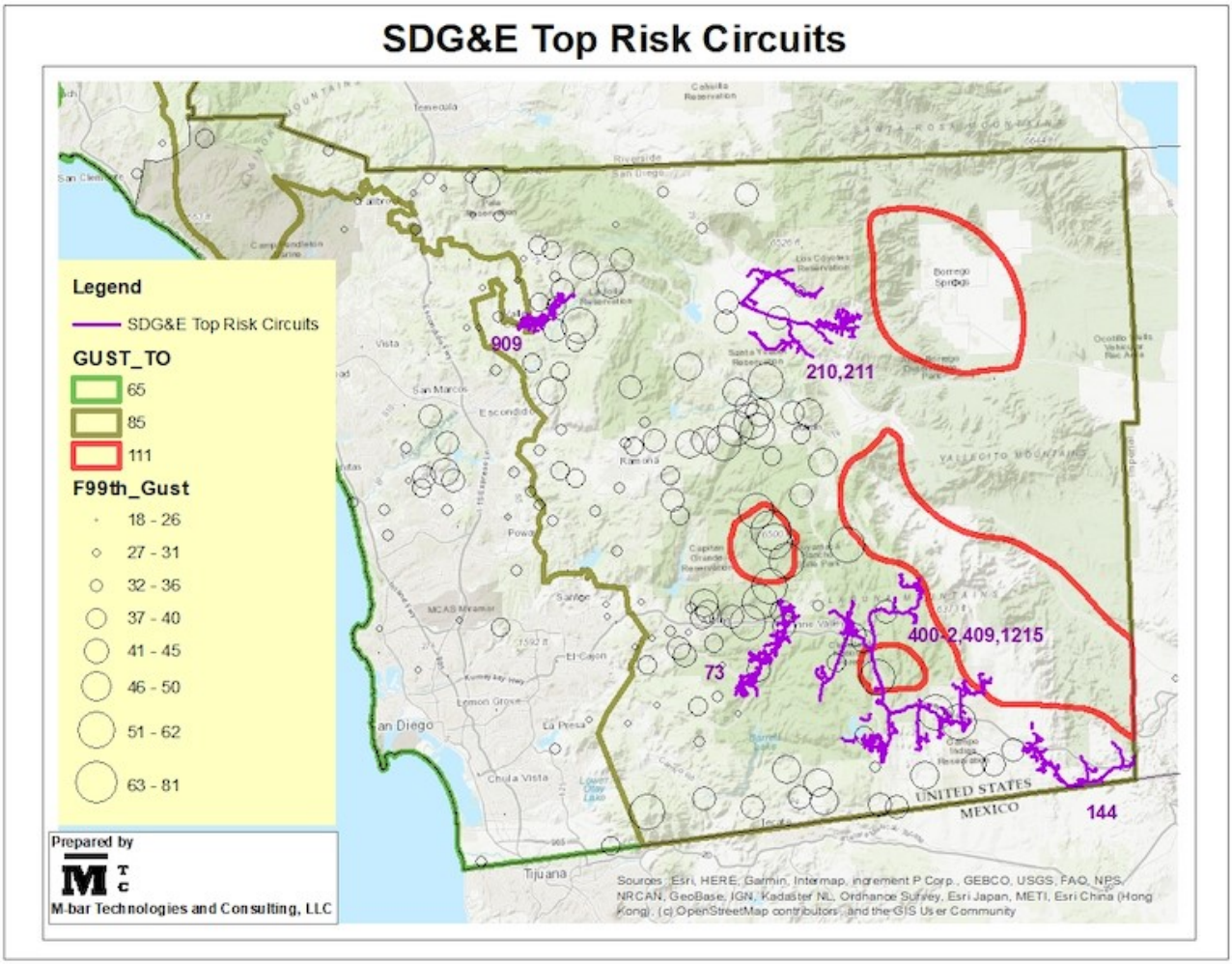


Figure 14 - SDG&E top ranked risk circuits[116] overlaid on its 99% wind gust data and wind loading zones.

SDG&E's top ranked risk circuits mostly extend into or abut areas where weather stations measure high speeds or extreme wind loading districts. There are two exceptions: Circuit 144, in the far southeastern corner of San Diego County, and circuits 210 and 211, near Warner Springs. It should be noted that SDG&E has had an extensive hardening program in place for several years, and many of the most extreme wind areas may have already been addressed.

Recommendation:

Utilities should state clearly and quantitatively the dependency of their risk-ranking model on outage-producing winds.

Urgency:

[116] Data request response MGRA-SDGE-01 Question 4.

Next plan update.

Recommendation:

If utilities do not explicitly use outage-producing winds in their circuit risk rankings, they should include this dependency in a manner that represents the increased probability of outage due to extreme wind events. In particular, PG&E should incorporate its OPW model into its circuit risk ranking if it has not already done so.

Urgency:

Next major plan revision.

Recommendation:

Where highest-ranked circuits occur outside of known high wind areas, utilities should note the special characteristics of the circuit risk that justify the higher ranking.

Urgency:

Ideally, immediately since this is not burdensome.

By next update is acceptable.

7. CAPABILITY MATURITY MODEL

The following section addresses the answers that PG&E, SCE, and SDG&E provided for the Capability Maturity Model survey.

7.3. C– Grid Design and System Hardening

7.3.2. C.II.a - Does grid design meet minimum GO 95 requirements and loading standards in HFTD areas?

This question is not framed in a way that provides instructive answers. GO 95 has considerable history and leeway for interpretation. The survey question should use language that will have a common interpretation by all parties.

The rules governing GO 95 loading standards are Rule 12, 31.1, and 43. Rule 12 introduces a grandfathering clause:

"*The requirements of this Order, other than the safety factor requirements specified in Rule 12.2, do not apply to lines or portions of lines constructed or reconstructed prior to the effective date of this Order. In all other particulars, such lines or portions of lines shall conform to the requirements of the rules in effect at the time of their construction or reconstruction.*"

Rule 31.1 is the legal requirement for compliance:

"*For all particulars not specified in these rules, design, construction, and maintenance should be done in accordance with accepted good practice for the given local conditions known at the time by those responsible for the design, construction, or maintenance of [the] communication or supply lines and equipment*."

And the actual loading is provided by Rule 43, which requires that a horizontal wind pressure of 6 pounds for square foot on cylindrical structures at elevations above 3000 feet and a horizontal wind pressure of 8 pounds for square foot on cylindrical structures at elevations below 3000 feet. Additionally, safety factors for wooden poles are specified in Rule 44.

For people new to WSD or the Commission, or parties who have recently become involved in this proceeding, it may come as a surprise that these rules are interpreted differently by SED and the IOUs, and that the Commission has not yet resolved these different interpretations. The IOUs generally interpret the wind gust speed specified by GO 95 to be used for loading calculations to be 56 mph, while SED has interpreted it as 112 mph for new construction and 92 mph for existing construction. The Commission did not rule on this point and deferred it to the statewide fire map proceeding.[117] Nevertheless, the Commission has determined that "a wind load standard of 56 mph would not be adequate in areas where the 'known local conditions' may exceed winds of 56 mph."[118] As mentioned in Section 3.1.1, the issue of wind loading was not addressed in the creation of the Commission's fire hazard maps, and this work was deferred to the creation of a "fire-wind" map,[119] which then was replaced with the notion of situational awareness through dense utility mesonets.[120] This left the question of wind loading standards unaddressed by the Commission, and for the time being left to the utilities to interpret.

[117] D.14-12-089; pp. 2-4.
[118] Id.; p. 5.
[119] D.17-12-024; p. 68-72.
[120] California Public Utilities Commission; Rulemaking 15-05-006; SED-CAL FIRE Joint Assessment and Recommendation Report; September 19, 2018

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories." However this language leaves some things undefined:

- How are fire-wind conditions determined?
- What are *foreseeable* conditions, as opposed to measured conditions?
- What about the lines in the utility infrastructure built before this requirement took effect?

Returning to CMM Question C.II.a, it should now be evident why a simple question of GO 95 compliance will not suffice. *Of course* the utilities will answer in the affirmative to the question: GO 95 is the law. In the utility reading of the law, old equipment is in compliance with GO 95 if it was built to a 56 mph wind loading at the time of construction. MGRA made an attempt to have new requirements applied to maintenance and asset replacements,[121] but the Commission did not address this argument in its subsequent decision.[122]

Fortunately, in the time since these earlier proceedings, the IOUs have been active in determining their "known local conditions", as WMP submissions regarding weather station installation and weather forecasting broadly show. This knowledge has in turn led utilities to define loading districts in which new construction and hardening are built to wind loading standards greatly in excess of 56 mph. SCE has defined additional 12 psf (65 mph), 18 psf (84 mph), and 25 psf (97 mph) wind loading districts,[123] and SDG&E has had a wind loading map in place for several years, defining districts with 65 mph, 85 mph, and 111 mph wind loading corresponding to expected 50 year wind peak gusts.[124]

The remaining question, then, is how much of the utility infrastructure is in compliance with the new standards using known local conditions, and how much remains under the old GO 95 wind loading standard, which IOUs interpret as 56 mph gust speed. MGRA Data Request 6 (SDG&E MGRA DR 3) seeks to probe this issue. PG&E, SCE, and SDG&E were all asked how they determined known local conditions, how much of their infrastructure was currently built to

---

[121] A.15-09-010; OPENING BRIEF OF THE MUSSEY GRADE ROAD ALLIANCE WEMA PHASE 1; March 24, 2017; pp. 23-30.
[122] D. 17-11-033.
[123] SCE CMM C.II.a.
[124] SDG&E WMP; pp. 14-15.

withstand current conditions, if they were engaged in a program to bring their infrastructure up to that standard, and if so what was the timeline.

The three IOUs provided the following technical documents as attachments to their data request responses:

SDG&E: File "MGRA-SDGE DR 3 Q1.pdf"; contains metadata for the Known_Local_Wind_Map File Geodatabase Feature Class. October 2015.

SCE: File "MGRA-SCE-006 Q.001 Att-REAX methodology 03282013.pdf"; High Resolution Wind Loading Study; March 26, 2013.

PG&E: File "WildfireMitigationPlans_DR_MGRA_006-Q01-Atch01_Redacted.pdf"; Extreme Wind Speed Estimates Across the PG&E Service Territory; January 2015.

SCE and SDG&E used a Weather Research and Forecasting (WRF) atmospheric model to recreate weather conditions over a historical period, 30 years for SDG&E and 34 years for SCE. SDG&E performed their computation over the entire history, while SCE performed its computation for historical peak wind events. SCE performed its analysis for all wind maxima and also for wind maxima filtered by humidity and temperature (fire weather). Both SDG&E and SCE validated their models with weather station data. PG&E, on the other hand, used only weather station data in their analysis, fitting the data with an extreme value statistical procedure (Gumbel).

SDG&E's results are shown in Figure 8. PG&E's and SCE's are shown below in Figure 15 and Figure 16, respectively.

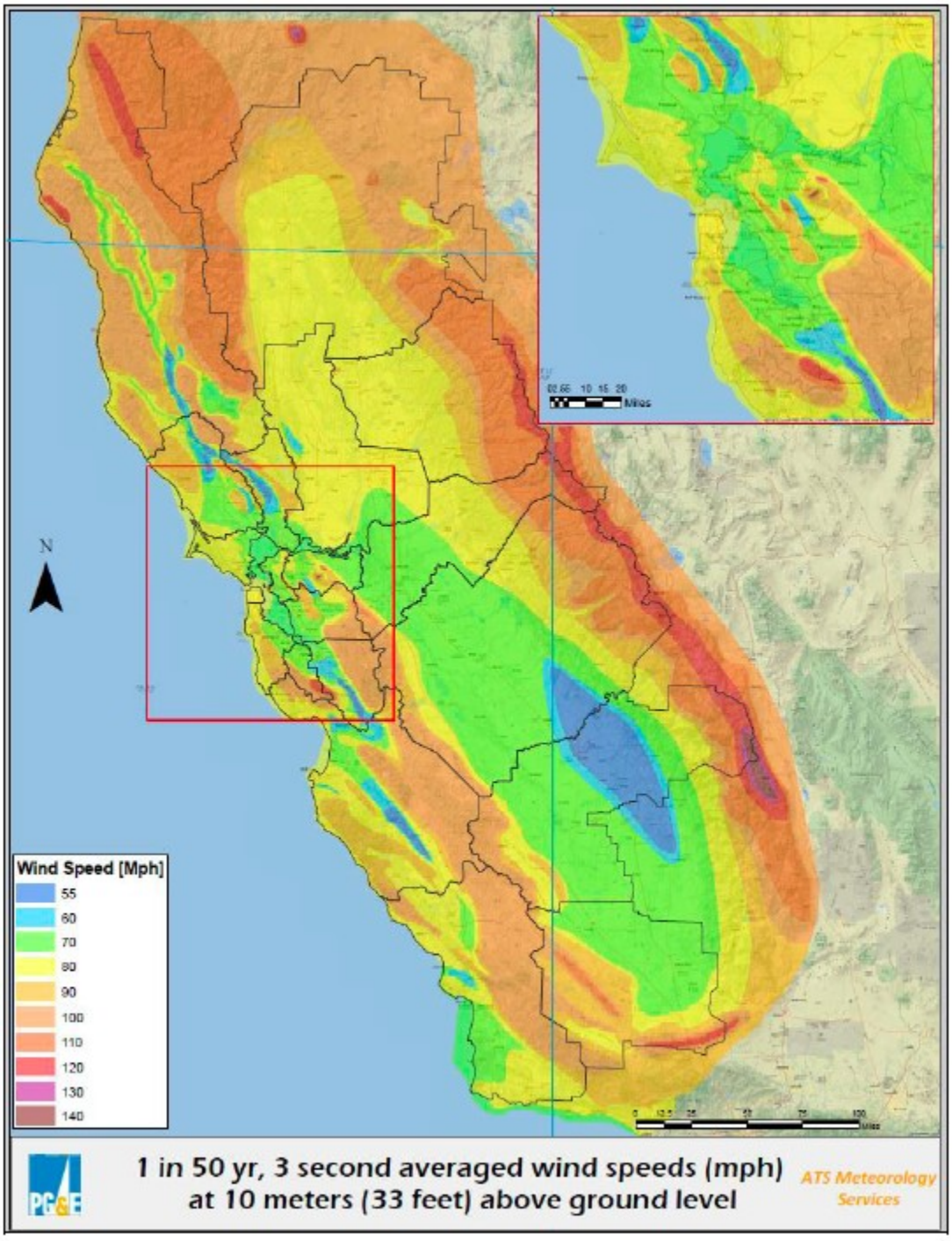


Figure 15 - PG&E 50 year return interval 3 second wind gust speed at 33 feet above the ground

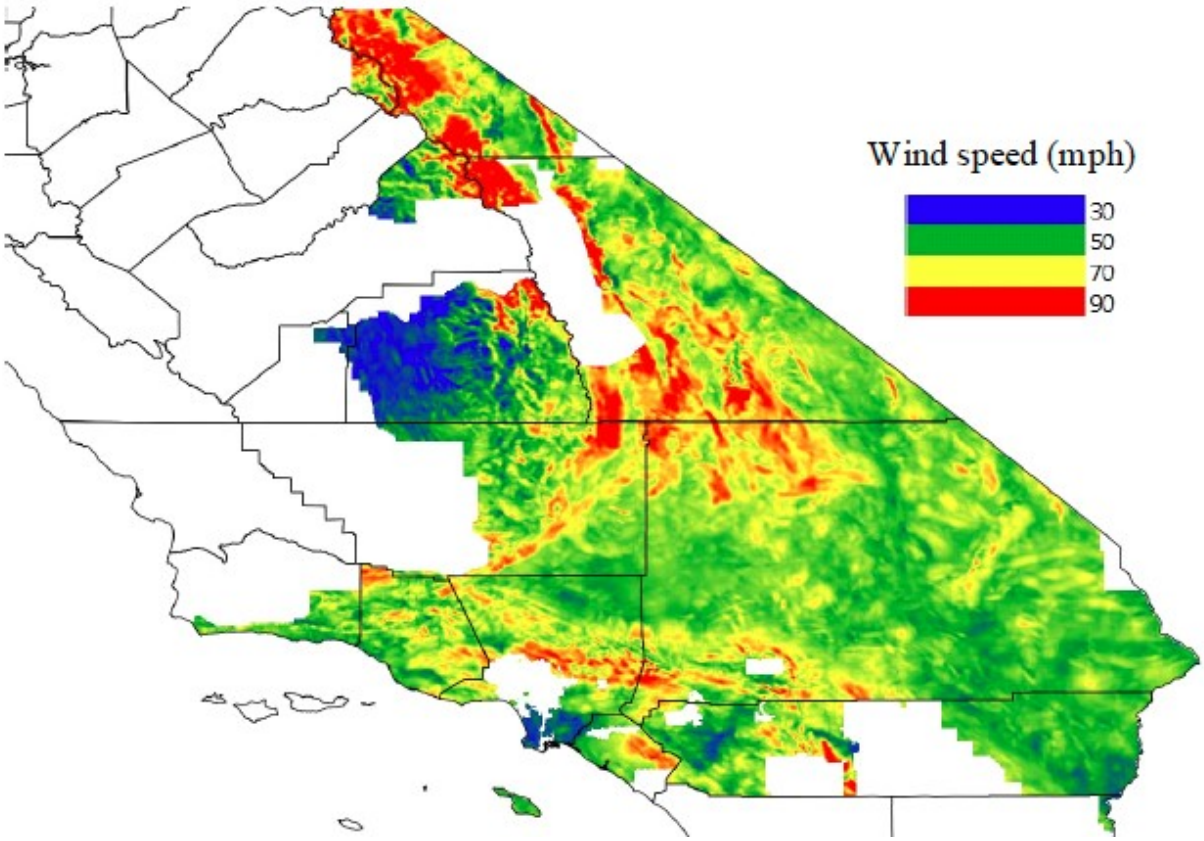


Figure 16 - SCE 50 year return interval 3 second gusts at 20 ft.

These studies make it clear that wind speeds are expected to regularly exceed 56 mph, the loading standard that IOUs historically built to, over vast swaths of utility service areas.

As to what measures that utilities are taking to adapt their infrastructure to this knowledge, only SDG&E gives a fully responsive answer. It states that even with its recent and current infrastructure hardening program, only 21% of its infrastructure has been brought up to its current wind loading standard.[125] It is concentrating additional work in the HFTD, and estimates that at its planned pace it will complete its hardening project in 11 years.[126]

SCE states that: "SCE does not track the circuit miles in its HFRA that were built to a wind loading standard less than that of current known local conditions. However, since its inception in 2014, SCE's Pole Loading Program has been assessing poles based on the latest wind loading standard. Any pole replacements or repairs resulting from these assessments are expected to be

[125] Data request response MGRA-SDGE-03, Question 3.
[126] Data request response MGRA-SDGE-03, Question 4.

completed by 2024. Furthermore, as part of the Wildfire Covered Conductor Program, poles are pole loaded against the current known local conditions."[127]

PG&E claims that it has no means to perform this calculation because: "Preparing this type of quantification would require identification of the date of construction or reconstruction of each structure of the approximately 30,000 circuit miles in the HFTD areas."[128] This response is of concern at two levels. Firstly, it indicates that PG&E has inadequate knowledge of its infrastructure. Second, it is evasive, since PG&E could have assumed a 56 mph wind loading for all distribution infrastructure not rebuilt after it performed its wind analysis. PG&E has issued new engineering bulletins for pole loading in high wind areas, but it mentions no systematic program to remediate infrastructure in those high wind areas.

Recommendation:

Both PG&E and SCE should be required to provide estimates of the fraction of infrastructure in their area that is likely to be built to a wind loading standard less than that suggested by their "known local conditions" wind loading studies.

Urgency:

SCE, prior to next plan update.

PG&E, immediately, so as to incorporate any programs into its 2020 RAMP submission this summer.

Recommendation:

WSD should reformulate C.II.a or add a new questions of the following type:

What fraction of the distribution circuits in the HFTD are built to a wind loading standard less than that of the known local conditions (50 year return interval)?

i. >50% ii. 20-50% iii. 10-20% iv. <10% v. None

If there are circuits built to wind loading less than known local conditions in the HFTD, what is the time line for rebuilding them to wind loadings sufficient to handle known local conditions (50 year return interval)?

i. No plan ii. > 5 years iii. 2-5 years iv. 1-2 years v. Already complete

[127] Data request response MGRA-SCE-006, Question 3.
[128] Data request response WildfireMitigationPlans_DR_MGRA_006-Q03.

Urgency:
Next plan update.

7.6. Grid Operations and Protocols

7.6.3. F.III.c – Customer Complaints

The survey question is: "*During PSPS events, what percent of customers complain*?"

This survey question will act to reward companies that suppress their customer complaints or put barriers in the way to discourage filing of complaints. As MGRA pointed out in its comments on the PSPS events,[129] this is exactly what may be happening in the SCE area, and most egregiously in the PG&E service area.

The following is quoted from our comments on the mid and late October PSPS report of SDG&E:

"*SDG&E received 25 complaints related to its October 20 – November 1st shutoff event as well as 77 claims for damages. This represents a complaint rate of 0.09% if we use the larger "Event 3" outage which affected 27,703 customers, and a claim rate of 0.28%.*

During SCE's October 24th shutoff, 30,521 customers were affected. However, only 12 complaints were received, and 40 claims, giving a customer complaint rate of 0.04% and a claim rate of 0.13%. PG&E's October 23-25th event affected 179,000 customers, and its October 26 and 29th shutoff events affected 941,000 customers. PG&E aggregated its complaints for these events and reported only 14 complaints, for a complaint rate of 0.0015%. It received 923 claims for the October 26-29th shutoff events and 22 claims for the October 23-25th event. Aggregating these claims and using the 941,000 affected customers (assuming that there is considerable overlap between customers subject to the two events), this gives a claims rate of 0.1%.

[129] MGRA Response to Mid and Late October SDG&E Shutoff Events; October 10, 2019; pp. 6-7.

The complaint rate for SDG&E is 2X larger than SCE's for the events evaluated, and 60X larger than PG&E's. The claims rates for PG&E and SCE are both approximately 0.1%. SDG&E's claims rate is almost 3X larger. The likelihood that the differences between SDG&E's, SCE's and PG&E's are the result of a statistical fluctuation vary from very unlikely (for SCE's complaint rate) to virtually impossible (for PG&E's complaint rate, and for claims rates for both SCE and PG&E).

SED needs to ask why SDG&E's customers are much more likely to complain about outages and request compensation than customers of SCE, and especially more than those of PG&E. The most likely answer will be that SCE and PG&E put hurdles in the way of customers who try to lodge complaints. PG&E, for instance, only reports complaints received by mail and by email, whereas SDG&E reports complaints received by phone. In order to determine whether PSPS was implemented in a reasonable way, SED should do a deep dive on the mechanisms used to allow customers to submit complaints and reimbursement requests.

As MGRA has repeatedly said: All California utility customers deserve equal treatment, rights, and protections. It is the CPUC's responsibility to ensure that every utility implements PSPS in a way that gives customers the right to raise complaints with their utility and request redress."[130]

These observations should clarify why the fraction of customer complaints is not a reliable capability/maturity metric.

Recommendation:
Coordinate with SED to ensure that the cause of lower numbers of complaints in SCE and PG&E service areas is investigated and understood.
Urgency: Immediate, so that this can be corrected for the upcoming fire season.

Recommendation:
Remove the question regarding customer complaint fraction, or
Alternative:

[130] Id.

Add a question to indicate whether the utilities are doing surveys to ascertain whether customers are able to complain or request relief.

Urgency:

By next update.

Recommendation:

If the question is kept, change the language to "During PSPS events, what percent of ***affected*** customers complain?" A large outage is likely to generate more complaints than a small outage.

Urgency:

By next update.

8. SUMMARY OF RECOMMENDATIONS

Recommendation:

WSD should arrange workshops to re-examine the templates and address quality issues. Should COVID-19 issues persist through the summer, WSD should examine what kind of online conferencing might support such workshops.

Urgency:

Within the next year.

Recommendation:

WSD should identify areas where utilities should work toward a common set of principles and approaches, and they or the Commission to drive programs to develop these approaches. Areas to be examined should include:

- Identification of climactic and vegetation zones requiring different utility wildfire mitigation approaches, and general agreement on these approaches.
- Examination of covered conductor in terms of effectiveness and risk/spend efficiency and means to accelerate deployment if it is advantageous.
- Factors driving proper tree trimming protocols.
- Approaches to catalogue the age, condition, and characteristics of all utility assets to be included in prioritization and risk analysis.

Urgency:

Prior to next major WMP revision.

Recommendation:

PG&E should report ignitions, not wildfires, in the same manner as SDG&E and SCE.

Urgency:

Immediate. Table 2 is missing required data and provision of this data should be a condition for plan approval.

Recommendation:

Outages/wires down/vegetation contact during high wind days (regardless of fire weather) is an indicator of system resiliency. This is especially true in light of the fact that PSPS will suppress these metrics during RFW days. WSD should suggest that outage / wires down / vegetation contact occurring for nearest weather station above a wind gust threshold be collected. Ideally, this could be collected for several thresholds (40-80 mph in 10 mph increments).

Urgency:

Next plan update.

Recommendation:

Remove Red Flag Warning – day – miles as a tracking metric, or supplement it with a wind speed metric.

Urgency:

Next major revison.

Recommendation:

WSD should replace the current 95^{th} / 99^{th} percentile wind gust metric with metrics tied to absolute wind scales. I would suggest 50 mph – 90 mph in 10 mph increments. Alternatively, the 95^{th}/99^{th} percentile values could be for the entire IOU service area. Since this will vary from utility to utility, though, results for different utilities would not be directly comparable. Regarding the current metric, it is prone to misinterpretation and should be removed.

Urgency:

Next plan update. A reliable wind speed metric would be very useful to have for a direct comparison between utilities, and it should not wait until the next major plan revisions.

Recommendation:

PG&E's MAVF risk estimates should represent real measured risk, and they should be limited by maximum foreseeable loss, not an arbitrary cap.

Urgency:

Needs to be addressed in PG&E's RAMP proceeding.

Recommendation:

PG&E would benefit by a predictive model for its loss distributions that uses a combination of 1) fire weather Monte Carlo selecting extreme weather event conditions from historical data 2) its OPW model to help predict increased ignition likelihood 3) fuel conditions informed by latest climatological data and fuel measurements, and 4) a "match-drop" simulation of fire spread for ignitions. PG&E can then compare results to its historical ignition for validation.

Urgency:

PG&E's MAVF model has severe shortcomings and these should be remedied prior to its upcoming RAMP proceeding.

Recommendation:

All utilities, especially SCE and SDG&E, should describe their MAVF and risk estimation process in adequate detail as part of their WMP filings. PG&E currently provides sufficient explanation.

Urgency:

Next plan update.

Recommendation:

WSD should request that the Commission initiate an S-MAP OIR proceeding according to OP5 of D.18-12-014 to address inconsistencies of utility approaches, and deviations between MAVF and other risk estimation methods. Full justification for this proposal can be found in Section 5.3.8.2. That section goes into technical detail regarding the inconsistencies that utilities are encountering between MAVF risk calculations and those using other methods, different methodologies used by different utilities, and it discusses the implications of power-law loss dependency and extreme tail risk.

Urgency:

Immediate, since sixteen months have already elapsed since the issuance of D.18-12-014 and processes developed in S-MAP need to be reviewed.

Recommendation:

WSD should determine whether the development of cost/benefit or RSE methodology that incorporates customer additional harm and risk due to PSPS should be developed within the WMP framework or through Commission mechanisms. If it is still a Commission matter, then WSD should request that the Commission act to drive the development of the cost estimation framework.

Urgency:

A cost framework incorporating all customer costs, harm, and risks from PSPS should be in place prior to the next major WMP revision.

Recommendation:

WSD should set a goal to move toward a common approach to FPI calculation, and identify best practices among the current utility approaches. To accomplish this, it should arrange workshops at which utilities would present and support their approaches.

Urgency:

Prior to next major WMP revision.

Recommendation:

SCE should improve its presentation and discussion regarding its FPI calculation so that it is comparable to the PG&E and SDG&E presentations.

Urgency:

Next WMP update.

Recommendation:

PG&E should provide the following data regarding its satellite wildfire detection system:
How many alerts are false alarms, or a non-wildfire source.
How many wildfires were detected by the satellite before and after the official reported incident time.

Urgency: Next update.

Recommendation:

SDG&E should provide a cost and safety justification for its choice of steel pole over other pole hardening mechanisms that achieve the same engineering standards, including wind loading.

Urgency:

Immediate. Since SDG&E was requested to provide this justification in the Commission's 2019 WMP review, and it fails to do so in the current WMP, it should be required to do so as a condition for 2020 WMP approval.

Recommendation:

SDG&E should provide a cost/benefit analysis for steel pole survivability, using historical wildfire data to estimate what fraction of wooden poles will be lost to fire over pole lifetime and how much savings could potentially be gained by using steel poles instead.

Urgency:

Next cycle, or immediate. Ideally, this kind of cost calculation should be performed as part of SDG&E's RAMP and GRC cycle. However, since choice of pole materials has safety implications it properly belongs under the WMP review, and it affects the RSE for this type of hardening. Note that it might be in SDG&E's interest to perform this calculation for the 2020 WMP, since if steel pole replacement makes sense from a purely economic standpoint (aside from any possible safety benefits) it would demonstrate reasonability as per the Commission's requirement in D.19-05-039.

Recommendation:

WSD should require utilities to state 1) how many wooden are poles adjacent to evacuation routes for limited egress communities 2) whether these poles are specifically targeted by hardening and undergrounding programs 3) how many poles they are removing and plan to remove as part of their hardening or undergrounding programs.

Urgency: Next plan update

Recommendation:

SDG&E should meet the requirements laid out in D.19-05-039 that it "*shall propose, in detail, guidelines for where a 25-footpost-trim clearance for vegetation management is both feasible and necessary*."[131]

Urgency:

Immediate. This is a Commission requirement for the 2020 WMP and should be provided prior to plan approval.

[131] p. 10.

Recommendation:

SDG&E should analyze its 2019 and 2020 PSPS damage data, collecting information on last trim distance, last clearance distance, tree-line distance, species, tree health, and tree height for every case of vegetation-line contact or damage occurring during PSPS events. It should perform contingency analysis to determine what mitigations would have prevented ignition in each case had the line been energized, including covered conductor and advanced technologies. It should also analyze wind conditions accompanying these contacts to determine appropriateness of de-energization threshold.

Urgency:

Prior to next plan update. As this will affect its mitigation strategy, SDG&E should perform this analysis as soon as possible.

Recommendation:

SDG&E should expand its covered conductor program, especially in the light of the fact that its RSE presented in its WMP is favorable. SDG&E should concentrate deployment of covered conductor in areas with large concentrations of native trees (such as oaks) and areas where a 25 foot trim will not be sufficient to mitigate branch-equipment contact.

Urgency:

Immediate. WMPs should be updated with more aggressive covered conductor strategy, or conversely a detailed explanation of why such a strategy would be unfeasible or inappropriate. This should be a condition of plan approval. This commitment needs to be in place prior to SDG&E's May 2021 RAMP filing.

Recommendation:

SDG&E should concentrate its 25 foot radius EVM trim and removal program on trees that are particularly fast-growing, particularly prone to ignition-causing failure (such as eucalyptus and sycamore), and those that show signs of disease or structural defects.

Urgency:

Immediate. This is the process that SDG&E suggests that it is currently following, but confirmation by WSD and SDG&E as part of plan approval would provide clear direction.

Recommendation:

WSD should request that SDG&E aggressively investigate alternative technologies that could be more effective in addressing tree fall-in risk and might thereby reduce or eliminate long term need for PSPS.

Urgency:

Immediate. WSD recommendation should be part of plan. SDG&E should be required to provide metrics from its R&D and pilot projects by its next plan update.

Recommendation:

PG&E should be required to provide a more granular breakdown of its programs into individual initiatives.

Urgency:

Immediate, in time for PG&E's RAMP proceeding.

Recommendation:

PG&E needs to do a full risk/RSE analysis for its full vegetation program. It can do this by estimating risk increase that would accompany a cut in program funding.

Urgency:

Immediate, in time for PG&E's RAMP proceeding

Recommendation:

SDG&E should attempt to expand its covered conductor program, especially in areas where it could help reduce risk otherwise requiring a 25 foot trim distance.

Urgency:

Next revision cycle and SDG&E RAMP in 2021.

Recommendation:

PG&E should conduct a risk/RSE calculation for its covered conductor program.

Urgency:

Immediate, in time for PG&E's RAMP proceeding.

Recommendation:

In lieu of a full understanding of the harms and risk arising from PSPS on customers, the RSEs calculated by utilities for their PSPS program should be ignored. A utility needs to demonstrate that its RSE incorporates external harm and risk before it is accepted.

Urgency:

Next full WMP. This is a difficult issue and the Commission or WSD should lead its resolution.

Recommendation:

The Commission or WSD should initiate a project to determine customer harm and risk so that costs of de-energization can be estimated and used in utility RSEs. This should not be utility-led, since utilities would face moral hazard to favor ignoring or downplaying risks, since they are unlikely to be held liable for secondary harms.

Urgency:

Within 6 months. MGRA has been advancing this proposal for some time, , and it may take significant investment of time and effort to implement it properly. The sooner it is started the sooner it will be completed.

Recommendation:

The Wildfire Safety Division should, in its proposed resolution, suggest that the Commission open an S-MAP OIR proceeding this year, in accordance with OP5 of D.18-12-014, to drive a resolution to the inconsistencies between utility risk estimates using RAMP and internal methods, and to explore mechanisms to better represent the risk of extreme "fat-tailed" risk distributions.

Urgency:

Immediate, since utility RAMP proceedings will be initiated yearly and a consistent and correct process for obtaining risk and efficiency estimates is of the utmost urgency.

Recommendation:

WSD should request additional information from the three major IOUs to help clarify whether there are significant differences between the weather models used and if so what their origin and implications are. If there are significant differences between models, WSD should host weather model workshops where meteorologists from the different utilities, WSD, and external experts can discuss improving the approach to utility weather modeling.

Urgency:

Response on existence and source of potential model differences should be provided prior to plan approval. Subsequent workshops, if necessary, should be held within the next year.

Recommendation:

WSD should request additional information from the three major IOUs to help clarify whether there are significant differences between the weather models used and if so what their origin and implications are. If there are significant differences between models, WSD should host weather model workshops where meteorologists from the different utilities, WSD, and external experts can discuss improving the approach to utility weather modeling.

Urgency:

Response on existence and source of potential model differences should be provided prior to plan approval. Subsequent workshops, if necessary, should be held within the next year.

Recommendation:

SDG&E should review Edison data and determine whether its 111 mph wind loading district should be extended to the Santa Ysabel area.

Urgency:

Prior to the next plan update.

Recommendation:

All IOUs should be required to provide 95th and 99th percentile exceedance wind data in the form of both modelled data and the form of point data from their weather station network. At first SCE and PG&E will not have the 10 year history that SDG&E has, but their results will improve over time.

Urgency:

Next plan update.

Recommendation:

All IOUs should be required to provide a GIS shapefile showing the wind loading districts that they apply for the sake of engineering, and the equivalent wind gust speed each corresponds to.

Urgency:

Next plan update.

Recommendation:

Utilities should state clearly and quantitatively the dependency of their risk-ranking model on outage-producing winds.

Urgency:

Next plan update.

Recommendation:

If utilities do not explicitly use outage-producing winds in their circuit risk rankings, they should include this dependency in a manner that represents the increased probability of outage due to extreme wind events. In particular, PG&E should incorporate its OPW model into its circuit risk ranking if it has not already done so.

Urgency:

Next major plan revision.

Recommendation:

Where highest-ranked circuits occur outside of known high wind areas, utilities should note the special characteristics of the circuit risk that justify the higher ranking.

Urgency:

Ideally, immediately since this is not burdensome.

By next update is acceptable.

Recommendation:

Both PG&E and SCE should be required to provide estimates of the fraction of infrastructure in their area that is likely to be built to a wind loading standard less than that suggested by their "known local conditions" wind loading studies.

Urgency:

SCE, prior to next plan update.

PG&E, immediately, so as to incorporate any programs into its 2020 RAMP submission this summer.

Recommendation:

WSD should reformulate C.II.a or add a new questions of the following type:

What fraction of the distribution circuits in the HFTD are built to a wind loading standard less than that of the known local conditions (50 year return interval)?

i. >50% ii. 20-50% iii. 10-20% iv. <10% v. None

If there are circuits built to wind loading less than known local conditions in the HFTD, what is the time line for rebuilding them to wind loadings sufficient to handle known local conditions (50 year return interval)?

i. No plan ii. > 5 years iii. 2-5 years iv. 1-2 years v. Already complete

Urgency:

Next plan update.

Recommendation:

Coordinate with SED to ensure that the cause of lower numbers of complaints in SCE and PG&E service areas is investigated and understood.

Urgency: Immediate, so that this can be corrected for the upcoming fire season.

Recommendation:

Remove the question regarding customer complaint fraction, or

Alternative:

Add a question to indicate whether the utilities are doing surveys to ascertain whether customers are able to complain or request relief.

Urgency:

By next update.

Recommendation:

If the question is kept, change the language to "During PSPS events, what percent of ***affected*** customers complain?" A large outage is likely to generate more complaints than a small outage.

Urgency:

By next update.

APPENDICES - MGRA DATA REQUESTS

PG&E Data Requests

PG&E – MGRA – Data Request Response 4

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q01		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs and are an attempt to provide insight into the relationship between utility risk prioritization and "risk-spend efficiencies". They are constructed in a manner intended to minimize burden, but nevertheless may require certain calculations be re-run with selected or filtered data. While adherence to the "three-day" response time is applicable to this phase of the proceeding, MGRA is willing to provide clarification and discuss technical issues, potentially including alternative proposals.

QUESTION 01

Does your utility rank individual circuits in the HFTD in terms of wildfire ignition risks?

ANSWER 01

PG&E has developed a relative risk ranking for all the individual transmission and distribution circuits in the utility service territory, including those in the HFTD. There is a separate ranking for transmission circuits and distribution circuits. The risk rankings are a function of multiple sub-components, one of which is wildfire risk.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q02		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q02		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs and are an attempt to provide insight into the relationship between utility risk prioritization and "risk-spend efficiencies". They are constructed in a manner intended to minimize burden, but nevertheless may require certain calculations be re-run with selected or filtered data. While adherence to the "three-day" response time is applicable to this phase of the proceeding, MGRA is willing to provide clarification and discuss technical issues, potentially including alternative proposals.

QUESTION 02

Does your utility use a wildfire risk ranking to prioritize circuits in the HFTD for remediation and improvements, and if so, which measures (hardening, enhanced vegetation management, etc.)?

ANSWER 02

PG&E uses the relative risk ranking to prioritize circuits in the HFTD for remediation and improvements. Specifically, the relative circuit risk ranking is an input to PG&E's annual Electric Operations detailed workplan, which outlines resourcing and scheduling for all planned Electric Operations work, including system hardening, enhanced vegetation management, maintenance, etc.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q03		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs and are an attempt to provide insight into the relationship between utility risk prioritization and "risk-spend efficiencies". They are constructed in a manner intended to minimize burden, but nevertheless may require certain calculations be re-run with selected or filtered data. While adherence to the "three-day" response time is applicable to this phase of the proceeding, MGRA is willing to provide clarification and discuss technical issues, potentially including alternative proposals.

QUESTION 03

Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?

ANSWER 03

PG&E tracks multiple sub-components as part of its circuit risk ranking model. Specifically, PG&E has separate wildfire, capacity, reliability, PSPS, and safety risk sub-scores, which are combined to develop a single circuit risk score and ranking.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q04		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions assume that a circuit risk ranking (or rankings) is in place. If your utility does not prioritize circuit remediation based on risk, no response is necessary and you can move to the next section.

QUESTION 04

Please provide a tabular listing of HFTD circuits in descending order of internal risk ranking, with the highest risk circuit listed first. If there is a numerical risk score associated with each circuit, include it as a second column. In the event that multiple internal risk scores are used by utilities to prioritize remediation of different wildfire risks independently, please provide additional tables showing the HFTD circuits sorted in descending order of risk for each applicable risk metric and include applicable score as a second column.

ANSWER 04

Although PG&E includes several sub-components when modeling relative circuit risk ranking, work is not necessarily prioritized based on these individual components.

Please see the attached file for lists of PG&E distribution and transmission circuits in descending rank order (i.e., ordered from highest risk to lowest risk).

WildfireMitigationPlan_DR_MGRA_004-Q4-Atch01_CONF is confidential and will be provided upon the execution of a signed PG&E Non-Disclosure Agreement.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q05		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q05		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

Continuing, the following questions will require a recalculation of risk scores and risk-spend efficiencies as listed in Table 21-26 for two sets of data:

Set 1: Calculation is limited to using only 50% of the HFTD circuits having the HIGHEST internal risk ranking.

Set 2: Calculation is limited to using only 50% of the HFTD circuits having the LOWEST internal risk ranking.

In the event that different internal circuit risk rankings are used to prioritize different remediations, apply the above using the ranking most applicable to the Initiative Activity (Column 1).

QUESTION 05

Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the HIGHEST internal risk ranking (Set 1) for the following Initiative Activities:

Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs -Surge Arrestor, Distribution Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management Table 26 - 5-1 PSPS events and mitigation of PSPS impacts – Distribution.

ANSWER 05

PG&E does not estimate RSEs on a circuit-by-circuit basis, rather the utility estimates RSEs on an HFTD-wide basis. Currently, mitigation effectiveness in HFTD is the same across all circuits, even though some circuits may have higher/lower risk levels. Risk ranking comes into play when determining work prioritization.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q06		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q06		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

Continuing, the following questions will require a recalculation of risk scores and risk-spend efficiencies as listed in Table 21-26 for two sets of data:

Set 1: Calculation is limited to using only 50% of the HFTD circuits having the HIGHEST internal risk ranking.

Set 2: Calculation is limited to using only 50% of the HFTD circuits having the LOWEST internal risk ranking.

In the event that different internal circuit risk rankings are used to prioritize different remediations, apply the above using the ranking most applicable to the Initiative Activity (Column 1).

QUESTION 06

Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the LOWEST internal risk ranking (Set 2) for the following Initiative Activities:

Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs -Surge Arrestor, Distribution Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management Table 26 - 5-1 PSPS events and mitigation of PSPS impacts – Distribution.

ANSWER 06

See response to WildfireMitigationPlans_DR_MGRA_004-Q05.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q07		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q07		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply all major IOUs.

QUESTION 07

Table 10 contains 95th and 99th percentile wind conditions, defined as circuit mile days with wind gusts over the specified percentile. Please describe in some detail how these numbers are derived. For instance, in your analysis, do you calculate

- circuit miles for wind speeds above the Xth percentile on that particular circuit given wind speeds at nearest weather station using data from that weather station,

or

- circuit miles when wind speeds at the nearest weather station exceed the X^{th} percentile over the entire wind speed history of the entire weather station network,

or

- some other method to calculate the circuit mile days?

ANSWER 07

Another method was used to calculate this information based on a historical analysis using PG&E's high-resolution weather and fuels climatology. Please see the notes under table 10 in PG&E's 2020 WMP on page 3-2, specifically note A.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q08		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q08		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only

QUESTION 08

The following documents were provided to Center for Environmental Justice (CEJA) under a non-disclosure agreement (NDA). Please provide a full justification to potentially be used in a confidentiality determination as to why the following documents cannot be disclosed publicly. Alternatively, please provide the documents.

- WildfireMitigationPlans_DR_CEJA003_Q02-Atch01.pdf (VMQA Distribution Audit Procedure)
- WildfireMitigationPlans_DR_CEJA003_Q02-Atch02.pdf (VMQA Distribution Audit Procedure)
- WildfireMitigationPlans_DR_CEJA003_Q02-Atch04.pdf (RISK-6310P-02: Electric Asset Wildfire Safety Program Quality Procedure)
- WildfireMitigationPlans_DR_CEJA003_Q02-Atch05.pdf (RISK-6310S-02: Wildfire Safety Inspection Program Quality Plan)
- WildfireMitigationPlans_DR_CEJA003_Q02-Atch06.xlsx (Approved Sampling Calculator)
- WildfireMitigationPlans_DR_CEJA003_Q02-Atch07 (Vegetation Management Quality Verification)

ANSWER 08

PG&E is changing the confidential designation for these documents and is attaching them here as public documents.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q09		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q09		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

With regard to Table 1-1 (p. 2-5) regarding inspection findings, please explain the following anomalies in the historical data:

QUESTION 09

Regarding Level 1 findings in the HFTD, the value for 2017 is over 100X that seen in 2015 and 2016. They then drop by approximately a factor of 4 from 2017 to 2018 and 2019. How can this be explained?

ANSWER 09

Table 1-1 of the 2020 WMP sets forth only "grid condition findings" from routine inspections, not other sources of tags, such as tags identified by T-men in the field or through the WSIP program in 2019. As a result, the increase in Level 1 findings in 2017 resulted from a shift from inspectors using paper forms to mobile technology to generate tags. Prior to 2017, if an inspector identified a Level 1 finding, he would fill out a paper form and the responding T-men or crew would usually enter the issue into their device. As a result, many pre-2017 Level 1 findings appeared to be generated by T-men, not inspectors. In 2017 with the shift to mobile technology for inspectors, the Level 1 tags more accurately reflected tags identified by inspectors. The decrease after 2017 may be attributable to inspection cycles (2017 vs 2018 inspection volumes) or a shift in tags identified through the WSIP in 2019.

.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q10		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q10		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

With regard to Table 1-1 (p. 2-5) regarding inspection findings, please explain the following anomalies in the historical data:

QUESTION 10

Regarding Level 2 and 3 findings in the HFTD, these increased by approximately a factor of 10 in 2019 above previous values. Please discuss whether or confirm that this increase is due to the detailed inspection program discussed in Section 5. Is it expected that Level 2 and Level 3 findings will decrease in future years or will they remain at an elevated level?

ANSWER 10

There are several contributing factors to this trend, many of which are components of PG&E's Wildfire Safety Inspections program. Starting in 2019:

- Inspection criteria were more prescriptive and extended beyond baseline compliance (e.g., FMEA focused on ignitions)
- Tools use was governed by explicit mobile application checklists, in addition to employee training
- More conservative internal guidance was issued to inspectors (report anything and everything)
- Internal guidance limited the discretion of Gatekeepers to extend or re-prioritize Level 3 findings, even if prior practices would have permitted such
- Timelines were more set more aggressively (e.g., GO 95 Rule 18 HFTD durations)
- Additional visual inspection methods were deployed (e.g., drone, helicopter, climbing, ground-based)
- For transmission inspections, each inspection finding was created as a unique corrective notification. In the past, corrective maintenance may have been nested or coupled into a single corrective notification in SAP.

In future years, assuming inspection criteria and governance remain stable and repeat inspections occur as proposed[1], the level of findings is anticipated to decrease. For 2020, the

1 PG&E currently plans inspection frequency of once per year for assets in HFTD Tier 3, once every 3 years for assets in HFTD Tier 2, and once every 5-6 years for assets in non-HFTD areas.

initial Level 2 and Level 3 “find rates” in non HFTD are expected to approach similar levels as the "find rates" of the initial WSIP 2019 program due to the changes noted above.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q11		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q11		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

With regard to Table 1-1 (p. 2-5) regarding inspection findings, please explain the following anomalies in the historical data:

QUESTION 11

Regarding Table 2, Items 4a, 4b, and 7-10f, the ignition data provided by PG&E supposedly is for wildfire ignitions only, i.e. larger than 10 acres (p. 2-19). This is a small subset of the data provided to the CPUC in accordance with D.14-02-015.

This is at variance with the data reported by the other utilities and is not the data requested by WSD.

Please provide an updated Table 2 including all relevant HFTD ignition data provided in compliance with D.14-02-015, and recalculating metrics associated with those ignitions.

Note: This appears to be a significant omission in the PG&E report. If PG&E receives permission from WSD to provide an errata to its Table 2, MGRA would consider this data request satisfied.

ANSWER 11

PG&E objects to MGRA's interpretation of the information requested in the WMP Guidelines for Table 2, Items 4a, 4b, and 7-10f. MGRA asserts that the WMP Guidelines for Table 2, Items 4a, 4b, and 7-10f indicate that all request information about ignitions should be aligned with the annual fire incident reports provided to the CPUC in accordance with D.14-02-015. Under D. 14-02-015, utilities provide annual fire incident reports, which include fires that traveled just one linear meter from the ignition point. However, Table 2, Items 4a, 4b, and 7-9b requests data regarding "utility-ignited wildfire," and Table 2, Item 10a-f seeks information regarding "utility wildfire ignitions." The Glossary of Defined Terms provided with the WMP Guidelines specifically defines a utility-ignited wildfire as "[w]ildfires ignited by utility infrastructure or employees . . ." but does not indicate that all fire ignitions qualify as a "wildfire". As shown by WMP Guidelines, Table 11, the WSD specified "ignition" when seeking information about all ignitions from one linear meter and up. Therefore, PG&E interpreted a difference between the population of "wildfires" to be leveraged for Table 2 from the population of "ignitions" used in Table 11 (and others). Subject to that objection, PG&E responds as follows:

For Table 2, Items 4a, 4b, and 7-10f, PG&E provided the requested information by providing data on utility-ignited wildfires, which PG&E interpreted as a fire greater than 10 acres consistent with CAL FIRE's definition and available data.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q12		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q12		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

Regarding Table 7, PG&E states that it is currently using two models to calculate the potential impact of ignitions. One is the "S-MAP conforming model" and the other is the computational wildfire spread modelling performed by Reax. Additionally, PG&E states that it is also using a third model developed by Technosylva.

QUESTION 12

Which of the three models used by PG&E most accurately represents the impact of potential ignitions, and why?

ANSWER 12

The three models mentioned are not perfect substitutes for one another, and the models have inherently different use cases from one another. Wildfire simulation models like REAX and Technosylva focus on the potential consequence of a wildfire should an ignition take place under a *specific set of extreme environmental conditions*. This type of modeling is better suited to inform *operational decision making* (e.g., determining whether or not a transmission circuit should be de-energized during a PSPS).

The S-MAP conforming model accounts for both the frequency of ignitions and the potential outcomes of such ignitions, and estimates the system-wide impact of risk-mitigation initiatives and ignitions *over the course of a year*. This model better reflects the *system-level risk* across PG&E's territory under *various weather conditions*. This model further breaks down into various system-level tranches and outcomes to better account for differences across PG&E's system. This type of system-level modeling is best served for *evaluating risk-mitigation investments* (e.g., estimating the risk reduction of a $500k investment in covered conductor), and the model is not built to assess individual, ignition-specific scenarios.

Thus, the S-MAP conforming model is best used to evaluate the overall Risk, RSE, and mitigation program effectiveness. PG&E is working to improve RSE estimation inputs, but the ability to integrate fire spread models into this process is still years away.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q13		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q13		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

Regarding Table 7, PG&E states that it is currently using two models to calculate the potential impact of ignitions. One is the "S-MAP conforming model" and the other is the computational wildfire spread modelling performed by Reax. Additionally, PG&E states that it is also using a third model developed by Technosylva.

QUESTION 13

Which of these models have been used to calculate risk and risk/spend efficiencies in Tables 22-26?

ANSWER 13

The S-MAP model was used to calculate the risk mitigation and risk-spend efficiency figures in Tables 22-26. This is consistent with CPUC guidance related to risk-spend efficiency.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_004-Q14		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_004-Q14		
Request Date:	March 3, 2020	Requester DR No.:	004
Date Sent:	March 9, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

Regarding Table 7, PG&E states that it is currently using two models to calculate the potential impact of ignitions. One is the "S-MAP conforming model" and the other is the computational wildfire spread modelling performed by Reax. Additionally, PG&E states that it is also using a third model developed by Technosylva.

QUESTION 14

If the model used to calculate Risk and RSE is not what PG&E considers the most accurate, how would using the most accurate affect the values calculated for Risk and RSE? Please use Table 23, Item 17-1. *Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution* as an example.

ANSWER 14

The S-MAP conforming model is the most appropriate, accurate currently available model to estimate initiative risk mitigation and RSE. Please see the response to question 12 for more details.

PG&E – MGRA – Data Request Response 5

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q01		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 20, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs.

QUESTION 01

Please provide a full definition of the Fire Potential Index (FPI) used by your utility or provide relevant citations.

ANSWER 01

The definition and history of the development of PG&E's Fire Potential Index is explained in great detail on pages 4-10 to 4-12 and 5-98 to 5-102 of PG&E's 2020 WMP. A high level summary of these sections is provided here for the user.

PG&E Fire Potential Index (FPI) model (2019) is a model which combines weather (wind, temperature, and relative humidity) and fuels (10-hour dead fuel moisture, live fuel moisture, and fuel type [grass, shrub/brush, timber]) into an index that represents the probability for large fires to occur. The model is based upon utility best-practices and is intended to the capture the largest drivers of large fire growth.

The FPI index represents the probability for small fires to become large incidents. The FPI data, along with data from other weather models, helps inform many operational decisions as discussed in the WMP.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q02		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q02		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 20, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs.

QUESTION 02

Provide a quantitative description how estimated peak wind gust speed (determined through either modelling or measurement) affects the Fire Potential Index.

ANSWER 02

The FPI increases as wind speed increases. A graph illustrating the dependence of wind speed on the FPI is presented in the attachment WildfireMitigationPlans_DR_MGRA_005-Q02-Atch01.xlsx, using hypothetical scenarios with all inputs to the FPI held constant while wind speed varies from 0 – 50 mph. For more information about the FPI, see the answer to MGRA Data Request No. 5, Question 1.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q03		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs.

QUESTION 03

Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?

ANSWER 03

Please see PG&E's response to MGRA_004, question 3.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q04		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following questions are being asked of all three major IOUs.

QUESTION 04

For your vegetation management program, please list the following summary data for customer refusals between 2015 and 2019:

a) Total number of refusals

b) Number of refusals resolved by customer outreach

c) Number of refusals resolved by forced action, such as court orders

d) Number of refusals resolved by other means

e) Number of refusals unresolved (or no trim)

f) Average time between customer refusal and final trim

ANSWER 04

a. PG&E Vegetation Management inspected approximately 50,558 trees on properties where some or all inspection or tree work was refused as part of Routine Maintenance in 2019. There were approximately 340 refusal locations in 2019 for Vegetation Control, which is the program that performs brush clearing around the base of subject poles per PRC 4292. For EVM in 2019, there were approximately 41,879 refusal trees.
b. For Routine Maintenance in 2019, there were approximately 47,695 refusal trees resolved by customer outreach. For EVM in 2019, there were 20 refusal trees resolved by customer outreach.
c. While PG&E does perform “forced action” refusal resolution for Routine Maintenance, such as civil standby, we do not currently track these nor know how many were performed in 2019. For EVM in 2019, there were zero refusals resolved by “forced action”.
d. Currently, there are no “other means” by which PG&E Vegetation Management resolves refusals.
e. For Routine Maintenance there were approximately 2863 refusal trees not resolved in 2019. For EVM, there were approximately 41,859 refusal trees not resolved in 2019.

f. Average time between customer refusal and final trim was about 65 days on average for Routine Maintenance. For EVM in 2019, it is about 249 days on average for the 20 refusals that were resolved.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q05		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q05		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 05

Regarding Table 17, why is PG&E not setting hardening targets for 2021 and 2022?

ANSWER 05

Table 17 segments system hardening initiatives by urban, rural, and highly rural areas and by HFTD zone. Since PG&E does not yet have precise work locations for all future system hardening projects, the utility cannot populate the table with 2021 and 2022 hardening mileage by location, hence the TBDs provided in table 17. However, information on 2021 and 2022 overall system hardening mileage targets are provided in Attachment 1, Table 23, initiative number 17-1.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q06		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q06		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 20, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 06

On page 4-10 of PG&E's WMP, it states that: ***"The enhanced PG&E FPI, which was operationally deployed in 2019, combines weather (wind, temperature, and relative humidity) and fuels (10-hour dead fuel moisture, live fuel moisture, and fuel type [grass, shrub/brush, timber]) into an index that represents the probability for large fires to occur."***

Please provide the outcome of the statistical analysis that justified the choices of the variables going into the FPI.

ANSWER 06

Classification and regression statistical model approaches for FPI were evaluated on models predicting final fire size and the rate of spread. The final FPI model candidate is a classification approach on the final fire size predicting the probability of a large fire. Over 4000 FPI model candidates were evaluated. The candidates were made up of combinations of subsets of weather, fuels, fire indices, and other features. The feature combinations were created based on meteorology and fire science expertise and literature review. Feature engineering included encoding categorical features, standardization of continuous features, and principal component analysis of related subsets of features. Regularization (Ridge, Lasso and Elastic Net) is used to support feature selection and interpretation. Regularization modifies the loss function adding a penalty for non-zero coefficients as the penalization constant increases. The final FPI model selection was chosen from the evaluation of model configurations across the model candidates based on both the evaluation performance metrics and the model suitability for operations. The metrics used to evaluate model performance were the Area Under the Receiver Operating Characteristic curve (ROC AUC) and the Average Precision (a more conservative measure to the Area under Precision-Recall curve). Both cross validation, and a train-validation-test splits were used. For model selection, the evaluation performance metrics are evaluated for models trained on the train set, and evaluated on the validation set. Cross validation within the train set is used for hyper-parameter tuning. Inspection of cross-validation performance results for each fold also allows for the interpretation of the stability of the model performance to be assessed. Model suitability for operations considerations included interpretability of

individual features in the FPI model, and allowing for real time hourly forecasts relating back to PG&E's operational Numerical Weather Prediction model, POMMS. FPI is a complex model and requires meteorological and fire science support to support interpretation. It is thus important that each feature of the model is directly interpretable and is able to be validated against observations and experience of operational meteorologists and fire scientists.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q07		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q07		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 07

Please provide the data underlying Figure 4-3 (Diablo wind events) in a GIS file.

ANSWER 07

Please see attachment WildfireMitigationPlans_DR_MGRA_005-Q07-Atch01.kml.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q09		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q09		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 09

With regard to the Fire Action Scheme and Technology (DTS-FAST) system described in 5.1.D.3.7, describe the sensing technology that allows objects to be detected prior to power line impact.

ANSWER 09

PG&E objects to this question as the DTS-FAST project constitutes commercially sensitive, proprietary technology that PG&E has developed internally and is currently in the pilot phase. Premature disclosure of the specifics of this emerging technology could irreparably damage PG&E's intellectual property rights.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q10		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q10		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 10

Has PG&E tested the REAX model against the Technosylva fire spread models, and if so, please provide the results of this comparison.

ANSWER 10

A direct comparison between the two models has not been performed to date as the results are not directly comparable. PG&E's deployment of the REAX model involves probabilistic fire spread results while Technosylva's results are deterministic at this time. For more information about the models, please see PG&E's answer to the Public Advocates Office Data Request Set # 21, Question 4, WildfireMitigationPlans_DR_CalAdvocates_021-Q04

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q11		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q11		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 11

Describe the experimental setup for simulated tree strike tests described in 5.3.3.6. Is the tree strike test derived from an industry standard?

ANSWER 11

As discussed in section 5.3.3.6 of the 2020 WMP, in 2019 PG&E performed simulations of tree strikes on electric distribution overhead assets. These simulated tests were performed by PG&E's Applied Technology Services (ATS) department. Finite element analysis (FEA) modeling software was used to simulate tree strikes and the overhead assets' response to those strikes. The ATS team simulated tree strikes on various systems with varying pole types / materials. The FEA models used for this simulated testing were developed by PG&E's ATS engineers as PG&E is not aware of industry standards for such a test / simulation today.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q12		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q12		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 12

Please provide examples for which a combination of EVM and covered conductor would not prevent ignition.

ANSWER 12

Examples of historical ignition drivers that may not be mitigated on a circuit where a combination of EVM and covered conductor have been completed include:

- Some 3rd party ignition drivers including “car pole” incidents (vehicles hitting power poles)
- Failures of large trees or branches that are outside the EVM program scope (the EVM program generally targets trees that are dead, dying or are otherwise visibly compromised, trees that are visibly healthy can still fail and impact powerlines)
- Some animal caused outages

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q13		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q13		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 13

Regarding PG&E's data request response WSD_001-Q20- PGE-43879-Z-114, the Potential Arcing columns are blank. Please provide update with these filled in if available, otherwise provide an explanation of why they are not available.

ANSWER 13

When assessing PSPS damages found, collecting arcing data was not standard practice prior to the 10/9/2020 PSPS event. PG&E is providing an updated 10/9/2020 PSPS damage report to include remaining arcing data not previously provided (see attachment WildfireMitigationPlans_DR_MGRA_005-Q13-Atch01).

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q14		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q14		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 20, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 14

Regarding PG&E's data request response WSD_001-Q24-PGE-43879-Z-118, this entire response was classified as confidential. Please provide a non-confidential file containing: Outage producing winds, Egress, VM outage files, or provide justification for confidentiality.

ANSWER 14

The response was deemed confidential because the files contain data and information on the physical location and characteristics of PG&E's electric system which is believed to pose certain safety risks if publicly released. Therefore, this is sensitive and proprietary information that can only be provided to parties who sign an NDA with PG&E regarding this information.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q15		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q15		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 15

Regarding PG&E's data request response WSD_001-Q38-PGE-43879-Z-132, the attachment contains only prevailing wind direction and not wind speed. Please provide a corrected file.

ANSWER 15

Please see attachment WildfireMitigationPlans_DR_MGRA_005-Q015-Atch01.zip for wind speed.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q16		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q16		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 19, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 16

Regarding PG&E's data request response WSD_002-Q006-PGE-43895-D-286, are the quoted times for the Kincade fire start PDT rather than UTC? The time quoted by PG&E is many hours before the start time reported by CALFIRE.

ANSWER 16

The time and GPS coordinates submitted for Kincade Fire in the response for WSD_002-Q006-PGE-43895-D-286 are incorrect. The correct timestamp and GPS coordinates for Kincaid satellite detection are:

Date/Time: 10/24/2019 4:36 AM (UTM/Zulu) (10/23/19 09:36PM PDT)

GPS Coordinates : 38.816, -122.769

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q17		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q17		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 17

Regarding PG&E's data request response WSD_002-Q019-PGE-43895, does PG&E use its Outage Producing Wind model results as an input to its Tag Risk score? If not, why not?

ANSWER 17

PG&E does not use Outage Producing Winds as in input to its Wildfire Risk Score for tags, because the Outage Producing Wind model is used for an input to a specific wind event. The Wildfire Risk Score includes Asset Failure Ignition Risk which is primarily driven by historical asset failure data which takes into account the affect of wind related asset failures.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q18		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q18		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 18

Regarding PG&E's data request response TURN_009-Q04, do any of the risk variables take into account the wind speed conditions at the point of failure, such as the Outage Producing Wind model?

ANSWER 18

Wind score based on the GIS climate layer was considered as part of the independent variables used to calculate the likelihood of failure. This was not however found to be a significant variable in predicting the dependent variable and excluded from the final calculation.

Furthermore, the Reax score developed by Reax Engineering was used as part of the calculation for the likelihood of wildfire spread. Factors used to develop the Reax score included Weather and Wind conditions.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_005-Q19		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_005-Q19		
Request Date:	March 18, 2020	Requester DR No.:	005
Date Sent:	March 23, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following data requests apply to PG&E only.

QUESTION 19

Restatement of MGRA_PGE_DR4_Q7. PG&E response was "Please see the notes under table 10 in PG&E's 2020 WMP on page 3-2, specifically note A.". Note a) states that: "Analysis is based on PG&E's 30-year weather and fuels climatology at 3 km spatial and hourly temporal resolution from 1989 – 2018." Further clarification is necessary.

Did PG&E estimate whether a circuit-mile point was above the 95% or 99% threshold based on 1) the grid data for the nearest point's 30 year weather climatology or 2) the maximum levels reached over the entire landscape in the 30 year weather climatology or 3) some other mechanism (please specify).

ANSWER 19

Method 1 (nearest grid point) was used. To be specific, this information is based on a historical analysis using PG&E's high-resolution 30-year weather climatology. The number of overhead line miles was calculated for each 3 x 3 km grid cell of the model used to construct the climatology. The wind data were then processed by each grid cell to determine the historical distribution of wind speed for each across the 30 years. For each year requested, PG&E counted the number of days each grid cell exceeded its 95th and 99th percentile wind speed value and then related this information back to the overhead circuit miles mapped to each grid cell.

PG&E – MGRA – Data Request Response 6

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_006-Q01		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_006-Q01		
Request Date:	March 26, 2020	Requester DR No.:	006
Date Sent:	March 31, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following question is being asked of all three major IOUs.

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts.

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 01

How are the foreseeable wind conditions calculated that are used for wind loading requirements? (a reference is acceptable).

ANSWER 01

Please see WildfireMitigationPlans_DR_MGRA_006-Q01-Atch01

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_006-Q02		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_006-Q02		
Request Date:	March 26, 2020	Requester DR No.:	006
Date Sent:	March 31, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following question is being asked of all three major IOUs.

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts.

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 02

What return interval is used to estimate maximum wind speed for wind loading purposes?

ANSWER 02

50 year of wind gust data (wind Gust is typically about 20% higher than sustained Wind Speed).

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_006-Q03		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_006-Q03		
Request Date:	March 26, 2020	Requester DR No.:	006
Date Sent:	March 31, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following question is being asked of all three major IOUs.

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts.

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 03

What fraction of the distribution circuit miles in the HFTD are built to a wind loading standard less than that of the known local conditions? Note: This will include circuits built to the 56 mph wind loading standard unless known local conditions for said circuits indicate that 56 mph wind gust speed will not be exceeded.

ANSWER 03

Objection. This discovery request is overly burdensome. PG&E does not have a prepared quantification of the number of circuit miles built to a specific loading standard less than that of the known local conditions. Preparing this type of quantification would require identification of the date of construction or reconstruction of each structure of the approximately 30,000 circuit miles in the HFTD areas. Then the date of construction for each circuit mile would need to be correlated to the applicable standards to determine the then-applicable wind loading criteria the assets would have been built to and a comparison to the known local condition. This effort would take substantial time and effort to prepare, and PG&E does not have such an analysis completed. Subject to such objection, PG&E responds as follows:

PG&E designs its facilities to satisfy wind loading criteria in effect at the time of construction, including those set forth in CPUC General Order 95, Rule 43. In addition to meeting GO95, Rule 43's wind loading requirements, PG&E also designs distribution lines to the high wind area criteria in accordance with engineering Bulletin TD-015203B-002, "High Wind Area Criteria for Distribution Wood Poles." PG&E issued Bulletin TD-015203B-002, "High Wind Area Criteria for Distribution Wood Poles" in December 2014. This bulletin requires that newly built or reconstructed electric distribution wood poles located in designated fire protection areas that are subject to high winds shall be

increased in size by a minimum of one class above the size determined by performing a pole loading calculation. Similar to a portion of the transmission line practice, the high wind areas for distribution were defined as those areas where the historical peak wind speed exceeds 70 mph. Under GO 95, if distribution facilities are underbuilt on a transmission structure, transmission wind loading standards apply to the support structure or pole.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_006-Q04		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_006-Q04		
Request Date:	March 26, 2020	Requester DR No.:	006
Date Sent:	March 31, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following question is being asked of all three major IOUs.

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts.

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 04

If there are circuits currently not built to the expected wind loading taking in to account local conditions, are these circuits scheduled for rebuilding/hardening? If so, please provide an estimated timeline.

ANSWER 04

See response to MGRA_006, question 3.

PACIFIC GAS AND ELECTRIC COMPANY
Wildfire Mitigation Plans
Rulemaking 18-10-007
Data Response

PG&E Data Request No.:	MGRA_006-Q05		
PG&E File Name:	WildfireMitigationPlans_DR_MGRA_006-Q05		
Request Date:	March 26, 2020	Requester DR No.:	006
Date Sent:	March 31, 2020	Requesting Party:	Mussey Grade Road Alliance
PG&E Witness:		Requester:	Joseph W. Mitchell, Ph.D.

The following question is being asked of all three major IOUs.

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts.

D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 05

What are the units for the raster values in the GIS file containing the 95% and 99% wind speeds for 2014-2018?

ANSWER 05

Units for the raster values in the GIS file containing the 95% and 99% wind speeds are in meters per second.

SCE Data Request Responses

SCE – MGRA – Data Request Response 4

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 001:
Does your utility rank individual circuits in the HFTD in terms of wildfire ignition risks?

Response to Question 001:
SCE uses predictive analytics to quantify the probability of ignition at the individual structure (e.g., pole) level. These probabilities can be aggregated to the segment and circuit level, thereby allowing for circuit, segment, or individual structure rankings.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 002:
Does your utility use a wildfire risk ranking to prioritize circuits in the HFTD for remediation and improvements, and if so, which measures (hardening, enhanced vegetation management, etc.)?

Response to Question 002:
Yes, wildfire risk rankings are used for system hardening, overhead inspections, and vegetation management. These rankings for overhead inspections and vegetation management are for activities that extend beyond mandated compliance cycles/requirements.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 003:
Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?
The following questions assume that a circuit risk ranking (or rankings) is in place. If your utility does not prioritize circuit remediation based on risk, no response is necessary and you can move to the next section.

Response to Question 003:
SCE calculates risk for individual assets (wire and components, switches, transformers, and capacitors). The individual risks calculated for these assets are equipment failure, and contacts from foreign objects including animal, balloon, vegetation, vehicles, and other. These individual risks can be aggregated or isolated to the specific location of the asset, the segment, or the circuit as needed.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 004:
Please provide a tabular listing of HFTD circuits in descending order of internal risk ranking, with the highest risk circuit listed first. If there is a numerical risk score associated with each circuit, include it as a second column. In the event that multiple internal risk scores are used by utilities to prioritize remediation of different wildfire risks independently, please provide additional tables showing the HFTD circuits sorted in descending order of risk for each applicable risk metric and include applicable score as a second column.

Response to Question 004:
SCE is providing an export of our wildfire risk model as of 3/6/2020 showing circuit risk from high to low. Although operational considerations may require prioritization of certain remediations, they can deviate slightly from this ranking as the ranking serves as the starting point for most mitigation decisions.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Gary Cheng
Job Title: Senior Advisor
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 005:
Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the HIGHEST internal risk ranking (Set 1) for the following Initiative Activities: Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution

Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs - Surge Arrestor, Distribution Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management Table 26 - 5-1 PSPS events and mitigation of PSPS impacts - Distribution

Response to Question 005:
SCE objects to "…the following questions will require a recalculation of risk scores and risk-spend efficiencies" on the grounds that new analysis/recalculation is outside the scope of a discovery/data request process.

SCE calculated RSEs at the system level, which is discussed in Section 5.3 of our 2020-2022 WMP, and has not done so at a more granular level than what has been provided.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Gary Cheng
Job Title: Senior Advisor
Received Date: 3/5/2020

Response Date: 3/9/2020

Question 006:
Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the LOWEST internal risk ranking (Set 2) for the following Initiative Activities: Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs - Surge Arrestor, Distribution Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management Table 26 - 5-1 PSPS events and mitigation of PSPS impacts - Distribution

Response to Question 006:
Please see SCE's response to MGRA-SCE-004, Question 5.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/5/2020

Response Date: 3/9/2020

Question 007:
Table 10 contains 95th and 99th percentile wind conditions, defined as circuit mile days with wind gusts over the specified percentile. Please describe in some detail how these numbers are derived. For instance, in your analysis, do you calculate - circuit miles for wind speeds above the Xth percentile on that particular circuit given wind speeds at nearest weather station using data from that weather station, or - circuit miles when wind speeds at the nearest weather station exceed the Xth percentile over the entire wind speed history of the entire weather station network, or - some other method to calculate the circuit mile days?

Response to Question 007:
To calculate the 95th and 99th percentiles, SCE's vendor, Atmospheric Data Solutions, used historical wind data at 6-meters, validated against SCE's weather station network, to calculate a daily maximum wind speed and gust value for each gridpoint using a horizontal grid spacing resolution of 2 km. These daily maximum values were used to calculate the 95th and 99th percentile sustained wind and gust over the historical period for each gridpoint. Each SCE circuit was then mapped to this gridpoint data to calculate the circuit mile days above these 95th and 99th percentile values.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 008:
Have known instances of "fault induced conductor slap" (FICS) been observed? If so, provide a table of incidents, including circuits and locations. Reference: https://wildfiremitigation.tees.tamus.edu/faqs/how-power-lines-cause-wildfires

Response to Question 008:
Fault Induced Conductor Slap (FICS) events are not tracked in SCE's historical outage management systems. One of the benefits of the Distribution Fault Anticipation (DFA) systems is that they collect information needed to help identify these type of event occurrences. Currently, the DFA is a pilot program and even with the information from the DFA differentiating a FICS from other fault energy related asset failures can be difficult to assess as information from the DFA system may appear identical in some cases. SCE is still in the initial stages of collecting data from the DFA pilot phase and will provide the data, when it becomes meaningful, once the pilot is completed.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 009:
Have instances of near-simultaneous faults occurred on circuit segments up to a few miles apart within the past 5 years? If so, provide a table of incidents, including dates, circuits, locations, ID of nearest weather station, and wind speed at nearest weather station for each of the faults. Also include a column for any remedial actions taken afterwards.

Response to Question 009:
SCE does not have the exact location of all faults. Instead, SCE tracks the device that operated to interrupt the fault. To respond to this question, SCE examined faults that occurred on the same day in a district and is providing the outage data for where a district experienced more than 25 outages in a day. See the attached Excel file entitled "MGRA-004-Q9.xlsx" which contains the requested data. The repairs listed in the spreadsheet are the emergent repairs that were documented on the day of the outage on the circuit listed. If no repairs are listed, there were no repairs documented on the circuit on that date listed in SCE's system of record.

Given the volume of outages and the need to manually analyze and associate weather stations with each circuit back to 2015, SCE is not able to complete this request within the requested time as it requires significant manual work.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 4

To: 151
Prepared by: Andrew Swisher
Job Title: Consulting Engineer
Received Date: 3/5/2020

Response Date: 3/10/2020

Question 010:
How many wireless fault indicators has SCE deployed as part of its Grid Modernization program?

Response to Question 010:
SCE deployment quantities for Remote Fault Indicators (RFIs) are not readily available specific to the Grid Modernization program. SCE can provide that 2,362 RFI installation locations are included in the 11,916 fault indicator installation locations identified in Table 15 of the 2020-2022 WMP.

SCE – MGRA – Data Request Response 5

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 001:
Please provide a full definition of the Fire Potential Index (FPI) used by your utility or provide relevant citations.

Response to Question 001:
The Fire Potential Index (FPI) is an index that is used to estimate fire potential across the landscape based on weather and fuel (vegetation) conditions. The weather component of the index consists of sustained wind speed and dew point depression (dryness of the air), while the fuels component incorporates the state of green-up or curing of the annual grasses, live fuel moisture, and dead fuel moisture. In addition, the FPI considers fuel loading which is the amount of vegetation on the ground.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Tom Rolinski
Job Title: Fire Scientist
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 002:
Provide a quantitative description how estimated peak wind gust speed (determined through either modelling or measurement) affects the Fire Potential Index.

Response to Question 002:
SCE calculates the Fire Potential Index based on forecasted conditions with an output that ranges from 1 to 17. Sustained wind speeds (not peak gusts), combined with the dew point depression (how dry the air is near the ground) are assigned a score between 1 and 6. The other portion of the index's total score is comprised of various forms of vegetation moisture. Depending on how windy/dry the weather is will determine the wind's effect on the total score of the index.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 003:
Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?

Response to Question 003:
SCE calculates risk at the asset level for mitigation prioritization. Each asset risk is broken into risk of equipment fault, vegetation contact, balloon contact, vehicle contact, animal contact, and unknown/other; which represent the major drivers of the risk event.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: BILL KOTTEAKOS
Job Title: Senior Manager, Compliance
Received Date: 3/18/2020

Response Date: 3/23/2020

Question 004:
For your vegetation management program, please list the following summary data for customer refusals between 2015 and 2019:
a) Total number of refusals
b) Number of refusals resolved by customer outreach
c) Number of refusals resolved by forced action, such as court orders
d) Number of refusals resolved by other means
e) Number of refusals unresolved (or no trim)
f) Average time between customer refusal and final trim

Response to Question 004:
SCE's Vegetation Management (VM) refusal process was implemented in May 2019, and therefore, the data provided below reflects customer refusals after May 2019. Prior to implementation of the refusal process, refusals were not tracked, but simply managed by our field personnel and escalated as needed.

Additionally, to clarify what SCE constitutes as a refusal, we are providing the following high-level explanation for SCE's VM program for routine compliance work and our Hazard Tree Program.

Routine Compliance – In June 2019, SCE implemented expanded clearances in HFRA in accordance with CPUC D.17-12-024. Given that obtaining expanded clearances is a recommendation, SCE field personnel attempt to obtain the expanded clearance distance, when achievable. During initial discussions and interactions between VM field crews and the customer, customers may refuse permission to obtain the additional clearance recommended by the CPUC. When this initial refusal occurs, SCE uses a field escalation process where SCE employees meet with the customer in an effort to gain permission to achieve the expanded clearances. This field escalation process is not tracked, but most of the time the customers permit the work after meeting with SCE personnel. It is only when a customer does not permit SCE to trim vegetation to achieve the regulation clearance distance (and what it takes to maintain that clearance for an annual cycle) that SCE starts the official refusal process, which is supported by Public Resource Code 4295.5 in HFTD. This process is tracked.

Hazard Tree – During the first quarter of 2019, SCE implemented its Hazard Tree program in

HFRA. When a tree or palm is considered a Hazard or reliability tree that requires mitigation, if a customer refuses that mitigation (which is often removal), then SCE starts the official refusal process which is supported by PRC 4295.5. This process is tracked.

The below data reflects SCE's refusal process as described above.

2019 Data			
Question		Compliance	Hazard Tree
a	Total number of refusals	32	589
b	Number of refusals resolved by customer outreach	2	377
c	Number of refusals resolved by forced action, such as court orders	0	0
d	Number of refusals resolved by other means	22	119
e	Number of refusals unresolved (or no trim)	8	93 (See Note 1)
f	Average time between customer refusal and final trim	30 days	(See Note 2)

Note 1. 38 of 93 are pending resolution (unresolved). 55 of 93 are currently assigned to tree crews to complete the required mitigation, but are considered unresolved until the mitigation is complete.

Note 2. Unlike the records for routine compliance work, Hazard Tree records are located in a user application that requires a manual search to determine an average time between customer refusal and final trim. As a result of this, determining an average time would require considerable resources to review the individual records.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Raymond Fugere
Job Title: Principal Manager
Received Date: 3/18/2020

Response Date: 3/23/2020

Question 005:
Please provide a list of outages including circuit identifier, including cause information, as per Section 5.3.7.4.2. If georeferenced outage information is available, please provide this as a GIS layer. Note that PG&E has provided outage information as a non-confidential GIS layer.

Response to Question 005:
SCE provided this information in response to WSD-003, Question SCE-43900-Z -632 in the following GIS data set.

- OutageData_NonConfidential.gdb

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 006:
Regarding SCE's WRM Probability of Failure / Ignition Likelihood module,
a) does SCE calculate this value based on static conditions or does it have the ability to estimate failure/ignition probabilities as a function of local wind speed?
b) what is the programming language(s) used for the WRM modules?
c) does SCE have direct access to or maintain the WRM code or is it run by a third party contractor, and if so who is the third party contractor?

Response to Question 006:
a) Currently, SCE's WRM does not adjust for local real-time windspeeds.
b) The programming languages are R and Python.
c) The WRM was built and is maintained by the data scientists in SCE's Advanced Analytics and Process Improvement organization.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/18/2020

Response Date: 3/23/2020

Question 007:
On page 4-12, SCE states that it currently "assumes a 100% conversion rate from spark to fire.". Please explain the apparent inconsistency between this figure and the ignition rates provided in Table 11 and Table 31

Response to Question 007:
The data in tables 11 and 31 represent the ratio of observed ignitions to observed faults. This ratio provides a rough estimate of how ignitions vary by fault type but does not provide information specific to where an ignition is more likely to occur which is what is needed for mitigation prioritization. To do that, we must consider that any fault that can create a spark can turn into a fire under a high enough fire potential index (FPI). Because FPI varies throughout the year, we assume any spark (100%) can turn into a fire and mitigate the equipment most likely to create a spark and with the highest consequence as defined by probability of ignition multiplied by REAX data. In the future, better historical information on localized FPI distributions will allow us to adjust this from 100% to a more accurate spark to fire values.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Jose Ramon Goizueta
Job Title: Director Advanced Analytics
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 008:
Has SCE tested the REAX model against the Technosylva fire spread models, and if so, please provide the results of this comparison.

Response to Question 008:
The Technosylva Wildfire Risk Reduction Model (WRRM) has not yet been implemented so no comparisons can be made.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Gary Cheng
Job Title: Senior Advisor
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 009:
Regarding SCE's modified Table 21 through Table 26 provided in response to WSD's data requests, the risk score for fire risk forecasting, grid topology, and PSPS (including Table 21, 4.2-4.4; Table 23, 8.1; Table 26, 5) all have an identical Risk score for 2020-22 of 8.3 and an RSE of 61.3:
a) What does this risk score represent?
b) How was this risk score calculated?
c) If PSPS is being used as justification for these scores, have costs of customer harm and risk arising from PSPS been included in the risk or cost calculations?

Response to Question 009:
Please refer to the "comments" column (Column Q), for each of the activities listed in the question, where SCE explained that these values are repeated from the columns in Table 26, Initiative 5.

(a) The risk score is an aggregate of the risk reduction over the 2020-2022 period for the PSPS mitigation in MARS (Multi-Attribute Risk Score) units. Please refer to the 2018 SCE RAMP Report for more details regarding MARS.
(b) Please refer to SCE's Response to the WSD data request: WSD-SCE-002, Question 033 (SCE-43895-X-379).
(c) SCE did not incorporate secondary impacts from PSPS, but incorporated costs from various mitigation activities (e.g., grid topology improvements, community resource centers, fuel sampling programs, etc.) which are to mitigate impacts of PSPS to our customers.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 5

To: MGRA
Prepared by: Gary Cheng
Job Title: Senior Advisor
Received Date: 3/18/2020

Response Date: 3/20/2020

Question 010:
Why is the risk reduction score for IR and corona inspection set to 0 in Table 24, 10.1?

Response to Question 010:
Table 24, Item 10.1 does not refer to IR / corona inspection, but instead refers to "High Fire Risk Informed Inspections of Transmission Electric Lines and Equipment Overview (IN-1.2)", as referenced in Section 5.3.4.10.1 in the SCE's 2020-2022 WMP.

SCE displayed only 1 decimal place by using Excel formatting. Clicking on the Excel cell which shows a zero, for example in worksheet (Table 24) cell (I91), shows a non-zero risk reduction.

SCE – MGRA – Data Request Response 6

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Cindy Jacobs
Job Title: Senior Manager
Received Date: 3/26/2020

Response Date: 3/30/2020

Question 001:
How are the foreseeable wind conditions calculated that are used for wind loading requirements? (a reference is acceptable).

Response to Question 001:
In 2013, SCE hired an experienced meteorological engineering firm to perform a system-wide wind study based on a scientific evaluation of historical wind events. The results of that wind study combined with SCE's historical wind information was used to identify local areas with wind loading of 12, 18 or 24 pounds per square foot. A copy of the study is attached.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Cindy Jacobs
Job Title: Senior Manager
Received Date: 3/26/2020

Response Date: 3/30/2020

Question 002:
What return interval is used to estimate maximum wind speed for wind loading purposes?

Response to Question 002:
A 30-year return interval was used.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Cindy Jacobs
Job Title: Senior Manager
Received Date: 3/26/2020

Response Date: 3/30/2020

Question 003:
What fraction of the distribution circuit miles in the HFTD are built to a wind loading standard less than that of the known local conditions? Note: This will include circuits built to the 56 mph wind loading standard unless known local conditions for said circuits indicate that 56 mph wind gust speed will not be exceeded.

Response to Question 003:
SCE does not track the circuit miles in its HFRA that were built to a wind loading standard less than that of current known local conditions. However, since its inception in 2014, SCE's Pole Loading Program has been assessing poles based on the latest wind loading standard. Any pole replacements or repairs resulting from these assessments are expected to be completed by 2024. Furthermore, as part of the Wildfire Covered Conductor Program, poles are pole loaded against the current known local conditions.

Southern California Edison

WSD-001 – Resolution WSD-001 to Establish Procedures for the Wildfire Safety Division's Review of 2020 Wildfire Mitigation Plans Pursuant to PUC Sections 8386 and 8386.3

DATA REQUEST SET M G R A - S C E - 0 0 6

To: MGRA
Prepared by: Cindy Jacobs
Job Title: Senior Manager
Received Date: 3/26/2020

Response Date: 3/30/2020

Question 004:
If there are circuits currently not built to the expected wind loading taking in to account local conditions, are these circuits scheduled for rebuilding/hardening? If so, please provide an estimated timeline.

Response to Question 004:
Please see SCE's response to MGRA-SCE-006 Question No. 3.

SDG&E

SDG&E – MGRA – Data Request Response 1

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

Amendments to this data request are shown in red, underline font.

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

The following questions are being asked of all three major IOUs and are an attempt to provide insight into the relationship between utility risk prioritization and "risk-spend efficiencies". They are constructed in a manner intended to minimize burden, but nevertheless may require certain calculations be re-run with selected or filtered data. While adherence to the "three-day" response time is applicable to this phase of the proceeding, MGRA is willing to provide clarification and discuss technical issues, potentially including alternative proposals.

III. RESPONSES

QUESTION 1:

Does your utility rank individual circuits in the HFTD in terms of wildfire ignition risks?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Yes, SDG&E has historically used its Wildfire Risk Reduction Model (WRRM) to prioritize circuits based on their wildfire ignition risk. In addition to that, SDG&E is currently working on updating its methodologies to further enhance the granularity of the assessments and update inputs and methods of calculating risk.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 2:

Does your utility use a wildfire risk ranking to prioritize circuits in the HFTD for remediation and improvements, and if so, which measures (hardening, enhanced vegetation management, etc.)?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Yes, as mentioned in response to Question 1 above, SDG&E has historically used WRRM and its data components to prioritize circuits for remediation and improvements. WRRM was first used to establish a prioritized list of hardening activities for FiRM by identifying and targeting the assets with the highest failure rates. More recently, WRRM data was used to develop a prioritized list of circuits to guide the fuels management work. As mentioned above, methodologies for circuit prioritizations are currently evolving and will be further refined to support more use cases to make operational and investment decisions in the future.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 3:

Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

The WRRM model calculates risk scores at the asset level but is also utilized to aggregate risk calculations to a circuit level.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

The following questions assume that a circuit risk ranking (or rankings) is in place. If your utility does not prioritize circuit remediation based on risk, no response is necessary and you can move to the next section.

QUESTION 4:

Please provide a tabular listing of HFTD circuits in descending order of internal risk ranking, with the highest risk circuit listed first. If there is a numerical risk score associated with each circuit, include it as a second column. In the event that multiple internal risk scores are used by utilities to prioritize remediation of different wildfire risks independently, please provide additional tables showing the HFTD circuits sorted in descending order of risk for each applicable risk metric and include applicable score as a second column.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

SDG&E uses two tools to calculate risk and create circuit rankings: the WRRM model and the WRRM Ops model. The WRRM model looked at a plausible worst case scenario of a Santa Ana wind condition for every circuit to develop the risk ranking. This output was utilized by the FiRM program (and now by the PSPS mitigation engineering team) to develop a circuit priority for planning purposes. Attached is the most updated version of the model output.

Circuit Ranking for 2018-2021		
Circuits	**Risk Number**	**Rank**
440	4.5	1
1215	5.8	2
449	6.5	3
442	7.95	4
444	11.6	5
211	11.85	6
73	12.9	7
909	13.1	8
441	15.15	9
210	15.25	10
75	15.8	11
240	16.8	12

Circuit Ranking for 2018-2021		
Circuits	**Risk Number**	**Rank**
974	17.4	13
236	17.4	14
220	17.4	15
907	18.75	16
1166	19.65	17
239	20.3	18
1250	20.95	19
357	21.05	20
351	21.25	21
356	22.25	22
524	22.35	23
182	22.8	24
411	23	25
233	23.9	26
599	24.15	27
231	24.8	28
354	25.25	29
205	25.6	30
RB1	26	31
788	26.75	32
1234	27.15	33
1235	27.55	34
260	29.15	35
209	29.7	36
204	30.05	37
859	30.2	38
504	30.9	39
234	31.85	40
522	32.55	41
206	32.7	42
246	35.25	43
283	35.85	44
243	36.3	45
300	39.15	46
244	39.45	47
198	40.2	48
591	43.05	49

Circuit Ranking for 2018-2021		
Circuits	**Risk Number**	**Rank**
202	44	50

Continuing, the following questions will require a recalculation of risk scores and risk-spend efficiencies as listed in Table 21-26 for two sets of data: Set 1: Calculation is limited to using only 50% of the HFTD circuits having the HIGHEST internal risk ranking. Set 2: Calculation is limited to using only 50% of the HFTD circuits having the LOWEST internal risk ranking. In the event that different internal circuit risk rankings are used to prioritize different remediations, apply the above using the ranking most applicable to the Initiative Activity (Column 1).

QUESTION 5:

Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the HIGHEST internal risk ranking (Set 1) for the following Initiative Activities:

- Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution
- Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs - Surge Arrestor, Distribution
- Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management
- Table 26 - 5-1 PSPS events and mitigation of PSPS impacts - Distribution

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9.

RESPONSE 5:

Following a meet and confer with MGRA on March 13, 2020, SDG&E amends its response as follows:

Currently, SDG&E undertakes two distinct risk assessments for wildfire risk. The first assessment attempts to estimate the overall risk due to wildfire from all triggers at all locations. The second method of assessments considers risk at more granular levels such as circuits or assets. Currently, the two methods of risk assessment are not fully integrated with each other, and do not lend themselves to comparisons across approaches. The Risk Assessment Mitigation Phase (RAMP) and WMP use the first method of overall risk to identify risk spend efficiencies (RSEs). Historically, once a program has been approved, SDG&E uses the second method to determine the prioritization of projects within the program. For example, Wildfire Risk Reduction Model (WRRM) and other tools have been used to prioritize particular circuits or parts of circuits to harden.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 6:

Provide a table with recalculated risk scores and risk spend efficiencies (Table columns I and J), including only HFTD circuits having the LOWEST internal risk ranking (Set 2) for the following Initiative Activities:

- Table 23 - 17-1. Updates to grid topology to minimize risk of ignition in HFTDs - System Hardening, Distribution
- Table 23 - 17-2. Updates to grid topology to minimize risk of ignition in HFTDs - Surge Arrestor, Distribution
- Table 25 - 15. Remediation of at-risk species - Enhanced Vegetation Management
- Table 26 - 5-1 PSPS events and mitigation of PSPS impacts - Distribution

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9.

RESPONSE 6:

Please see the response to Question 5 above.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 7:

Table 10 contains 95th and 99th percentile wind conditions, defined as circuit mile days with wind gusts over the specified percentile. Please describe in some detail how these numbers are derived. For instance, in your analysis, do you calculate:
- circuit miles for wind speeds above the Xth percentile on that particular circuit given wind speeds at nearest weather station using data from that weather station, or
- circuit miles when wind speeds at the nearest weather station exceed the Xth percentile over the entire wind speed history of the entire weather station network, or
- some other method to calculate the circuit mile days?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

The percentiles used in Table 10 of SDG&E's 2020 WMP were calculated using data from Santa Ana wind events through the entire period of record for each weather station. To arrive at the final numbers in Table 10, the peak wind gusts for every Santa Ana wind day from 2015-2019 were obtained. From there, an analysis was done to determine whether the 95th and 99th percentiles were reached. Since each weather station is associated with nearby circuit segments, the line miles of each segment were calculated, then summed if the 95th and 99th wind gust thresholds were reached.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 8:

Have known instances of "fault induced conductor slap" (FICS) been observed? If so, provide a table of incidents, including circuits and locations.

Reference: https://wildfiremitigation.tees.tamus.edu/faqs/how-power-lines-cause-wildfires

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 8:

SDG&E does not have information responsive to this request.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 9:

Have instances of near-simultaneous faults occurred on circuit segments up to a few miles apart within the past 5 years? If so, provide a table of incidents, including dates, circuits, locations, ID of nearest weather station, and wind speed at nearest weather station for each of the faults. Also include a column for any remedial actions taken afterwards.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

SDG&E does not have information responsive to this request.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 10:

With regard to Table 11, in 2019 SDG&E's ignitions as a result of conductor contacts dropped by approximately 4-fold over previous years. What corrective measures or changes to data collection criteria account for this drop?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 10:

After studying the data, it is difficult to say what accounts for the significant drop in 2019 ignitions caused by foreign objects in line contacts. SDG&E saw 538 foreign object in line contacts in 2019, which is above the five year average of 501 contacts, but that only led to 4 ignitions, well below the average of 12.8. What this points to is a substantially lower ignition rate of .74% versus the average of 2.65%, which we would typically credit to enhancements in system protection, and our systems ability to detect and isolate faults quickly in order to reduce the heat generated by the fault, reducing the chance that fault becomes an ignition. However, SDG&E has had similar protection schemes in place since 2017, and it had not seen that type of significant decline before, and the same dramatic drop is not present in the equipment related ignition probability, which involve the same protection systems. In sum, SDG&E is unsure of the specific cause. SDG&E, however, believes that its protection initiatives will continue a long-term trend of reducing the ignition probability over time.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 11:

With regard to Table 12, please provide an updated table using number of PSPS inducing weather events rather than individual circuit de-energization decisions. This will ensure that data is more comparable to that provided by PG&E and SCE.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 11:

Please see the updated version of WMP Table 12 below that changes circuit de-energization decisions to the total PSPS events. Please note that this table was updated by SDG&E in response to Wildfire Safety Division Data Request #1 on March 2, 2020.

PSPS characteristic	2015	2016	2017	2018	2019
Frequency of PSPS events (total)	0	0	5	5	4
Frequency of PSPS events (normalized)	0	0	0.0001	0.0001	0.0001
Scope of PSPS events (total)	0	0	230	295	177
Scope of PSPS events (normalized)	0	0	0.0020	0.0048	0.0042
Duration of PSPS events (total)	0	0	744,542	1,061,637	1,325,490
Duration of PSPS events (normalized)	0	0	7	17	30

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 12:

With regard to the FPI Weather Component shown on page 22 of SDG&E's WMP, please confirm whether this table is in error, and if so whether this error represents a misprint in the table or a miscalculation of the FPI itself. The table's y axis represents dewpoint. In meteorology, the lower the dew point the lower the absolute humidity. However the table indicates that higher dewpoints are associated with higher fire risk. Note: If the table is in error and SDG&E submits an errata to WSD and parties, that would constitute a response to this data request.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 12:

The table's y-axis represents dewpoint depression. The dewpoint depression is the difference between the temperature and the dewpoint temperature. An updated table is included below with the updated labeling. SDG&E will inform Wildfire Safety Division and parties of this errata in its WMP weekly update email and will coordinate with the Wildfire Safety Division on when to formally incorporate this updated table into its WMP.

Dewpoint Depression/ Wind	≤5 knots	6 to 10	11 to 16	17 to 22	23 to 28	≥29 knots
≥50ºF	4	4	4	5	5	6
40ºF to 49ºF	3	3	4	4	5	5
30ºF to 39ºF	3	3	3	4	4	5
20ºF to 29ºF	3	3	3	3	3	4
10ºF to 19ºF	2	2	2	2	2	3
<10ºF	0	1	1	1	1	2

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

On pp. 22-23 of its WMP, SDG&E states that: "In 2020, SDG&E plans to operationalize and release an enhanced version of the FPI which further leverages the analytical capabilities of its high performing computing cluster, incorporating artificial intelligence into the Live Fuel Moisture Model and adding additional spatial and temporal resolution to the weather components."

QUESTION 13:

Please provide a technical description of SDG&E's planned new FPI, including how it differs from the existing FPI, especially in terms of the algorithms used.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 13:

The algorithm to calculate SDG&E's FPI is not changing. The improvements to the FPI stem from how SDG&E generates the data inputs for the FPI. Historically, the weather inputs for the FPI were based upon point forecasts for a certain location across the service territory such as Ramona or Campo. The upgraded version will take a spatial average of forecast weather conditions across the impacted region forecast from our forecast models. This will generate higher quality forecast data inputs, ultimately giving SDG&E's meteorologists higher quality data to analyze while determining their FPI forecast.

QUESTION 14:

Will the new FPI results use the same scale as the existing FPI so that the results are comparable?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 14:

As discussed in the response to Question 13 above, the higher quality data inputs will not adjust the algorithm or the scale of the existing FPI.

QUESTION 15:

Has SDG&E backtested the new FPI against the current FPI yet? If so please provide the results of this benchmark testing.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 15:

As discussed in the response to Questions 13 and 14 above, since there will be no change to the algorithm or the rating of the FPI, no additional backtesting is necessary or has been conducted.

QUESTION 16:

With regard to Table 1-1, are the "detailed" and "patrolled" normalizations per mile inspected or do they apply to the entire HFTD?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 16:

With regard to the first set of data titled "Issues in HFTD/HFTD Circuit miles in 2019", the data provided shows the number of type 1, 2 or 3 issues found on transmission or distribution assets (both overhead and underground) divided by the total circuit mileage (both overhead and underground) within the HFTD (or FTZ for years before the HFTD was created).

The second set of data within the same row but titled "Issues/Total Circuit miles in 2019" for example provides the total number of type 1, 2 or 3 issues found on assets throughout the entire system divided by the total system miles.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 17:

With regard to Table 1-1, SDG&E saw a 10X drop in transmission Level 2 defects from 2016 to 2017. Please provide an explanation.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 17:

For clarification, it is assumed that this question is regarding the lower quantity of level 2 findings in 2016 and 2017 as opposed to the decrease in findings from 2016 to 2017 as stated in the question, since the quantity of findings between 2016 and 2017 are similar. In response to this clarification, the majority of the Level 2 findings are from the Type 2 inspections which represent detailed inspections. These detailed inspections are performed on every structure on a three-year cycle, so approximately 1/3 of all transmission structures have a detailed inspection completed on them each year. With this schedule, the quantity of findings will be highly dependent on the tielines patrolled that year due to factors associated with the tielines inspected. The age of the structures, hardware, conductor, and components will be a factor in the quantity of findings. Structures and hardware that have been replaced through wood-to-steel programs, tieline reconductor projects, insulator replacement programs, and single structure replacements through Corrective Maintenance programs will utilize new structures and hardware and will be subject to a complete field QA/QC inspection. If a tieline is on the schedule for a detailed inspection the subsequent year, the new structures and hardware used in construction in conjunction with the QA/QC inspection will result in minimal detailed inspection findings on that tieline. In addition, the geographic location of the structure and tieline will play a role in the quantity of findings. For example, locations close to the coast will be more susceptible to corrosion, so rusted components will be more in coastal, salt-rich environments in comparison to more inland locations.

Regarding Type 1, level 2 findings, it can be noted from the complete transmission system statistic (Issues/Total Circuit Miles) that the number of findings has a downward trend. For the FTZ or HFTD statistics, due to the low quantity of findings, minor variations in the number of findings will have an impact on these statistics. Type 3, level 2 findings for other inspections are similar, with the low quantity of findings having an impact on statistics. In addition, for Type 3 inspections, SDG&E has updated its structure light monitoring program through the addition of digital monitoring. This results in a decrease in the number of special patrols related to light monitoring which is one reason for a decrease in Type 3 findings.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-01
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 5, 2020
Date Submitted: March 10, 2020
Date Amended: March 16, 2020

QUESTION 18:

With regard to Table 3, are the units used for FPI and RFW days or simply units?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 18:

These units are not normalized, but simply the number of x as described in the row, take vegetation caused ignitions for example, that occurred on days with an elevated or greater FPI or a red flag warning days. Keep in mind that every red flag warning day is also an elevated or higher FPI day, so the elevated or higher FPI data is inclusive of the red flag warning day data.

SDG&E – MGRA – Data Request Response 2

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

III. RESPONSES

QUESTION 1:
Please provide a full definition of the Fire Potential Index (FPI) used by your utility or provide relevant citations.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

A full and comprehensive definition of the Fire Potential Index is included in SDG&E's 2020 Wildfire Mitigation Plan in Section 4.2 under the headline *Monitoring Contribution of Weather to Ignition Probability and Estimated Wildfire Consequence,* beginning on page 20.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 2:

Provide a quantitative description how estimated peak wind gust speed (determined through either modelling or measurement) affects the Fire Potential Index.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

Peak wind gust speed is not taken into consideration when calculating the Fire Potential Index. The Fire Potential Index is calculated using a spatial average of the sustained winds across our operating districts.

QUESTION 3:

Does your utility track multiple wildfire risk prioritizations per circuit, broken into individual risk, or calculate an aggregate risk score?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

SDG&E's Wildfire Risk Reduction Model (WRRM) model breaks down risk to the asset class level. Asset class includes conductors by size and type, poles, equipment such as fuses, capacitors and transformers etc. The risk calculation is broken down into many subfactors.

Risk = Ignition Likelihood * Impact

Ignition Likelihood = Asset Failure Rate * Ignition Ratio

The asset failure rates are broken down by asset specific information such asset type, age, condition, historical failure rates, and weather impacts. Ignition ratio is calculated through asset specific ignition history based on the fault that caused the ignition, as well as an approximation of the grid surface fuels in the area. The impact side is calculated by the individual fire spread simulations at the asset where the ignition occurs and quantified by the acreage and structures (dwellings and SDG&E assets) burned.

To get the circuit level risk, all circuit asset risk is aggregated to the circuit level and then normalized by the miles of circuit.

QUESTION 4:

For your vegetation management program, please list the following summary data for customer refusals between 2015 and 2019:

a) Total number of refusals
b) Number of refusals resolved by customer outreach
c) Number of refusals resolved by forced action, such as court orders
d) Number of refusals resolved by other means
e) Number of refusals unresolved (or no trim)
f) Average time between customer refusal and final trim

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

The following data pertains to customer refusals between 2015 and 2019:

a) There were approximately 520 customer refusals.

b) There were approximately 120 refusals, which were resolved directly by SDG&E's contractor through customer outreach.

c) One refusal was resolved by forced action.

d) Approximately 300 refusals were escalated from SDG&E's contractor and resolved by an SDG&E Area Forester.

e) Approximately 100 of refusals were unresolved.

f) The average time between a customer refusal and final trim was approximately one month.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 5:

Please provide a list of outages including circuit identifier, including cause information, as per Section 5.3.7.4.2. If georeferenced outage information is available, please provide this as a GIS layer. Note that PG&E has provided outage information as a non-confidential GIS layer.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9.

RESPONSE 5:

Location of asset faults for 2015-2019 is provided in the attached: "MGRA-SDGE DR 2 Q5.gdb.7z."

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 6:

Regarding Table 17: When SDG&E discusses "hardening" does this refer to covered conductor?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9.

RESPONSE 6:

Hardening refers to SDG&E's major system hardening programs, including all the work being performed by the Cleveland National Forest (CNF) project, the overhead hardening program (which includes covered conductor), and the underground hardening program. For specifics of how much of each type SDG&E plans to perform each year, please see SDG&E's 2020 WMP, Appendix A at Table 23 which breaks down the mileage for each specific mitigation.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 7:

Please provide Chapter 4, Figure 1 "SDG&E Known Local Wind Conditions Map" as a GIS file.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

Please see attachment: "MGRA-SDGE DR 2 Q7.gdb."

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 8:

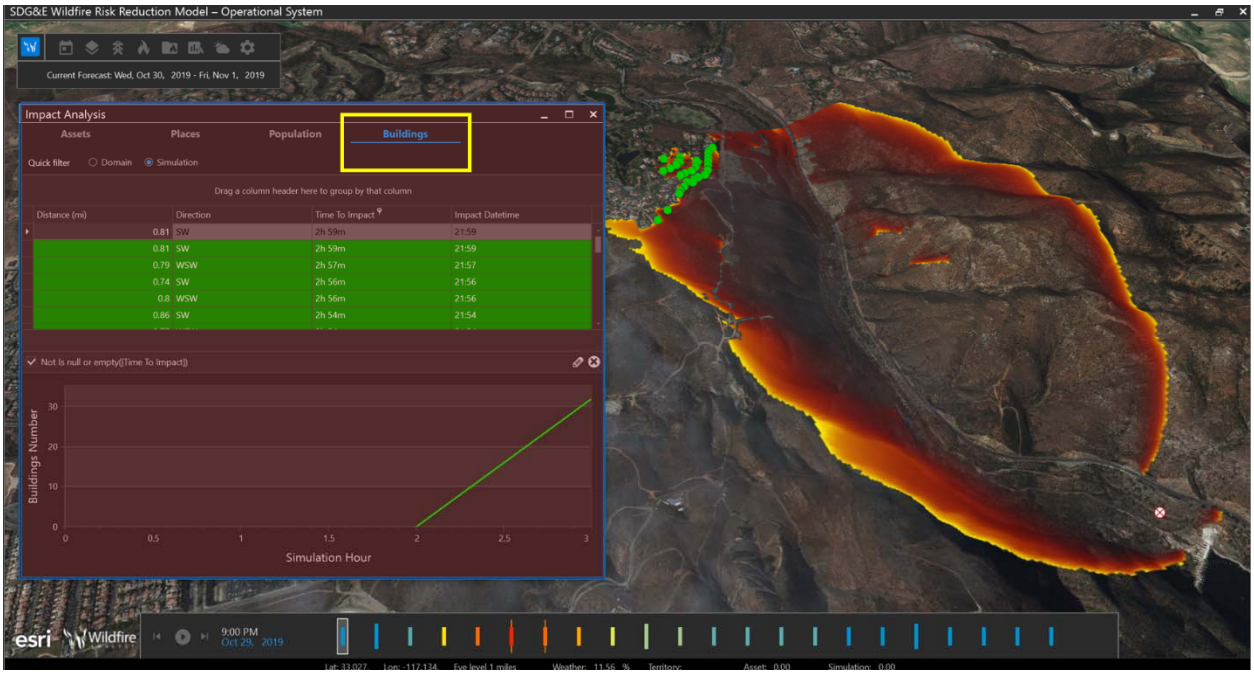
In Chapter 5, Figure 5 appears identical to Figure 6. Is this supposed to be the case and if not please provide a corrected figure.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 8:

Regarding Figure 5 and Figure 6 in SDG&E's 2020 WMP, Figure 5 was inadvertently duplicated in Figure 6. The correct Figure 6 is provided below. SDG&E will inform Wildfire Safety Division and parties of this errata in its WMP weekly update email and will coordinate with the Wildfire Safety Division on when to formally incorporate this corrected figure into its WMP.



MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 9:

Regarding SDG&E's undergrounding program discussed in 5.3.3.16, of the 120 miles of planned underground cabling, how much is planned in the HFTD? In Tier 2? In Tier 3?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

SDG&E initiated its Strategic Undergrounding Program approximately eight months ago. While SDG&E anticipates installing 120 miles of planned undergrounding/cabling, not all of the projects have been scoped. Below is an estimate of where SDG&E plans to install the 120 miles of undergrounding/cabling.

- Mileage scoped in HFTD: 85 miles
- Mileage scoped in Tier 3: 63 miles
- Mileage scoped in Tier 2: 22 miles

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-02
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 18, 2020
Date Submitted: March 23, 2020

QUESTION 10:

Provide the data indicating showing the relationship between outages and trim distance that forms the basis of SDG&E's 25-foot trim distance: Provide a table of vegetation-related outages, including where available columns for:

a) tree species
b) distance of trunk from impacted conductor/asset
c) estimated distance of contacting branch from conductor/asset prior to outage.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 10:

Please see attachment "MGRA-SDGE DR 2 Q10.xlsx," which provides the requested information for 2015-2019.

SDG&E – MGRA – Data Request Response 3

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-03
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 26, 2020
Date Submitted: March 31, 2020

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

III. RESPONSES

Historically, all IOUs interpreted the GO 95 wind loading requirements as 56 mph gusts for light loading districts. D.17-12-024 states on p. 67 that: "Going forward, utilities must design, build, and maintain their overhead facilities to withstand foreseeable fire-wind conditions in their service territories."

QUESTION 1:

How are the foreseeable wind conditions calculated that are used for wind loading requirements? (a reference is acceptable).

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2 and 5. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

For design purposes, SDG&E performed a study to understand the maximum known local wind conditions within its service territory by focusing on certain areas and analyzing the 50-year maximum three-second gust. The end-product was a wind map that breaks up SDG&E's service territory into the following maximum wind speed categories:

- Green: 65 mph max wind speed
- Yellow: 85 mph max wind speed
- Red: 111 mph max wind speed

Please see the attached document "MGRA-SDGE DR 3 Q1.pdf" which details all the data that went into the creation of this map.

The light loading conditions outlined in General Order (GO) 95 assume an 8 pounds per square foot for wind, which is 56 mph, so SDG&E's design criteria is typically more conservative, and more in line with the worst case known local wind conditions.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-03
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 26, 2020
Date Submitted: March 31, 2020

QUESTION 2:

What return interval is used to estimate maximum wind speed for wind loading purposes?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2 and 5. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

The following intervals are used to estimate maximum wind speed for wind loading purposes:

- As discussed in the attached document "MGRA-SDGE DR 3 Q1.pdf", (provided in response to Question 1 above) SDG&E uses a 50-year interval for design purposes.

- Wind Gusts: The wind gusts are the highest three-second average of the wind samples taken over ten minutes.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-03
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 26, 2020
Date Submitted: March 31, 2020

QUESTION 3:

What fraction of the distribution circuit miles in the HFTD are built to a wind loading standard less than that of the known local conditions? Note: This will include circuits built to the 56 mph wind loading standard unless known local conditions for said circuits indicate that 56 mph wind gust speed will not be exceeded.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

Since the development of its wind map, SDG&E has hardened approximately740 miles of distribution circuits within the HFTD, designing and building the lines based on the known local conditions identified in SDG&E's 50-year wind map. All SDG&E distribution projects since 2010 within the HFTD (Fire Threat Zone at the time) were designed to meet the known local wind conditions and this will continue to be the case moving forward.

SDG&E has a total of 3,485 miles of overhead (OH) conductor within the HFTD, with approximately 2,745 miles unhardened. Those 2,745 miles were designed and constructed before SDG&E created the known local wind map and were designed to meet GO 95 light loading conditions or GO 95 heavy loading conditions depending on the elevation. SDG&E has not completed an engineering study on every structure in the HFTD to understand if that structure meets the known local conditions. Depending on how many conductors are attached to the structure, size of the conductors, the structure height and class, and the span length, it is possible that an existing structure would meet the known local conditions.

Based on confirmed information, however, the ratio in question is calculated as unhardened (not necessarily wind loading less than known local conditions) circuit miles over total circuit miles, which is 79%. That said there are mitigating forces here: SDG&E has a good inspection and maintenance program which leads to very few wood pole failures, and during extreme Fire Potential Index (FPI) combined with real time actual wind gusts that reach 99th percentile levels, SDG&E utilizes Public Safety Power Shutoffs (PSPS) to mitigate this risk of its unhardened system.

QUESTION 4:

If there are circuits currently not built to the expected wind loading taking in to account local conditions, are these circuits scheduled for rebuilding/hardening? If so, please provide an estimated timeline.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

SDG&E is focused on hardening the highest risk areas of the HFTD, which includes circuits with small conductor (high probability of failure), and areas that have experienced PSPS (areas that have seen high winds on a consistent basis). The total mileage that fits this criteria is 1,784 miles of the remaining approximately 2,745 miles. Of that, approximately 325 miles have been identified for undergrounding where these high-risk segments regularly see winds above 50 mph. Based on SDG&E's current hardening plan, SDG&E will harden an average of 100-125 miles a year for the next 5-10 years and plans to complete the 325 miles of underground scope. From there, SDG&E plans to install 200 miles per year of OH (mostly covered conductor going forward). At this pace, SDG&E anticipates completing the hardening scope of work in 11 years.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-03
2020 WILDFIRE MITIGATION PLAN
SDG&E RESPONSE

Date Received: March 26, 2020
Date Submitted: March 31, 2020

QUESTION 5:

Please provide a GIS file containing the circuit ranking shown in the "SDG&E Wildfire Risk Reduction Model: RISK REDUCTION" figure on page 48.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9.

RESPONSE 5:

SDG&E utilizes the Wildfire Risk Reduction Model (WRRM) to perform live modeling of the ignition probability and failure rates of assets summed up to the circuit level given the current meteorological and fuel conditions within the service territory. This tool was designed as an operational tool and currently does not contain an export capability to provide this data within a GIS file.