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Transmittal via OIES filing. Docket # Risk-Model-Group

MUSSEY GRADE ROAD ALLIANCE COMMENTS ON THE OFFICE OF ENERGY INFRASTRUCTURE RISK MODELING WORKSHOP

Dear Office of Energy Safety Infrastructure,

The Mussey Grade Road Alliance (MGRA or Alliance) files these comments pursuant to the instructions in the Proposed Working Group Schedule[1] issued by the Office of Energy Infrastructure Safety (OEIS) and by email, inviting comments on the Working Group meetings and Proposed Schedule by November 6, 2021.

Comments have been prepared by Alliance expert Joseph W. Mitchell, Ph.D.

1. OVERVIEW

The Mussey Grade Road Alliance has been involved in the review of the Wildfire Mitigation Plans since their original inception in 2019, and in utility fire prevention planning for the previous decade.[2] One observation MGRA has consistently made in its reviews and in other CPUC

[1] OIES Docket #: 2021-WMP; TN10409_20211029T152059_Proposed_Working_Group_Schedule; Wildfire Risk Modeling Working Group; October 29, 2021. Also,
Efiling Notification: Risk Modeling Working Group, Risk-Model-Group, Proposed Working Group Schedule; October 29, 2021.

[2] Prior to the Wildfire Mitigation Plans, utilities had to prepare Fire Prevention Plans, a measure originally proposed by MGRA in 2009 as contingency plans for extreme weather events. (CPUC D.12-01-032; pp. 45-55.)

filings relating to utility fire prevention is that the utility fire prevention programs have lacked a common approach and methodology. Wildfire does not respect utility service area boundaries, and while there are ecological, geographical and climatological differences between different California firescapes these firescapes extend over utility boundaries. Nevertheless, utilities have historically conducted their affairs with considerable independence except as required by regulators. Regarding the 2021 Wildfire Mitigation Plans, MGRA observed that "the three major California IOUs are operating on different planets"[3] with regard to their risk and risk/spend efficiency calculations. In the one area where the three major IOUs have adopted a uniform approach, specifically using the Technosylva fire spread model as their consequence model, MGRA has raised concerns regarding some of the basic assumptions that utilities use with the Technosylva model, and suggested that OEIS sponsor workshops or a working group to study these assumptions.[4]

MGRA therefore welcomes OEIS's establishment of a wildfire risk modeling group and its requirement that utilities use it as a framework for collaboration.[5] MGRA intends to fully participate in this collaborative effort.

2. PROCEDURAL ISSUES

2.1. Schedule

MGRA supports the Proposed Schedule and timelines.

2.2. Topics and Completeness

MGRA supports the topic list and order proposed by OEIS Staff. In MGRA's September 29, 2021 email to Staff we listed topics that MGRA wanted to discuss at the workshops. These are listed below:

Ignition Probability Drivers:

[3] MUSSEY GRADE ROAD ALLIANCE COMMENTS ON 2021 WILDFIRE MITIGATION PLANS OF PG&E, SCE, AND SDG&E; March 29, 2021; p. 66. (MGRA 2021 WMP Comments)
[4] MGRA Comments; p. 54.
[5] For example: WSD-20; p. 41; Issue SCE 21-03.

1) To what extent is machine learning now being used to calculate risk probability drivers?
2) Are there best practices for machine learning techniques for calculating ignition risk that can be shared among utilities?
3) How is it possible to incorporate hourly weather measurements (rather than cumulative or maxima) into machine learning models?
4) Are outages or ignitions the proper proxy for wildfire ignition risk?
5) How is it possible to incorporate system damage found during post-event surveys into ignition risk modeling?

Fire Spread and Consequences:
1) How do consequence models account for the bias introduced by prematurely truncating fire spread models?
2) Are fire spread consequence models now using 8 hour or 24 hour spread models?
3) How are models compensating or measuring the biases introduced by ignoring fire suppression?
4) What is the proper method for estimating the probability that a risk event will result in a wildfire under specific conditions?

MAVF and RSE Modeling:
1) Are utilities examining truncated power law distributions for estimating high end losses, and if so for what risks?
2) Is the mechanism for incorporating power law distributions provided to the SMAP working group by PG&E a valid approach?
3) Should external driver events such as high winds be studied as a cross-cutting factor for risk calculations?
4) Can utilities find a way to make their risk and RSE calculations directly comparable across utilities?

2.3. Confidentiality

During the 10/29 meeting, the issue of confidentiality was discussed by participants. MGRA's representative stated that MGRA avoids signing Non-Disclosure Agreements whenever possible. This is to 1) avoid any risk to MGRA or utilities due to accidental disclosure, 2) ensure that data can be freely circulated to the public and to researchers. MGRA agrees that some utility data should remain confidential, but for the purposes of its own analysis it concentrates on data that it asserts should be public. MGRA has been successful with this approach in CPUC proceedings, and we urge Energy Safety to apply any confidential treatment in this working group very narrowly to data that merits confidential classification.

2.4. Intervenor Compensation

The CPUC's intervenor compensation program has proved to be an effective mechanism to provide high-quality public input that the Commission can incorporate into regulation and policy. The Commission has ruled that in order for an intervenor's claim to be eligible for compensation

under California Public Utilities Code, "an intervenor must contribute to the Commission's consideration of a decision or ratification of a resolution."[6] As the Office of Energy Infrastructure Safety is now an independent agency, many of its determinations, finding and activities will not directly qualify for the CPUC intervenor compensation program, and no corresponding program has been set up to support public intervention for OEIS activities.

While this shortcoming is not something that is within Energy Safety's power or mandate to address, it does have consequences, as evidenced by TURN's withdrawal from OEIS workshops related to executive compensation and safety certifications.[7] MGRA welcomes TURN's request for OEIS's support for any future legislation that would make intervenor compensation available for work that substantially contributes to OEIS proceedings and decisions.

Pending any future legislation, some work done within OEIS proceedings, including contributions to the present wildfire risk workshop, may be compensable within the CPUC's program under Rule 17.4(d) of the Commission Rules of Practice and Procedure, which states that work performed prior to the start of a proceeding may be eligible for compensation. As mentioned in the October 27th workshop, some of the outputs of this working group will be incorporated into the 2023 Wildfire Mitigation Plans, and therefore may be compensable after these WMPs are ratified by Commission Resolutions in 2023.

In order to claim a substantive contribution, a CPUC intervenor will need to demonstrate that their work contributed to the output of this working group, and then that subsequently the same work influenced the utilities' wildfire mitigation plans. While it will be up to CPUC intervenors to make this case, Energy Safety can help by ensuring that contributions from participants are part of the record and that these contributions are given attribution by OEIS. The Alliance therefore respectfully requests that Energy Safety ensure adequate recordkeeping and attribution as this working group proceeds in order to support contributions from non-utility and non-governmental participants.

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[6] D.21-03-013; p. 9.
[7] Email: TURN Participation in 9/29 executive compensation workshop, future safety certificate proceedings; From: Katy Morsony; 9/27/21, 2:27 pm.

3. OEIS RISK WORKSHOPS

3.1. Modeling Expert Panel Questions

The following questions were sent to panelists in preparation for the Wildfire Risk Modeling Working Group workshops on October 5th and 6th, 2021. A summary of MGRA's answers to and comments regarding these questions is presented below.

Panel Questions:

1. *What general data sets and/or sources do you know about that the utilities could potentially utilize as part of their modeling? How should "generic" (industry-wide) data be combined with user specific (regional, utility, area, ...) data sets? Are there other tools/models that can be used to better understand the current data sets?*

In general, utility data is comprehensive and improving in quality. One previously overlooked set of data that needs to be included in risk modeling impact of wildfire smoke. SDG&E, in its most recent RAMP filing, has attempted to account for wildfire smoke impacts but tested methodologies need to be developed and reviewed. Additionally, safety impacts arising from power shutoff need to be identified so that appropriate datasets can be collected. Examples include wildfires started by PSPS-related causes (generators, cooking fires) and communication impacts such as delays in 9-11 calls.

Data will have to be standardized. Energy safety is responsible for protecting residents statewide and should not leave data collection and formats to the discretion of utilities.

2. *How should wind speed be accounted for in both ignition and consequence risk models? Should external driver events such as high winds be studied as a cross-cutting factor for risk calculations?*

The probability of outages ignition steeply with wind speeds.[8] MGRA discussed this effect extensively in its 2021 WMP Comments.[9] Intense fire weather events are relatively rare, and when they occur act as drivers for "power line firestorms", with ignitions of many near-simultaneous

[8] 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 (Mitchell 2013).
[9] MGRA 2021 WMP Comments; pp. 14-39.

fires. This was seen in California in 2007 and 2017, and was likewise seen in Australia, with power lines accounting for 5 of 11 of the major "Black Saturday" fires and 4 out of 8 of the "Ash Wednesday" fires.[10] One could argue with some justification that such disasters might have occurred again in 2019 or 2020 had power shutoff not been initiated in extreme wind areas.[11]

Consequence models such as Technosylva's generally use the Rothermel model for fire growth spread calculations. This model incorporates wind. Wind speed estimates are taken from WRF weather model calculations, which are downscaled to 2 km grid resolution. For cases where fire behavior needs to be modeled in finer detail, other fire spread models that more accurately represent finer-scale atmospheric behavior may be used.[12]

The reason that power line fires are over-represented in listings of catastrophic fires is that the same external driver that causes ignition – high winds – are also a driver of rapid wildfire growth. The reason that they can be considered a "cross-cutting factor" is that high winds are also a driver of wire-down risk, which is often handled as a risk distinct from wildfire in utility risk analyses.

3. *How can climate change models be incorporated into risk models? What timeframe for anticipated changes should be considered and how should uncertainties in the model predictions be considered? Are there any data sources that utilities could utilize to capture climate change within their models?*

One advantage of modeling high winds as an external driver is that this allows climate change effects to be more easily parameterized, for instance by studying the frequency and severity of fire weather events, and the length of the fire season. Climate change also need to be incorporated into consequence models, since increased temperatures and decreased moisture will lead to more rapid fire growth. In both cases, models should be designed in a modular manner so

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[10] 2009 Victorian Bushfires Royal Commission Final Report. Government Printer for the State of Victoria. PP. No. 332, Session 2006 – 10, ISBN 978-0-9807408-4-4, July 2010. v.2, pp. 148-150.

[11] California Public Utilities Commission; 2019 PSPS Event –Wildfire Analysis Report; Technosylva Inc. (La Jolla, CA); July 9, 2021. (Technosylva Reports)
Reports were commissioned by the CPUC Safety Enforcement Division to model simulated ignitions at locations of damage found during inspections during PSPS events. Separate reports model individual 2019 PSPS events for PG&E, SCE, and SDG&E. Findings have not been validated by SED or to our knowledge by any third party.

[12] Coen, J.L., Schroeder, W., Conway, S., Tarnay, L., 2020. Computational modeling of extreme wildland fire events: A synthesis of scientific understanding with applications to forecasting, land management, and firefighter safety. Journal of Computational Science 45, 101152. https://doi.org/10.1016/j.jocs.2020.101152

that different models for climate change impacts can be easily exchanged and different assumptions tested.

4. *Are there any inter-industry and/or agencies (such as aviation (FAA) and nuclear (NRC)) with whom to collaborate that could contribute to utility wildfire risk assessment and modeling knowledge sharing? Do you have any practical examples of something you've seen utilized by other industries that utilities or Energy Safety could apply?*

No comment.

5. *What forms of validation/benchmarking are needed to verify quality, accuracy, robustness, reliability of the risk models? What's considered "good enough"? Do you think the current verification of utilities' models is sufficient?*

Based on the RAMP and GRC filings the utilities have released applying the new MAVF methodology, and based on their Wildfire Mitigation Plans for 2019 to 2021, the IOUs have provided very little in the way of justification or verification of their risk models and the underlying data. As a result, it is difficult to judge the quality, accuracy, robustness and reliability of their models.

Methodologies of validation, quality control, and benchmarking, however, are domain dependent, and will need to be developed for each individual risk. Certain standard statistical benchmarks – standard variance, 10/90 ranges, operator/receiver curves for machine learning models, should be applied where appropriate but may not fully describe model quality.

One tool that should help as an overview is the "Transparency Proposal" that was put forward by PG&E in the CPUC RDF (Risk-based Decision-making Framework) proceeding R.20-07-013 and adopted by the Commission on November 4, 2021. While this mechanism by no means guarantees that all quality and uncertainty estimates will be disclosed, it provides a high-level overview of the quality landscape, and should provide a guide to further effort by reviewers. The initial test of this tool will be as part of SCE's 2022 RAMP filing, and findings from that initial use will feed back into improving the tool. The advantage of this tool is that it provides a common reporting framework for uncertainties and quality estimates for all risks.

6. *How should utilities be balancing and evaluating ignition versus consequence when determining how to reduce the risk of catastrophic wildfires?*

Ignition probability and consequence are both essential components of wildfire risk. There is very little that a utility can do to reduce the consequences of an ignition once it has been established as a wildfire. A utility's responsibility is to reduce ignition probability under conditions where catastrophic wildfires are foreseeable.

Aside from mitigations that reduce ignitions by improving infrastructure resiliency, utilities have been resorting to power shutoff as a preventative measure. Undeniably effective, power shutoff has a number of negative safety and economic impacts on customers, and the CPUC has cautioned IOUs that it should be a measure of "last resort".

For this reason, MGRA is concerned regarding PG&E's classification of "Black Swan" conditions that relate to PSPS, conditions that are related only to the potential for catastrophic fire growth and lack an ignition component. PG&E's use of this term is a misnomer. A "Black Swan" event should be unpredictable,[13] and "fire weather" supporting rapid fire growth is a common occurrence in California. For PG&E to adopt ignition *consequences* alone as sufficient justification for power shutoff puts residents who are under threat of catastrophic fire (most of which do *not* come from power line ignitions) at greater risk.

As Jaqueline Ayers of the Acton Town Council stated during the October 5 and 6th workshops, residents are under much higher risk during fire weather, and need safe electricity for such activities as communication, fire reporting, evacuation, and fire-fighting. As mentioned by MGRA's expert during the October 29th workshop, exposure to wildfire smoke may prove to be the greatest safety threat from wildfire, and residents without power will have reduced ability to provide themselves with clean air.

7. *The utilities are using outage and ignition data to various degrees to inform or train their models. What are the benefits and drawbacks of using ignition data and outage data? How can utilities augment small data sets and implement machine learning while still retaining accuracy? Are there best practices for machine learning techniques for calculating ignition risk that can be shared among utilities?*

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[13] Oxford English Dictionary: https://www.lexico.com/en/definition/black_swan.
Originating from: Taleb, N.N., 2010. The Black Swan - The Impact of the Highly Improbable, Second. ed. Random House, New York.

There is significantly more outage than ignition data, which allows analysis of greater resolution and accuracy, but using it properly requires a correct model for how outages proceed to ignitions. One problem that has been raised by MGRA in CPUC proceedings and in WMP reviews is the fact that the introduction of proactive de-energization inherently biases both outage and ignition data, since no data is collected during power outages. Using biased data to train models will lead to models that underpredict risks in the most dangerous areas and overpredict risks elsewhere. A remedy that MGRA has suggested and that some utilities are currently working towards is to incorporate PSPS damage data (collected during inspections prior to re-energization) into risk models. As with outage data, correctly incorporating this data requires a valid model for ignitions given an outage/damage event.

A serious issue with SCE and PG&E models to date is that they use aggregated rather than hourly weather data. This does not allow "fire weather" events to be identified as ignition drivers. The geographic distribution of ignitions and outages due to "fire weather" events may differ from that of other ignitions and outages, and utility wildfire ignition models need to be able to identify any such dependencies.

As noted in its E3 consultant's review of its machine learning model,[14] PG&E assumes that ignitions follow a "Poisson" distribution that assumes events occur at a constant event rate. Catastrophic utility wildfire is most definitely NOT a Poisson process. Catastrophic utility fires are largely, but not exclusively, tied to extreme weather events, and cluster into specific periods associated with these events. Utility wildfire models need to incorporate this data in the form of hourly weather data that contains enough information for the models to discriminate "fire weather" from other conditions.

8. *What specific approaches do you want to see consistent across utilities (data inputs, calculations, benchmark testing, in-field verification, software, reporting, decision-making, etc.)? What are the benefits of this? Have you seen such consistency elsewhere, such as in RAMP or GRC proceedings?*

It is the responsibility of the Office of Energy Infrastructure Safety and the California Public Utilities Commission to ensure that all Californians receive a basic level of safety and reliability from their electric utilities. It follows from this that all utilities should be held to a common

[14] E3 Review of PG&E's 2021 Wildfire Distribution Risk Model; May 2021; p. 67.

standard, and to the extent that there are "best practices" utilities should implement them. It is OEIS's role to "ride herd" over the utility implementation of safety practices and hold them to common standards. As MGRA noted in its 2021 WMP Comments, utility risk and RSE calculations appear to come from "different planets". OEIS should not accept the argument that the utility service areas are so different that different approaches to data, calculations, verification, and so on are justified.

One example where a common approach was adopted was in consequence modeling using the Technosylva fire spread modeling package. While MGRA has identified questions and potential shortcomings in the utility's implementation of this model, there is at least only one model to evaluate, making it much easier to evaluate and allowing problems to be identified and resolved in an organized fashion.

9. *What aspects of risk modeling do you think might not benefit from consistent approaches across the utilities, and why? How should we leave room for innovative solutions when considering implementing more consistent approaches?*

In cases where new problems are being solved, diversity in approach can be an advantage in that it allows different approaches to be compared side by side. This advantage is squandered, however, if the utility reporting is so different that comparisons between utility approaches are not possible. Therefore OEIS should push for consistent approaches except in cases for which 1) there is a distinct difference between utilities that merits the difference in approach, 2) a utility is experimenting with an innovative approach that may be applicable to other utilities. It should be incumbent on the IOUs to explain why their innovative approach improves upon the status quo, and why potential advantages exceed that of maintaining consistency with other utilities.

10. *How should Public Safety Power Shutoff (PSPS) as a risk to communities be quantified to compare to the risk of a wildfire on those communities?*

A number of real and potential harms due to power shutoff have been raised by CPUC intervenors over the years, including but not limited to communication disruption effects on public safety, the potential for fire ignitions due to generators or cooking fires, impacts on medical baseline customers, disruption of evacuation, and traffic accidents. The correct approach to such a diverse portfolio of risks is to break them out individually and evaluate them. A "triage" approach should be applied first, to immediately identify the most impactful harms and likewise to identify any

potential risks that can be safely ignored. For every potentially significant PSPS risk, it is important to identify:

- Data sources that can be used to better quantify the risk,
- Methodologies to best estimate the probability of the risk event occurring,
- Methodologies to estimate the consequences of the risk event, and
- Mitigations that would reduce the risk event occurring.

11. *How should utilities factor fire suppression into fire spread models? How would this affect the accuracy of output?*

The greatest impact of fire suppression is during the initial attack phase of the fire, when there is a high probability that the fire will be extinguished prior to doing significant damage. The success of the initial attack phase is highly dependent on weather conditions.[15] For wildfires driven by extreme weather, safety of firefighters and the public become paramount, and the best course is sometimes to stand aside and protect life and (where possible) property until the weather conditions ease.

Currently, Technosylva assigns an "Initial Attack Assessment" score to the fires it models,[16] but it is not clear how this score translates into the probability that an ignition leads to a catastrophic fire. It is also not clear whether utilities incorporate this score into their ignition probability models.

Throughout the course of the wildfire, firefighters will attempt to control the fire perimeter. During extreme weather periods these efforts may have limited success. Under less extreme conditions, fire services will begin to establish containment, which means that the fire perimeter will progressively become smaller than what would be predicted by a model that allows unlimited fire spread.

Therefore, the fire suppression modeling problem would likely be best handled with a two-pronged approach. On one side, the probability of a "wildfire", as opposed to merely an "ignition", should be calculated using historical data that incorporates initial attack and accounting for fire growth conditions. On the other side, deviations of real wildfire sizes from models that allow

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[15] Abatzoglou, J.T., Balch, J.K., Bradley, B.A., Kolden, C.A., 2018. Human-related ignitions concurrent with high winds promote large wildfires across the USA. International Journal of Wildland Fire. https://doi.org/10.1071/WF17149
Also,
Mitchell, J.W., 2009. Power lines and catastrophic wildland fire in southern California, in: Proceedings of the 11th International Conference on Fire and Materials; pp. 225–238.

[16] See for example Technosylva Reports on PSPS events produced for SED.

unlimited fire growth should be studied and incorporated into consequence models. Neither of these approaches can rely on established science, and both will require development work as well as input from technical experts.

3.2. Other Issues Raised During Workshops

3.2.1. High Fire Threat District boundaries

PG&E stated that they were including areas outside of HFTD Tiers 2 and 3 due to climate change and population shifts. MGRA stated that PG&E should instead be requesting modifications to the HFTD Tier 2 and 3 boundaries so that these tiers accurately represent areas of fire threat.

3.2.2. Evacuation and wooden poles

MGRA questioned the IOUs as to whether distribution segments with wooden poles along evacuation routes were being preferentially hardened or put underground. In MGRA's 2020 WMP, it noted that burning wooden poles blocked evacuation routes during the Camp fire.[17] PG&E claims not to have a mechanism to identify evacuation routes. SDG&E has not explicitly considered evacuation but claims that the real evacuation risk comes from the fire itself, not the poles. SCE claims to have evaluated evacuation routes for targeted undergrounding and hardening.

4. CONCLUSION

The Alliance thanks OEIS for the opportunity to contribute these comments and looks forward to active participation in the Wildfire Risk Modeling workshops.

[17] MGRA 2020 WMP; pp. 28-29; quotes
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

Respectfully submitted this 5th day of November, 2021,

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