



California Wildfire Safety
Advisory Board

Recommendations on the 2022 Wildfire Mitigation Plan Guidelines, Performance Metrics, and Safety Culture Assessment



Approved June 28, 2021



California Wildfire Safety Advisory Board

Cover Photos



Shown: **PG&E Signs Directing Traffic to a Shelter, San Ramon**

October 10, 2019: Sign providing directions to Pacific Gas and Electric shelter during Public Safety Power Shutoff (PSPS). The Wildfire Safety Advisory Board (WSAB) provides recommendations on how to reduce the scale and scope of PSPS.

See Section 3 on Public Safety Power Shutoffs.



Shown: **Shrubs Under Utility Lines, Palm Springs**

Shrubs under utility lines in Southern California Edison territory can act as ember catchers and prevent the invasion of flammable grasses.

See Section 4 on Vegetation Management.



Shown: **Utility Workers Using Bucket Trucks**

Maintaining utility lines and installing grid hardening measures like covered conductors poses safety concerns in rural and forested areas where bucket trucks are not available.

See Section 5 on System Design and Operation.



Shown: **Contractor Fills Out Survey**

The WSAB recommends expanding the scope of the staff and contractors that are surveyed to get a more complete picture of utility safety culture.

See Section 7 on the Safety Culture Assessment.



Background

Following the catastrophic fires of 2017 and 2018, the California Public Utilities Commission (CPUC) opened Rulemaking 18-10-007 to provide guidance on the form, contents, and process for review and implementation of the utilities' Wildfire Mitigation Plans (WMPs) to be filed pursuant to Senate Bill (SB) 901. In addition to establishing the WMP process, SB 901 established the Wildfire Safety Division (WSD). Assembly Bill (AB) 1054 and AB 111¹ established the Wildfire Safety Advisory Board (WSAB or the Board) consisting of seven members appointed by the Governor, Speaker of the Assembly, and Senate Committee on Rules, and mandates the WSAB to develop and make recommendations related to the electric corporations' WMPs. To meet its AB 1054 mandate, the WSAB operates as an independent entity outside of the WSD and the CPUC, which has ensured its ability to provide separate analysis and expert guidance as the basis of its recommendations to the WSD on wildfire safety issues.

The WSAB is comprised of seven appointed member experts. Each board member brings a unique perspective and expertise to the state and to their review of the Wildfire Mitigation Plans.² Additional information about the Board and its members can be found on its website: www.cpuc.ca.gov/WSAB.

- Marcie Edwards, Chair
- Diane Fellman, Vice Chair
- Ralph Armstrong
- Jessica Block
- Chris Porter
- John Mader
- Alexandra Syphard

2020-2021 Achievements

The WSAB is comprised of seven highly motivated members, appointed by the Governor, Speaker of the Assembly, and Senate Rules Committee for their expertise in the field of wildfire safety issues. Each WSAB member brings dedication and a unique perspective to support California's efforts in mitigating wildfire.

Since its inception, the WSAB has tirelessly worked to provide recommendations and advise the WSD on wildfire safety measures. The WSD considers the WSAB's guidance and recommendations in its evaluation of the WMPs.

¹ Appendix I provides key excerpts from the Public Utilities Code that were added by AB 1054 and AB 111.

² The Board approves these recommendations as a whole, but each recommendation may not reflect the views of individual Board members.



Following its inauguration during 2020,³ during the first half of 2021, the WSAB:

- Held four public, virtual Board meetings,⁴ including one regarding a recommended requirement for the Publicly Owned Utilities (POU) WMP updates that will be submitted July 1, 2021;
- Independently evaluated, developed, and made recommendations to the WSD on the contents of the three large Investor-Owned Utilities (IOU) 2021 WMPs;
- Independently evaluated, developed, and made recommendations to the WSD on the contents of the Small and Multi-Jurisdictional Utilities' (SMJU) 2021 WMPs;
- Independently evaluated and made recommendations to the WSD on the 2022 Wildfire Mitigation Plan Guidelines, Performance Metrics, and Safety Culture Assessment.

Acknowledgements

The WSAB recognizes California's utilities' dedication to wildfire mitigation as reflected in the WMPs and looks forward to continued collaboration with the staff responsible for designing and reviewing those plans during the transition to the California Department of Natural Resources (CNRA). We are eager to begin this new chapter to execute our statutory authority to provide recommendations based on the Board's high-level of expertise. AB 1054 entrusted the WSAB to provide a dispassionate lens critical to the WMP process. The Board members have allegiance solely to the citizens of California to achieve the highest standards for wildfire mitigation efforts. We take this responsibility seriously and without reservation.

None of this would be possible without the skill, creativity, acumen, patience and project management of our advisors, Katherine Stockton and Lea Haro who, regrettably, will not follow us and will remain at the CPUC. These two staff are responsible for keeping the Board on schedule and formatting cohesive recommendations from the Board in the face of Bagley Keene open meeting requirements. We would not have been as successful without their tireless coordination.

³ WSAB, Recommendations on the 2021 Wildfire Mitigation Plan Updates for Large Investor-Owned Utilities, available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/WSD/WSAB%20Recommendations%20on%202021%20Large%20IOU%20WMP%20Updates%20Issued%204.16.2021.pdf.

⁴ Including the upcoming WSAB meeting on June 28, 2021.



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Introduction

Pursuant to Public Utilities Code Section 326.2(b) and 8389(b)(1-3),⁵ the Wildfire Safety Advisory Board (WSAB or the Board) provides these recommendations to the Wildfire Safety Division (WSD) for its consideration as it updates its 2022 Wildfire Mitigation Plan (WMP) Guidelines, Safety Culture Assessment, and Performance Metrics applicable to the Investor-Owned Utilities (IOU) and Small and Multi-Jurisdictional Utilities (SMJU) (collectively “IOU” or “utilities”).

The WSAB acknowledges WSD’s review and incorporation of many of the Board’s recommendations in the 2021 WMP Update Guidelines. The utilities’ filings were more accessible and transparent to the reviewer as a result of this iterative progress. The WSAB appreciates the participation of all stakeholders in providing thoughtful comments at our meetings and to our recommendations. We submit these draft recommendations for public comment prior to adoption and consideration by the WSD in preparing the 2022 Guidelines.

These recommendations are organized by categories utilized in the WMP preparation and evaluation including risk assessment, public safety power shutoff (PSPS), vegetation management, system design, and community outreach, and performance metrics, similar to the WSAB’s prior recommendations on the 2021 IOUs’ and SMJUs’ WMPs. The WSAB has included a section recommending structural and scope improvements to the 2022 WMP Guidelines. The WSAB also provides recommendations on developing in-house expertise as WSD transitions to the Office of Energy Infrastructure Safety (OEIS or Energy Safety) within the California Natural Resources Agency (CNRA). The WSAB refers to WSD in these 2022 recommendations, but acknowledges that on July 1, 2021, it will become OEIS.

The WSAB appreciates public participation in its recommendations. The WSAB received seven public comments on its draft recommendations on June 23, 2021, from the Center for Environmental Law at Tulane University; the Green Power Institute, a program of the Pacific Institute; Pacific Gas and Electric Company; the Protect Our Communities Foundation; Southern California Edison Company and San Diego Gas and Electric Company’s Joint Comments; the Small Business Utility Association, and the Tree Care Industry Association.

⁵ Public Utilities Code § 8389(b) states that the Board shall make recommendations to the WSD on

“(1) Appropriate performance metrics and processes for determining an electrical corporation’s compliance with its approved wildfire mitigation plan.

(2) Appropriate requirements in addition to the requirements set forth in Section 8386 for the wildfire mitigation plan [the Guidelines].

(3) The appropriate scope and process for assessing the safety culture of an electrical corporation.”



1 Structure and Scope

As discussed in the 2021 Wildfire Mitigation Plan Updates for Large Investor-Owned Utilities⁶ and 2021 Wildfire Mitigation Plan Updates for Small and Multi-Jurisdictional Utilities (SMJU),⁷ the Board observed some recurring issues on these topics across those filings and makes these structural recommendations based on its assessment.

WSD and CPUC coordination after the transition to CNRA. Review of the utility WMPs represents only one of several procedural routes for assessing the utility wildfire mitigation efforts, reaching conclusions on compliance, and then determining the pathway forward. Rulemaking (R.) 18-10-007, serves as the titular WMP proceeding to establish guidelines for the utility submittals, which are then approved by the CPUC. Today, the WSD exists as a division under the umbrella authority of the CPUC's jurisdiction. However, it works independently of the CPUC's Safety Policy Division, Safety Enforcement, and Energy Divisions, as well as not being directly engaged with reasonableness evaluation of the mitigation measures and compliance as part of the determination for the utilities' recovery in rates. Once the WSD transitions to CNRA and becomes Energy Safety, an inter-agency bridging mechanism will be needed to coordinate the work and provide the utilities with clarity.

Several CPUC proceedings address critical aspects of the overall utility wildfire mitigation and prevention efforts. These include, among others: microgrids for resiliency and backup power during PSPS events (R.19-09-009); examining the utilities PSPS generally (R.18-12-005) evaluating the specific actions before, during and after PSPS (R.19-11-013); approval of the utility wildfire mitigation plans (R.18-10-007) and general rate cases to determine what costs are appropriate to recover in rates. All of these factor into a utility's decision making process before counting on those measures to ameliorate wildfire threat. In each of these, including approval of the WMPs, the CPUC reaches decisions on whether the utilities have met the standards of conduct and, if not, what remediation is necessary. These can range from approval of specific measures, requiring further reports and, in rare cases, financial penalties

Clarity for the utilities and all stakeholders underlies effective filings and public participation. For example, it is important to delineate where final safety sign-off for the certificates will belong or for that matter on the WMPs themselves. Without coordination between the CPUC's efforts and outcomes in these proceedings and the actions required by the WMP guidelines, redundancies could occur that would increase the burden on the utilities without concomitant benefits, or the opposite may result where a critical measure is not taken due to a belief that the issue is being addressed elsewhere. The WSD should coordinate its WMP evaluation efforts as it migrates from the CPUC to CNRA. To avoid unintended adverse consequences, the WSD must track and assess the impact of new developments in CPUC proceedings in the evaluation of WMPs. The Board recommends that the WSD creates an in-house team of staff members that follow CPUC wildfire, safety, PSPS, microgrid, and general rate case proceedings.

⁶ WSAB, Recommendations on the 2021 Wildfire Mitigation Plan Updates for Large Investor-Owned Utilities, available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/WSD/WSAB%20Recommendations%20on%202021%20Large%20IOU%20WMP%20Updates%20Issued%204.16.2021.pdf.

⁷ WSAB, Recommendations on the 2021 Wildfire Mitigation Plan Updates for Small and Multi-Jurisdictional Utilities, available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/WSD/WSAB%202021%20WMP%20SMJU%20Recommendations%20Issued%20-%205.13.21.pdf



In addition to advising the WSD on the CPUC proceedings, these staff members should be available to the CPUC to advise the Administrative Law Judges and Commissioners on how the proceedings may impact the evaluation of the WMPs.

Topical organization for 2023 WMP Guidelines. Overall, the 2021 WMP Update Guidelines format has been developed to ensure clarity of the utilities' responses to previous recommendations. However, strict conformance to the Guidelines requires addressing the same topics across multiple sections of the WMPs and can be somewhat disjointed for the reader. The Guidelines would be easier to read and digest if all the information about any particular mitigation measure is combined in one chapter.⁸ The WSAB understands that the 2022 WMPs will be updates and not comprehensive revisions of the plans. Therefore, the WSAB recommends that in 2023 the WSD organizes the WMPs around mitigation initiatives.

For example, the vegetation management and inspections section would contain only information on vegetation management mitigation initiatives and could be organized as follows:

- 1) Lessons learned, past deficiencies, notices of violations from other agencies;
- 2) Pilots, research proposals, and findings;
- 3) Goals, objectives, and program targets;
- 4) Performance metrics, underlying data, and data governance;
- 5) Risk modeling, prioritization, and risk spend efficiency;
- 6) Workforce planning for vegetation management and other limited resources; and
- 7) Detailed information on mitigation initiatives.⁹

Visual aids and illustrative examples. It would aid the reviewer for the utilities' WMPs to include illustrative examples, summary tables, and other visual aids to assess the objectives, inputs, outputs, and results of the different mitigation approaches. The utilities often create very effective visual aids as part of presentations given at workshops. These types of visual aids could easily be incorporated into the WMPs.

Specific guidance to SMJUs and ITOs. The WSAB recognizes that the SMJUs and the Independent Transmission Owners (ITO) have smaller service territories than the three large utilities and may be more resource constrained. The WSD should consider providing specific guidance to the SMJUs and ITOs to help them best allocate their limited resources. Similarly, the WSD should consider whether the SMJUs and ITOs may be relieved of some of the reporting requirements for the same reason.

⁸ This is discussed further in Section 1 of the WSAB's Recommendations on the 2021 WMP Guidelines, Performance Metrics, and Safety Culture, available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/WSD/WSAB%20Recommendations%20on%202021%20WMP%20Guidelines%20APPROVED%20CONCURRENCES%206.24.2020.pdf

⁹ For example, the information in Section 7.3.2. in the current 2021 WMP Guidelines.



BOARD RECOMMENDATIONS

1. The WSAB recommends the WSD coordinate wildfire mitigation plan evaluation efforts following its transition from the CPUC to the CNRA.
 2. The WSAB recommends the WSD create a team of staff to provide advice to other internal WSD staff and to CPUC decision-makers. As appropriate, the WSD should track the CPUC Proceedings affecting the utilities' wildfire mitigation activities, link those to its review efforts and engage directly in a meaningful way, if necessary.
 3. The WSD should consider restructuring the WMP guidelines to be organized based on the different mitigation measures.
 4. The 2022 WMP Guidelines should require the utilities to include illustrative examples, summary tables, and other visual aids to assess the objectives, inputs, outputs, and results of the different mitigation approaches.
 5. The WSD should consider creating separate Guidelines for the SMJUs and ITOs and consider relieving them of some of the reporting requirements.
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2 Risk Assessment: Risk Modeling, GIS Mapping, and Resource Allocation

Data collection, reporting, and GIS. The WSAB commends the WSD's structured Geographical Information Systems (GIS data) schema requirements.¹⁰ Currently, the GIS data requests appear to be formatted into (1) standard spatial database features that must be populated to its completion and (2) time-relevant events and activities on the spatial data that must be reported at time-sensitive intervals. These tables can then be joined to the semi-static infrastructure features by specific infrastructure type and location. The current requirements also do a good job of specifying how to report the location and current state of the infrastructure so the WSD can build out a map of assets and their current state.

The WSAB supports the WSD's data requirements, their expansion in the Guidelines, and the GIS data reporting requirements. The utilities must have a good representation of data to have safe and well documented utility processes and to make responsible decisions. Each incident and mitigation must be tied to a relevant piece of infrastructure being mitigated or affected, and every activity (mitigation, PSPS, hardening, outage) must be put into context. Documentation should be provided that describes the associated infrastructure proximal to it and the issue that the mitigation aims to address, in addition to the location of the activity. The WSD should also request that the utilities provide the process explaining how each of the reporting elements fit together and how their departments coordinate data collection amongst each other. As quarterly reporting proceeds to complete this data, the WSD will have well documented mitigations, management practices, and inspections across the entire infrastructure in space and time. The Board recommends high resolution spatial detail for all GIS data reporting so that the WSD can assess the impact of the mitigation efforts.

While the WSD is well on its way to enhancing its data reporting requirements, it is necessary to have transparent data and data structures to understand the regulated infrastructure. The Board is looking forward to working with the WSD to dive deeper to specify data reporting requirements.

Reporting modeling methods, assumptions, inputs, outputs, and decision-making. As explained in its review of the utilities' 2021 WMP Updates, the WSAB found that the utilities briefly described their modelling methods, mentioned machine learning, and referenced their consultants. The WSAB recommends that the 2022 WMP Guidelines require that the utilities provide a deeper explanation of how they use all the components of their modeling approaches, the inputs and outputs of each of their models, more detail about modeling algorithms and assumptions, how modeling outputs affect decision-making, and further detail about the experts that they are relying upon to assess and conduct their modeling work. Ideally, the utility teams would consist of expert scientists and ecologists who have extensive modeling experience and substantive understanding of fire behavior, global change trends, geography, and ecology. The utilities must provide enough information for the WSD to evaluate the science being used, methodologies and assumptions being made, and expertise being used to conduct the modelling work.

Further, the WSAB supports the WSD's remedial plan described in the PG&E 2021 WMP Revision Notice.¹¹ The Board has adapted the PG&E 2021 WMP Revision Notice so that the requirement can be

¹⁰ WSD GIS Data Reporting Standard for California Electrical Corporations – V2 (Feb. 4, 2021), available at: <https://www.cpuc.ca.gov/wildfiremitigationplans/> or <ftp://ftp.cpuc.ca.gov/WMP/2021/GIS/WSD%20GIS%20Data%20Reporting%20Standard.pdf>.

¹¹ PG&E 2021 WMP Revision Notice, Critical Issue PGE-02, issued May 5, 2021, at 9-10.



applied to all utilities and included more data points for utility decision-making based on outcomes. The WSAB recommends that all utilities improve their reporting by submitting the following:

1. *Background, context, and justification:* This section could review the context and background of fire issues in the service territory that require fire risk modeling and what the fire modeling can achieve (e.g., identification of the areas with highest ignition risk and consequence). It would also include:
 - a. A literature review describing the different types of models that could be used to attain the utilities' objectives and their assumptions and limitations; and
 - b. A list of common alternative modeling approaches and justification for the method selected.
2. *Input data and sources:* This would be a description of what the model requires to run and what the utility is currently using. It would also include:
 - a. A discussion of scale and geographical context;
 - b. Choice of input data sets for each modeling component; and
 - c. Potential data alternatives or goals for future data products.
3. *Model summaries:* Description of the models, their assumptions and algorithms, previous applications in other research projects or commercial applications, and relevant literature cited. It would also include:
 - a. Additional information that validates its modeling assumptions, inputs, and outputs. The additional information shall include, but not be limited to:
 - i. Any internal validation report for each model;
 - ii. The results of any third-party review and validation of each model, including the evaluation of model inputs, assumptions, and findings; and
 - iii. Any other available materials that review and/or validate the utility's models, including peer review(s).
 - iv. Examples of other applications of the model, particularly if these are in the peer-reviewed literature.
 - b. A list of all modeling components and model linkages.
 - c. A detailed description of and justification for the following modeling components:
 - i. Assumptions for each modeling component; and
 - ii. Assumptions for how each component links to other components, i.e. model interdependencies.
 - iii. Descriptions of algorithms, and if applicable, how machine learning is utilized.
4. *Model outputs:* This section would list what the model creates as outputs in general, in addition to the specific outputs generated by the utility, both numerically and geographically. It would also describe the accuracy of outputs including:
 - a. Source and range of uncertainty/confidence for each modeling component;
 - b. Weight of each component of the ignition and consequence models;
 - c. Range of uncertainty for the outputs of the model as a whole and the propagation of uncertainty through model linkages; and



- d. The relative differences in the model output due to uncertainty and how these affect the interpretation of the outputs.
5. *Application:* This section would describe how the outputs of the different models are combined to use for decision support by the utilities, and why.
6. *Discussion and limitations:* This section would review the current status of the modeling, how to best interpret what the results mean (what is or is not appropriate), what the limitations of the models are (all models have limitations), and how they could be improved in the future.
7. *Prioritization and decision-making:* This section would include a detailed description of how modeling outputs are used to justify the prioritization of any mitigation measure, as well as other decision-making, including:
 - a. Descriptions of how weather modeling, fire behavior modeling, projections of consequence, and risk indices are used to make decisions around infrastructure management and mitigation efforts;
 - b. Prioritization criteria for mitigation efforts based on modeling outcomes;
 - c. Descriptions of how their prioritization criteria vary geographically and along environmental gradients around their service territory;
 - d. A decision tree or workflow diagram that explains how each utility prioritizes mitigation efforts and makes decisions:
 - i. For example, vegetation type, flammability, and density, fire history, infrastructure age, and the combination of these features, and its decision hierarchy;
 - ii. This should be defined using GIS data submission requirements and should identify where decisions, mitigations, or PSPS were made, what data, and what methods were used; and
 - iii. The model products should be presented in the decision workflow.
 - e. Detailed maps showing what mitigation measures will be completed in what areas; and
 - f. Report all the findings of these data components to the WSD spatially, in figures that demonstrate impact and relevance to the decision.

This approach to the presentation of risk assessment is similar to the approach taken in scientific journals. Examples of the structures of these journals can be found in the *Environmental Modeling and Software, Ecological Applications*,¹² and *Ecological Modelling*.¹³

Reporting decision-making processes. The utilities' actions rely on various studies, direct experience, feedback from the stakeholder and scientific communities, and outputs from their models. The WSAB recommends more explanation of how the information that the utilities rely upon is used to make mitigation decisions. Descriptions of workflows and decision trees would be helpful to understand each step from data collection to model creation, to model outputs, and finally, decision-making. This additional rationale for mitigation choices would help the reviewer understand how each utility

¹² Available at: <https://www.journals.elsevier.com/environmental-modelling-and-software>

¹³ Available at: <https://www.journals.elsevier.com/ecological-modelling>



determined its preferred course of action was the most effective option. The Board recognizes that much decision-making information is rooted in field experience, and if decisions are made this way without quantitative modeling to defend it, describing this process is still useful. As WMP's evolve, and as technological and scientific advancements are made, the content reported will also change. Describing current processes in detail are essential to understand evolving needs.

The WSAB further recommends the utilities provide more details about its prioritization criteria and how risk modeling outputs are used to make decisions, including specific examples of how mitigation measures were prioritized based on these models. This should include how the utilities evaluate circumstances such as crew related outages and fires (for example, line strikes during vegetation removal or repair and maintenance) or how/if the utilities are utilizing data collected when investigating near ignitions.

Open science and scientific review. As discussed in Section 2 of the WSAB's Recommendations on the 2021 Large IOU WMP Update, neutral peer review, collaboration, and more accessible data are necessary to ensure that the best emerging science, tools, and technology are being used. All the utilities are now creating their own in-house models and using models created by other vendors. The Board is concerned that the assumptions, algorithms, and outcomes of the models are not being closely and transparently reviewed by independent experts, including those from the academic community who have extensive experience in peer review, to ensure they meet scientific standards. Scientific reproducibility is essential to environmental research, ethics in machine learning,¹⁴ and is fundamental to state and federal environmental regulation. Scientists must be able to access utility data, modeling methods, and assumptions to be able to reproduce what the utilities report in their WMPs, and to understand how data are influencing decisions. In addition, the Board recommends coordinating field experts in machine learning and fire science to recommend emerging best practices in each discipline.

The Board is respectful of proprietary and confidential data; however, the utilities should not maintain confidential modeling methods or implementation because this information may be considered proprietary.¹⁵ The implementation of these models must be vetted to ensure that the utilities are using the best available science.¹⁶ The public safety of Californians depends upon our ability to reduce or eliminate utility-caused ignitions and wildfires and risk modeling is a key piece of the puzzle.

Without undergoing a transparent peer review process, neither the WSD nor the public can verify the accuracy of these models. Verifying the accuracy of the models is an essential step in reviewing the rationale for determining priorities. Further, these models must be vetted to ensure the prudent use of ratepayer funds. The Board recommends that the WSD establishes a peer review process from the scientific community to evaluate the accuracy of the data, assumptions, methods, results, and interpretations for the different models. The Board will be happy to help facilitate this process.

¹⁴ Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. "The FAIR Guiding Principles for scientific data management and stewardship." *Sci Data* 3, 160018 (2016), <https://www.nature.com/articles/sdata201618>; See also *FAIR Principles*, GO FAIR Initiative, <https://www.go-fair.org/fair-principles/> (last visited April 1, 2021).

¹⁵ For example, see SCE 2021 WMP Update at 58, for a description of the proprietary implementation of fire modeling methods.

¹⁶ *FAIR Principles*, GO FAIR Initiative, <https://www.go-fair.org/fair-principles/> (last visited April 1, 2021).



Guidance on a common data system or platform. The WSAB applauds the utilities' efforts to create risk models for PSPS, wildfire consequence, and probability of ignition, with little guidance from the CPUC. However, the WSAB is concerned that neither the CPUC nor WSD provides clear guidance and each of the utilities are creating their own in-house models and use models created by other vendors. This makes it very difficult for the regulators and stakeholders to evaluate and determine the effectiveness of models and whether the application of these models correctly accounts for differences in environmental conditions that vary by region and service territory.

The Board recommends that the WSD and CPUC create structures that help the utilities adapt to changing technology to ensure that they are using the best methods available. As discussed in Section 2 of the WSAB's Recommendations on the 2021 Large IOU WMP Updates, a common data system would allow for streamlined parsing and evaluation of the environment. A centralized platform¹⁷ that enables peer review¹⁸ of data and models from the utilities is essential for accurately vetting utility processes, and for helping account for changes in the climate as they develop. Utility modeling tools must be capable of being tested against utility data. While the WSAB appreciates the sensitive and confidential nature of the data collected, there are ways to anonymize data so that it may be shared with the scientific community for peer review. A data system should be ingesting all utility open data and be able to also manage semantic tagging of datasets for easy querying and evaluation. If such a data system already exists, the WSD should consider partnering with the organizations already managing such data.

BOARD RECOMMENDATIONS

1. The 2022 WMP Guidelines should require utilities to explain how each of the reporting elements fit together and how their departments coordinate data collection amongst each other. The WSAB also recommends high resolution spatial detail for all GIS data reporting so that the WSD can assess the impact of the mitigation efforts.
2. The 2022 WMP Guidelines should require improved reporting on modeling methods and assumptions, as outlined in these recommendations, so that the WSD and the public can verify the accuracy of these critical tools. For example, the WSD may need the utilities to provide maps that visualize modeling outcomes and additional descriptions about how those outcomes resulted in the utilities' specific mitigation decisions. The WSAB provides a detailed outline with recommended reporting elements, an expanded list similar to PG&E 2021 WMP Revision Notice requirements for reporting modeling methods, assumptions, inputs, outputs, and decision-making.
3. The 2022 WMP Guidelines should require improved reporting on modeling outcomes and how these outcomes affect decision-making. This includes more detail about the utilities' prioritization criteria and how risk modeling outputs are used to make decisions, including specific examples of how mitigation measures were prioritized based on these models. This should include, for

¹⁷ See the WSAB's Recommendations on the 2021 IOU WMP Guidelines, Section 3.2 at 27-28.

¹⁸ Scientists are motivated to do this type of work because they receive credit for their review.



example, how the utilities evaluate errors, such as line strikes, that occur during vegetation removal or repair and maintenance, and how these errors are factored into their risk assessment.

4. The 2022 WMP Guidelines should establish a peer review process from the scientific community to evaluate the accuracy of the data, assumptions, methods, results, and interpretations for the different models. Alternatively, the WSD could direct the utilities to establish a peer review process that the WSD could monitor as part of its compliance activities. The WSAB is available for collaboration on how this recommendation can be implemented to safely ensure that confidential data remain confidential. In addition, the WSD can recruit field experts to advise on emerging best practices for machine learning and atmospheric and fire science that utilities may be interested to incorporate.
 5. The WSD should continue to explore its options working with the utilities to develop a data access portal for interconnected data repositories and permission hierarchy.¹⁹ The WSD has indicated it will incorporate this recommendation following the standardization of data metrics, processing, and analysis,²⁰ however, it may be necessary to begin work on a platform now, especially if a CPUC rulemaking or utility application proceeding is required. A data system should be ingesting all utility open data and also be able to manage semantic tagging of datasets for easy discoverability and evaluation. If such a data system already exists, the WSD should consider partnering with the organizations already managing such data and modeling.
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¹⁹ See the WSAB's Recommendations on the 2021 IOU WMP Guidelines, Section 3.2 at 27-28.

²⁰ Resolution WSD-011, Attachment 1, Analysis and recommendations on Wildfire Safety Advisory Board (WSAB) recommendations at 11.



3 Public Safety Power Shutoffs: Reducing Scale, Scope and Frequency

Risk spend efficiency and reducing PSPS: During the August 11, 2020, WSD workshop, the WSAB presented the System Hardening for Electric Utility Resiliency (SHEUR) threshold.²¹ The WSAB recommended that the utilities develop a methodology (such as the SHEUR threshold) for reducing the risk of both wildfires and PSPS events, and systematically prioritizing grid hardening measures through risk spend efficiency calculations that treat wildfires and PSPS events as risks for the utilities to reduce the scale, scope, and frequency of PSPS.

While the Board is pleased that the utilities are moving in this direction without explicit guidance from the CPUC, the 2022 WMP Guidelines must require that the utilities share their methodologies for completing their Risk Spend Efficiency (RSE). This should include an analysis for each mitigation measure, at the circuit level, showing that each measure has been considered individually, in aggregate, and against each other, to determine the most appropriate wildfire mitigation measure(s) for each circuit section. The utilities must identify each mitigation and their associated risk reductions of PSPS, probability of ignition, wildfire suppression, or PSPS mitigation. SCE's Table 4-8,²² at a high level, identifies each mitigation and designates whether the mitigation reduces the probability of ignition and/or PSPS, and whether it reduces the consequences of ignition and/or PSPS.

Further, the Board recommends that the 2022 WMP Guidelines require PSPS to be treated as a risk for the purposes of the RSE calculations to encourage the utilities to allocate resources in a way that prioritizes reducing the number, scope, duration, and reenergization timeline of PSPS events. This goes beyond WSD's previous requirement that RSE not be used to justify PSPS.²³ For example, Table 4-7 in SCE's 2021 WMP, identifies attributes, units, weights, ranges, and scales when estimating its wildfire and PSPS consequence scores.²⁴ In order to effectively evaluate PSPS as a risk, the 2022 WMP Guidelines should require the utilities to report on any efforts already underway to evaluate PSPS impact on customers and to develop procedures to collect data about how PSPS has impacted customers. The WSAB can coordinate with the WSD to host a workshop to develop specific parameters.

Studying the effects of risk toleration above zero. Although risk tolerance has been quantified as zero, for the utilities' models to advance and produce accurate results, the WSD, CPUC, and the utilities must begin a dialog to determine the appropriate level of risk tolerance so that systems can be engineered to lower the risk of consequence of PSPS. As a first step, an assessment should be made about whether zero risk is advisable as the basis and, if so, can it be achieved regardless of cost? The WSD should require the

²¹ The WSAB presented recommendations to the WSD during the August 11, 2021, WSD Workshop. A recording of the presentation is available at: <https://www.cpuc.ca.gov/wmpworkshops/>; See also, WSAB Recommendations on the 2021 WMP Guidelines (June 24, 2020), available at: www.cpuc.ca.gov/wsab.

²² SCE 2021 WMP at 65-67.

²³ In WSD-002 at 18, RSE was no longer permitted as a justification for the use of PSPS:

"Further, RSE is not an appropriate tool for justifying the use of PSPS. When calculating RSE for PSPS, electrical corporations generally assume 100 percent wildfire risk mitigation and very low implementation costs because societal costs and impact are not included. When calculated this way, PSPS will always rise to the top as a wildfire mitigation tool, but it will always fail to account for its true costs to customers. Therefore, electrical corporations shall not rely on RSE calculations as a tool to justify the use of PSPS."

²⁴ SCE 2021 WMP at 61.



utilities to explain how they quantify risk tolerance for their models and provide their risk tolerance threshold. The 2022 WMP Guidelines should require the utilities to analyze their systems at various risk levels, identify the reduction, and the corresponding reduction of PSPS that comes from the toleration of some risk. The utilities should also evaluate the need for PSPS at a risk levels higher than zero for high consequence wildfires. The utilities should consider developing risk measurements that are asset specific (e.g. probability of high consequence wildfire per circuit per operating minute) and system based (a higher wind threshold will result in projected increase in x number of building lost to wildfires). Further, the 2022 WMP Guidelines should require the utilities to evaluate and quantify the reduction of wildfire initiation and wildfire consequence risk through the application of mitigation, which will result in PSPS avoidance as a result of lowered risk and the toleration of some risk.

For the regulators to evaluate the way in which the utilities are assessing risk, it would be preferable for utilities to be working with a common metric. While each utilities develops its own models, examination of these models may lead to a determination of best practices and more common models will enable the utilities to better react, including reducing the duration of PSPS and mitigating the consequences of PSPS. If the utilities perform these evaluations as part of their WMPs, this data could help the CPUC in determining an acceptable level of risk. Once risk tolerance has been quantified, engineers can design the systems around this level of risk.

Consequence mapping to reduce risk: As the utilities plan new construction of overhead lines, it is important that they are using technology to identify problematic areas. Consequence modeling tools can identify high risk areas where no overhead lines should be constructed, as well alternative areas with lower risk. The Board recommends that the utilities use geographical consequence mapping to identify the areas of lower risk to avoid building new overhead lines in highest risk areas within high fire threat districts (HFTD).

Evaluation of mitigation efforts and PSPS: The WSAB recommends that the utilities collect data and evaluate their mitigation efforts to determine their effectiveness. Quantifying the effectiveness of mitigation measures such as system hardening, and enhanced vegetation management is a critical next step. The utilities must be able to evaluate and quantify mitigation efforts cost against the risk of PSPS. For example, if utilities harden systems in HFTDs and determine that the wildfire risk is too great and call a PSPS event 100 percent of the time, then system hardening may not be the most appropriate mitigation measure in this area.

Today, although system hardening may reduce the risk of responsibility to an acceptable level, the utility is still held accountable for any failure, which may result in PSPS events. The Board recommends that the utilities evaluate their wind threshold and risk tolerance for lines that have been hardened. As the utilities collect data from new equipment, such as weather stations, being installed there should be enough data to determine maximum winds in various areas of the system, which should help the utilities to build to that threshold. This type of evaluation would enable the utility to determine if alternatives such as undergrounding or rerouting of lines to areas that experience lower wind speeds or looping systems in a way that those areas can be shut off with minimal or no outages.

Further, the WSAB recommends that the utilities utilize the data collected when investigating near miss events and cross reference it with PSPS events in areas where the utilities have completed mitigation efforts for the purposes of evaluating the effectiveness of their mitigation efforts and resource allocation. The Board recommends that the utilities conduct independent short and long-term studies that evaluate



mitigation practices including enhanced vegetation management, grid hardening, etc. to assess their effectiveness in mitigating wildfires and reducing PSPS events. The studies should focus on areas where mitigation efforts have taken place and evaluate the data collected during patrols after a PSPS event. The progress of such studies should be reported in one year and three-year time frames, while also continuing on these studies over time.

BOARD RECOMMENDATIONS

1. The 2022 WMP Guidelines must require that the utilities complete a Risk-Spend Efficiency (RSE) analysis for each mitigation measure, at the circuit level, so that each measure can be considered individually, in aggregate, and against each other, to determine the most appropriate wildfire mitigation effort for each circuit section. The utilities must identify each mitigation and their associated risk reductions of PSPS, probability of ignition, wildfire suppression, or PSPS mitigation. At minimum, the utilities should identify each mitigation and designates whether the mitigation reduces the probability of ignition and/or PSPS, and whether it reduces the consequences of ignition and/or PSPS, similar to SCE's Table 4-8.²⁵
2. The 2022 WMP Guidelines must require PSPS to be treated as a risk for the purposes of the RSE calculations in order to encourage utilities to allocate resources in a way that prioritizes reducing the number, scope, duration, and reenergization timeline of PSPS events. In order to effectively evaluate PSPS as a risk, the 2022 WMP Guidelines should require the utilities to report on any efforts already underway to evaluate PSPS impact on customers and to develop procedures to collect data about how PSPS has impacted customers.
3. The 2022 WMP Guidelines must require that the utilities share the methodologies used to determine the level of risk and consequences reduction of PSPS and/or wildfire for each mitigation measure. The CPUC can use this information to start the discussion about an acceptable level of risk that utilities could design their systems around.
4. The 2022 WMP Guidelines should require that the utilities use geographical consequence mapping to identify the areas of lower risk to avoid building new overhead lines in highest risk areas within HFTD.
5. The 2022 WMP Guidelines should require that the utilities evaluate their wind threshold and risk tolerance for lines that have been hardened.
6. The 2022 WMP Guidelines should require the utilities conduct independent short and long-term studies that focus specifically on areas where mitigation efforts have taken place and evaluate the data collected during patrols after a PSPS event. The utilities must evaluate data collected after PSPS events to assess measures such as enhanced vegetation management and grid hardening, and their effectiveness in mitigating wildfires and reducing PSPS events.

²⁵ SCE 2021 WMP at 65-67.



4 Vegetation Management: Strategies and Environmental Stewardship

With these recommendations, the WSAB focuses on how utilities can improve environmental stewardship.²⁶ Vegetation management practices can either improve the surrounding ecosystem, such as, by removing trees that are hazardous and thinning dense forests that are naturally adapted to high-frequency fire. Alternatively, vegetation management practices can harm surrounding ecosystems for example, by removing old growth trees, intentionally or unintentionally converting woody shrublands to grasslands, or failing to remove slash and cut trees, and thereby causing a greater fire hazard. The WSAB encourages the WSD and the CPUC to evaluate the environmental impact of vegetation management practices.

Tree replacement programs. Utilities must work with ecologists and data scientists to determine where tree replacement is needed to prevent damage to the environment. Trees help prevent climate change by being natural carbon sinks. Although replanting and replacing trees may have a high cost in the short-term, the potential negative impact in the long-term of tree removal will be borne by the ecosystem where the tree was removed, the local community, and future Californians because of climate change. The WSAB recommends the 2022 WMP Guidelines require the utilities to create tree replacement programs that are larger with a broader scope and that include consultation with ecologists and data scientists.

Tree removals after fires. The WSAB and the CPUC have received many comments from the public about tree removals after wildfires.²⁷ Vegetation removal occurring during an evacuation should not be permitted, unless that vegetation poses an immediate public safety risk. Residents must be informed of all planned activities. The WSAB understands the necessity for utilities to be exempt from many environmental regulations like the California Environmental Quality Act, but there should be a review process to evaluate whether the removal of certain trees is reasonable before the activity is performed due to the impact on the ecosystem and the surrounding community. The WSAB is especially concerned about native species of old growth trees that cannot be replaced.

Including Notices of Violation in the WMPs. The WSAB recommends the 2022 WMP Guidelines require inclusion of any notices of violation issued by other state agencies such as the Department of Forestry and Fire Protection (CAL FIRE), or the Coastal Commission, among others, as they relate to utility wildfire mitigation programs like vegetation management. Utility vegetation contractors must follow all regulations and represent the utilities as environmental stewards. The WSD should partner with its sister agencies to review the environmental impacts cited in any notices of violation.

Utilities have training programs for vegetation contractors and some monitoring and auditing activities are performed. The 2022 WMP Guidelines should require utilities to improve upon these programs to ensure that utility vegetation management contractors reduce wildfire hazards instead of creating new hazards or negatively impacting the environment.

²⁶ For specific illustrative examples, see Section 3 of the WSAB's Recommendations on the 2021 Large IOU WMP Updates, and Section 3 of the WSAB's Recommendations on the 2021 SMJU WMP Updates.

²⁷ Public comments received by Nancy Macy and Dan Courtney at the WSAB Vegetation Management Workshop (March 2, 2021), and the WSAB Meeting (March 3, 2021), both webcasts available at: www.adminmonitor.com/ca/cpuc.



Database of vegetation-caused outages. The 2022 WMP Guidelines should require utilities to create a statewide database so all outage incidents related to vegetation can be recorded in a shared database. This database could track modes of failure, species-specific failure patterns, how species characteristics vary along different environmental gradients and vegetation locations relative to these environmental gradients and wildfire risk. Adequate scientific review cannot be performed when plants and trees are referred to by their genus, of which there are hundreds of species' contained within. This database could serve as a repository to start narrowing the information and traits of these species. The data can be mined to optimize prescriptive work methodologies and can help determine the effectiveness of various programs and initiatives.

Utility Defensible Space Programs. Invasive grasses that establish in the open space are much more flammable than many woody shrubs, and thus the clearance of woody shrubs could result in the opposite of the desired effect. The WSAB supports SCE's use of low-growing shrublands underneath lines and assets to serve as ember catchers to prevent the invasion of flammable grasses in these areas.²⁸ The WSD should require the utilities to do pilot programs and plant low-growing shrubs underneath utility lines or in other areas near utility lines where the shrubs could replace dry grasses that create a high risk of wildfire.

Use of tree growth regulators and herbicides. The WSAB is concerned about the environmental impact of tree growth regulators that slow the growth of vegetation, as well as herbicides. The 2022 WMP Guidelines should require utilities provide more information about tree growth regulator use because any chemical used on the soil may leech into the water table and potentially impact drinking water sources. Utilities must provide more information on herbicide use because herbicides generally kill all the vegetation treated and has cumulative impacts on ecological and human health. Additionally, the dead vegetation that remains must be cleared. When all vegetation is cleared, there are opportunities for new plants to grow, especially grass, which tends to be more flammable than woody vegetation. The WMPs should include the chemical composition of tree growth regulators and herbicides, the volume, where and over how big of an area, and with what frequency they are applied.

BOARD RECOMMENDATIONS

1. The 2022 WMP Guidelines should require the utilities create tree replacement programs that are larger with a broader scope. The Guidelines should require that utilities to hire or contract with ecologists or fire scientists to provide expert consultation.
2. The 2022 WMP Guidelines must prohibit the practice of removing healthy trees following wildfire events without some kind of environmental review by an independent ecologist. Singed and even burned native species or old growth trees may still be healthy, and if they are not prone to eventual failure and do not pose a risk to utility infrastructure, these trees can be valuable assets to their environment.
3. The 2022 WMP Guidelines must require the utilities report notices of violation issued by other state agencies as they relate to utility wildfire mitigation programs like vegetation management.

²⁸ SCE 2021 WMP Update at 333.



The WSD should coordinate with other state agencies and experts to review these notices of violations and recommend changes to wildfire mitigation practices.

4. The 2022 WMP Guidelines should require utilities to improve training programs for vegetation management contractors and increase the auditing and monitoring of vegetation contractors, especially where a utility has multiple notices of violations related to their vegetation management practices.
 5. The 2022 WMP Guidelines should require the utilities to create a statewide database of vegetation-related utility outages, tree species, traits, growth rates, morphological characteristics, modes of failure, and locations along environmental gradients. The Guidelines must require utilities to refer to plants by their genus and species.
 6. The 2022 WMP Guidelines should require the utilities to do pilot programs and plant low-growing shrubs as Utility Defensible Space under utility right of ways or in other areas near utility lines where the shrubs could replace dry grasses that create a high risk of wildfire.
 7. The 2022 WMP Guidelines must require the utilities report the use of herbicides, pesticides, tree growth regulators or other chemicals. The Guidelines should require reporting on the chemical composition of tree growth regulators and herbicides, the volume, where and over how big of an area, and with what frequency they are applied. The WSD should also direct the utilities to perform a cost-benefit analysis to compare the benefits of planting low-growing shrubs versus the cost of vegetation clearance and chemicals.
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5 System Design and Operation: Grid Hardening, Workforce Management, Asset Inspections, and Emerging Technology

Emerging technology. The WSAB encourages the utilities to continue to explore technologies that reduce the risk of ignitions, recognize faults more quickly, and reduce the intensity of arcs. The 2022 WMP Guidelines should require all utilities to increase the scope of pilots of these technologies because of their potential to allow infrastructure to remain in service during high wind events, and therefore reduce the need for PSPS.

The 2022 WMP Guidelines should request information about whether the utilities have considered lessons learned from the Southeastern United States, or other parts of the country that experience strong winds. For example, in Florida, where the utility lines are exposed to hurricanes and high-wind events, utilities often install guy wires to stabilize utility poles. Hardening measures like these could increase resiliency and allow for faster restoration times when utility lines do go out during a high-wind event.

Workforce protection. Although covered conductors have advantages in eliminating arcs that have the potential to initiate a fire, in areas where access is limited, covered conductors can create some safety challenges to the workforce assigned to perform work on them. For example, the removal and repair of covered conductor insulation can be hazardous if the wire is energized. The danger to the workforce further increases if the line being installed, repaired, or removed is located in a rural area and the workers do not have access to bucket trucks. The 2022 WMP Guidelines should require that the utilities describe their protocols to ensure the safety of their workforce when introducing new technologies or equipment, implementing new work practices, or during the removal, installation, and repair of equipment. As the utilities begin to adopt new technology, it is imperative that they ensure that procedures are in place to protect the workforce.

Workforce training and qualified electrical workers. The WSAB recognizes the challenge that all the utilities have with the scarce labor force and limited pool of qualified personnel within the state. The utilities current training looks at General Order (G.O.) 95 infrastructure and assets. While the large utilities appear to provide plans for training a qualified workforce, the 2022 WMP Guidelines must require the utilities to provide adequate information for the WSD to evaluate the training programs, including start dates and expected hours of training.

The WSAB is pleased that SCE is deploying Qualified Electrical Workers (QEW) to do some asset inspections. However, WSAB is concerned that other asset inspections are completed by Electrical System Inspectors (ESI).²⁹ The Board cautions against allowing unqualified individuals to inspect and interpret infrastructure that they do not design or construct beyond validating if structures comply with G.O. 95 requirements. These workers may not have enough field engineering capabilities and training to recognize all hazards and propose effective solutions. At a minimum, SCE should perform increased quality control for the annual inspections that are not performed by QEWs. SCE could re-inspect a larger sampling of inspections, close to the time the inspections were completed, to determine whether the ESIs are recognizing all hazards.

²⁹ SCE 2021 WMP Update at 133-139 and 230-253.



The 2022 WMP Guidelines should require that the utilities utilize the minimum qualifications of a QEW, or its equivalent, for inspections and mitigation efforts concerning utility infrastructure. The Board recognizes the limited resources to adequately meet the required timelines imposed by both the rate payer and regulatory entities, which expect a more mature and efficient response from the utilities. The need for accurate and well-informed inspection data to help drive actionable and sustainable mitigation efforts requires a minimum level of knowledge and skills that can be translatable to other classification of workers to better utilize resources available. The Board recommends that formalizing the requirement imposed upon the utilities in the infancy of the wildfire mitigation programs. Requiring a minimum qualification to inspect and interpret wildfire mitigation data sets a definable standard that will allow the utilities to identify well qualified support classifications, which will deepen their resource pool for other efforts. The CPUC requires that all asset inspections be performed and interpreted by QEWs. QEWs have a level of exposure to the utilities' actual infrastructure and equipment, intimate knowledge of the construction requirements, and hazards that adversely affect the reliable operation of each grid configuration. QEWs also have extensive knowledge and exposure to fault limiting equipment and its most effective placement for at risk circuits, sectionalizing, and isolation loops to avoid areas of concern.

De-energization of idle lines and equipment. The WSAB recommends that the utilities describe their protocols for the de-energization of idle lines and equipment. Several utility systems may have equipment such as transformers, jumpers, line sections, or secondary services that are not in use all the time but may still be energized. The WSAB supports this best practice, particularly in high fire threat areas where de-energization of idle lines and equipment would prevent sparks.

G.O. 95 Exempt Equipment. The WSAB recommends the utilities provide information about facilities that are exempt from G.O. 95, both inside, and outside of HFTDs.³⁰ The utilities must highlight descriptions of G.O. 95 exempt equipment and inspection processes for these exempted lines. The WSAB would like to understand how each utility identifies these risks on its own system and then better understand plans to mitigate the risk of exempt assets.

Asset inspection cycles and safety: The WSAB recommends that all utilities follow the POUs and large IOUs best practices for visual and detailed inspections.³¹ The utilities should conduct more detailed, invasive inspections on a three-year cycle, until they have adequate historical data to evaluate their mitigation efforts. The Board also recommends that all Tier 3 lines be inspected annually, all lines in Tier 2 be inspected at least every three years, and all other lines be inspected on a five-year cycle.

BOARD RECOMMENDATIONS

1. The 2022 WMP Guidelines should require all utilities increase the scope of pilots of different technologies that reduce the risk of ignition, recognize faults more quickly, and reduce the intensity of arcs. The Guidelines should request information about whether the utilities have

³⁰ See G.O. 95 Rule 12.1 on applicability stating that "[t]he requirements apply to all such lines and extensions of lines constructed hereafter" the adoption of G.O. 95, which was adopted in 1941.

³¹ For example, PG&E performs detailed inspections on all Tier 3 lines annually and all Tier 2 lines every three years (1/3 inspected per year). PG&E 2021 WMP Update at 237.



considered lessons learned about grid hardening from other regions like the Southeastern United States, where hurricanes and high-wind events are frequent.

2. The 2022 WMP Guidelines should require the utilities explain their protocols to ensure the safety of its workforce during the removal, installation, and repair of equipment, especially when introducing new technologies or equipment, and implementing new work practices.
 3. The 2022 WMP Guidelines should require the utilities provide more detail about how they will ensure the workforce will become qualified, their training plans, including start, length of the training, etc.
 4. The 2022 WMP Guidelines should require all utilities, including SCE, to perform increased quality control for inspections that are completed by any worker with fewer qualifications than Qualified Electrical Workers, such as the Electric System Inspectors.
 5. The 2022 WMP Guidelines should require that the utilities require the minimum qualifications of a Qualified Electrical Worker, or its equivalent, for inspections and mitigation efforts concerning utility infrastructure. Requiring a minimum qualification to inspect and interpret wildfire mitigation data sets a definable standard that will allow the utilities to identify well qualified support classifications, which will deepen their resource pool for other efforts.
 6. The 2022 WMP Guidelines should require the utilities to evaluate the risk involved in keeping idle lines or equipment energized versus disconnecting completely when not in use. The Guidelines should require the utilities to identify any equipment or lines that may still be energized and not in service. The Guidelines should require the utilities remove or de-energize lines and equipment from service, which would lower the risk of those assets failing and causing a fire. The Guidelines should require the utilities to explain in their WMPs whether the utilities have adopted the practice of de-energizing idle lines.
 7. The 2022 WMP Guidelines should require reporting on G.O. 95 exempt equipment so that WSD can track and monitor this equipment. The WSD should evaluate the sufficiency of the utilities plans or lack thereof to mitigate the increased risk this equipment poses, especially any equipment located in the high fire threat districts.
 8. The 2022 WMP Guidelines should require the SMJUs to increase their more detailed, invasive inspections from every five years to every three years, until they have adequate historical data to evaluate their mitigation efforts. The 2022 WMP Guidelines should require that all Tier 3 lines be inspected on an annual basis, all lines in Tier 2 are inspected at least every three years, and all other lines are inspected on a five-year cycle. The 2022 WMP Guidelines should require that the SMJUs follow the POUs and IOUs' best practices for visual and detailed inspections.
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6 Communication and Community Outreach: Performance Metrics and Improving Stakeholder Outreach Efforts

Incorporate the outcome of I.19-11-013³² and R.18-12-005³³ (the PSPS proceedings) in stakeholder outreach. Under the 2021 WMP Guidelines, the utilities must report outreach efforts including advancement over the previous year. In the past, SDG&E was the leader (and continues to set the bar). PG&E has been found the most lacking with SCE doing slightly better. The utilities have made significant progress, which was reported in the 2021 WMP Updates. Each IOU has increased its efforts and provided detailed descriptions of expanded outreach efforts. While informative and encouraging, the WSAB's review found that the information did not reveal the extent of the utilities' actions fully incorporate the Commission's efforts in its other forums to ensure that state, federal, local and tribal governments, community-based organizations, the Access and Functional Needs (AFN) populations, businesses, residents, and even visitors are being kept informed "before, during, and after" wildfires.

In general, progress is being made. Governments and affected populations are being kept informed and actively engaged. In the PSPS proceedings, the Commission performed an extensive assessment of the utilities' communication and outreach efforts both retroactively and prospectively. The PSPS proceedings are a comprehensive review of the IOU's PSPS activities and reach conclusions regarding the effectiveness of past actions as a basis for future actions. The outcomes should be incorporated into the 2022 WMP Guidelines in a manner that reveals the extensive range of activities already in place but does not force the utilities to replicate the level of detail in other compliance filings.

Further, Decision (D.)21-06-014 in Investigation (I.)19-11-013 and the May 21, 2021 Proposed Decision in Rulemaking (R.)18-12-005 address specific actions for seamless communication, operational coordination and real-time data sharing with governmental bodies at all levels and of all types, emergency responders and operations centers of public safety partners, community choice aggregators (CCAs), critical facilities, e.g. hospitals, communication providers, water companies and the AFN community including medical baseline customers. If the primary system does not work or there are concurrent catastrophic events, the PSPS proceeding decision require alternative pathways for communication and function for affected populations. The PSPS proceedings specify actions required by the utility that are not currently fully reflected in the WMPs.

The WSAB recognizes the many moving pieces of utility efforts to achieve excellence in outreach related to wildfire impacts. Demonstrable progress on this front in compliance with other requirements should be meaningfully reflected in the WMPs with a roadmap on what is being done and why but without a duplication of effort.

Measuring effectiveness of outreach efforts. Under the 2021 WMP Guidelines, the utilities are adhering to the requirements that skew to a quantitative assessment of points of contact and types of outreach. There is a distinction that needs to be drawn between volume and effectiveness. Knowing whether a particular

³² Order Instituting Investigation on the Commission's Own Motion on the Late 2019 Public Safety Power Shutoff Events (I.19-10-013).

³³ Order Instituting Rulemaking to Examine Electric Utility De-Energization of Power Lines in Dangerous Conditions (R.18-12-005).



activity reaches a specific target population is critical going forward. The Commission has begun developing this type of evaluation as part of the WMP process.

D.20-03-004³⁴ set forth guidance on community awareness and public outreach “before, during and after” a wildfire and issued requirements for communications and outreach focusing on the languages to be used. As a first step, utility surveys filed on December 31, 2020, provided the first insight into whether outreach efforts were successful. The focus was on ensuring all appropriate languages were used with less emphasis on what worked the best. PG&E’s submittal³⁵ was the most informative to the WSAB regarding how it obtained feedback and the effectiveness of those efforts.

PG&E looked at the adequacy of website information and distinguished customer dissatisfaction with the website from customer dissatisfaction with PSPS in general. Business and residential customers that took the surveys identified selected features that were useful such as the PSPS portal. Customers appreciated that the 2020 PSPS events were smaller and impacted fewer customers. PG&E identified suggestions made by customers in the listening sessions:

- Automate PSPS portal update notifications for immediate distribution
- High-level and detailed summaries of changes to situation reports each time the PSPS portal is updated
- Focusing resiliency and temporary generation solutions on rural clinics
- Fewer notifications with information bundled from multiple sources wherever possible.

Additionally, SCE reported that based on feedback, it shifted certain communications to regional rather than service territory wide.

Community outreach performance metrics. The Board’s review of the WMPs did not reveal the same granularity found in the December 31, 2020, submittals to R.18-10-007 nor did the WMPs provide adequate materials to draw an informed conclusion on the relative value of the outreach efforts collectively and on an individual basis. Performance metrics are important to determine not just the scope but the effectiveness of utility actions. As the WSAB formerly recommended,³⁶ the WSD should request the utilities submit their internal evaluation methodology for selecting the most effective outreach platforms for each critical stakeholder populations, e.g. social media, text, web or in person meetings as well as the best delivery mechanism for each.

It is important that the WSD measures the performance of outreach along with other mitigation measures. The WSAB does not suggest that the Commission micromanage the utilities and create mandates. The WSAB assumes that the utilities have a decision matrix for determining what to do. The

³⁴ Decision on Community Awareness and Public Outreach Before, During and After a Wildfire and Explaining Next Steps for Other Phase 2 Issues in R. 18-10-007 Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901.

³⁵ Submittals on December 31, 2020 in R. 18-10-007

³⁶ WSAB Recommendations on the 2021 Large IOU WMP Updates, Section 6 where the WSAB recommended the “WSD ask the utilities what metrics are being used to evaluate the sufficiency of these WMPs to determine if their outreach efforts have been successful...”



Board would like a better understanding of how that process be made more visible so there is transparency regarding the choice of effective communication.

BOARD RECOMMENDATIONS

1. The 2022 WMP Guidelines should utilize the PSPS reporting framework established in the most recent decision in I.19-11-013.
 2. The 2022 WMP Guidelines should require the utilities to include an analysis of the correlation between the quantity of contacts and effectiveness of the outreach methods.
 3. The WSD should request the utilities submit their internal evaluation methodology for their outreach efforts. Based on this information the 2022 WMP Guidelines should include additional performance metrics to measure the success of community outreach efforts.
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7 Safety Culture Assessment

In 2020, the WSD created the Safety Culture Assessment, and this year, 2021, will be the first time the division will complete the assessment. The Safety Culture Assessment includes four components:

- A workforce survey, on the workers performing wildfire mitigation work.
- A management self-assessment, on organizational systems, structures, governance, and safety enabling systems.
- Supporting documentation to justify and validate the utility submissions, requested at the discretion of the WSD.
- Interviews to better understand survey and self-assessment results.

Ensure key players are surveyed. The workforce survey is completed by utility employees and contractor workers. The utilities choose who should respond to the for the management self-assessment, and so far, only the utility program managers have responded. The WSAB recommends that in addition to utility managers, contractor supervisors and managers should complete the self-assessment. Their assessment of the safety culture is critical given that the majority of the mitigation work is being completed by contractors.

The WSAB recommends that the WSD interview a variety of stakeholders including utility managers, contractor managers, utility employees and contractor workers. This will create a full picture of the safety culture at the utility for the WSD.

Pricing structure: Utility vegetation management contractors are typically paid for the quantity of work, not the time their crews spend on a particular site. In many cases, contractors may get paid the same amount despite varying levels of difficulty because of the per capita payment structure. The pressure to produce can result in some contractors spending as little time as possible doing the work, taking shortcuts, or disregarding safety rules. In the 2022 Safety Culture Assessments, the WSD should evaluate whether unit (production-based) pricing or lump sum contracting leads to more safety incidents compared to time and equipment (hourly) pricing.

BOARD RECOMMENDATIONS

1. In the 2022 Safety Culture Assessments, the WSD should request that contractor managers, in addition to utility managers, complete the self-assessment. Their assessment of the safety culture is critical given that the majority of the mitigation work is being completed by contractors.
 2. In the 2022 Safety Culture Assessments, the WSD should interview a variety of stakeholders including utility managers, contractor managers, utility employees, and contractor workers. This will create a full picture of the safety culture at the utility for the WSD.
 3. In the 2022 Safety Culture Assessments, the WSD should evaluate whether production-based pricing structures leads to more accidents compared to hourly pricing structures.
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8 Expertise to Support Wildfire Safety

Expertise in utility equipment and climate change. The WSAB recommends the WSD consider developing expertise in the equipment and devices attached to utility lines and assets, in addition to climate change issues as they relate to wildfire mitigation.³⁷ The WSD could provide recommendations to the CPUC on how to reduce the greenhouse gas impact of wildfire mitigation activities such as replacing the carbon capture capacity that is lost when vegetation is removed and converting slash into biofuel. The WSAB also suggests the WSD begin evaluating the CPUC General Orders and the requirements for the equipment attached to the electric transmission and distribution infrastructure. The WSD could explore issues such as: the appropriate use of covered conductors; setting a wind speed threshold that all utility lines must be able to withstand; whether utilities should adopt certain fault detection equipment; and whether the utilities should consider undergrounding utility lines more aggressively under certain circumstances.

Developing staff expertise on wildfire safety matters. The transition from the CPUC to CNRA offers the opportunity to build a bench of staff experts in matters pertaining to wildfire matters to address all the WMP categories. Hitting the ground running following the passage of AB 1054, the WSD (soon to be OEIS) staff has performed beyond expectations to carry out its mission. Consultants have supported these efforts at the direction of staff led by Director Caroline Thomas Jacobs. Creating the capacities in-house that move from a CPUC-centric foundation to ones that are primarily focused on wildfire specialties such as fire ecology, engineering, vegetation management, risk modeling, safety culture assessments, and compliance infrastructure inspections will allow a strong review arm. As wildfires continue to plague the state and utility efforts grow more sophisticated, the State of California must keep pace.

The Board appreciates the WSD efforts to carry out the California Legislature's direction to work with the state's utilities on eliminating wildfire threats and mitigating the impacts of those that occur. The WSAB is an independent board of experts created by the Legislature to guide this work, and is committed to continuing the strong presence that it has established since its inception in 2019. The Board's relies on high-level staff fully dedicated to its work to continue the high-level execution of its mission. We anticipate that following the transition this will be the case.

BOARD RECOMMENDATIONS

1. The WSAB recommends the WSD expand its expertise and begin evaluating the CPUC General Orders and the requirements for the equipment attached to the electric transmission and distribution infrastructure. The WSD should also consider evaluating the greenhouse gas impact of wildfire mitigation activities to reduce the impacts of climate change.
2. As part of its transition to OEIS, the WSD should continue to develop in-house expertise to perform critical analysis and review of the WMPs, as well as to conduct safety culture assessments, and ensure compliance with the WMPs.

³⁷ See Public Utilities Code § 326(a)(7).



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3. The WSAB should continue to have adequate staff support to execute its statutory responsibilities.
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Approval

The California Wildfire Safety Advisory Board's Recommendations on the 2022 Wildfire Mitigation Plan Guidelines, Performance Metrics, and Safety Culture Assessment were approved on June 28, 2021, and are hereby executed on June 30, 2021.

Marcie Edwards, Chair

Diane Fellman, Vice Chair

Ralph M. Armstrong Jr., Board Member

Jessica Block, Board Member

John Mader, Board Member

Christopher Porter, Board Member

Alexandra Syphard, Board Member