California Wildfire Safety Advisory Board

DRAFT POLICY PAPER ON UPDATING VEGETATION MANAGEMENT REGULATIONS AND INDUSTRY PRACTICES

Executive Summary

Increased catastrophic wildfires of the past two decades in California have increased the level of attention to, and expenditures on, reducing vegetation and powerline conflicts. Since 2007, the industry has introduced many exemplary practices including the utilization of new technologies, enhanced inspection protocols, data collection and tree inventory management, and collaboration with federal and private landowners. While great progress has been made, the Wildfire Safety Advisory Board (Board) finds that there is potential to reduce the risks further beyond the existing utility vegetation management practices (UVM).

To support further risk reduction from vegetation-related utility ignitions, the Board recommends that the current regulations be expanded beyond simply aerial and ground clearances within the utility right of way (ROW) to also focus on enhancing inspections, limiting the use of herbicides, and mitigating structurally unsound trees outside of the utility ROW that pose a risk of striking the lines when they fail (referred to as hazard trees).[i]

The Board recommends that the Office of Energy Infrastructure Safety along with other stakeholders develop a process to review and adopt the industry practices that are appropriate for widespread use as well as reexamine thinning practices, the use of fuel breaks and bare/mineral earth clearances, UVM workforce training, vegetation planting efforts and the siting of new infrastructure.

In this Policy Paper, the Board identifies process suggestions for considering these updates.

Background

In 2019, the State Legislature passed Assembly Bill (AB) 111 that added Section 326(a)7 to the Public Utilities Code (P.U.C.), which requires the Office of Energy Infrastructure Safety (Energy Safety) to review, as necessary, electrical infrastructure safety requirements in coordination with the Board and provide recommendations to

the CPUC to address the dynamic risk of climate change and mitigate wildfire risk.[ii] In early 2023, Energy Safety began a UVM scoping process to identify best practices for UVM. Furthermore, Energy Safety in June 2023 formally requested advice from the Board on UVM best practices and regulations to inform the scoping process. As part of its effort to coordinate with Energy Safety and inform the review of the CPUC's utility safety regulations and to recommend improvements to UVM practices and regulations, the Board offers this policy paper.

Discussion

Powerlines coming into contact with vegetation is responsible for nearly 40 percent of all utility ignitions in California's highest risk areas and has been behind many of the State's most catastrophic wildfires.[iii,iv] Additionally, many power outages are the result of vegetation contact with electric lines To reduce the risk of ignitions and outages, California electrical corporations focus their efforts on conducting inspections and patrols in and around the utility ROW, monitoring trees with remote sensing technologies like satellites and LiDAR, maintaining specified clearances from overhead wires (based on voltages, geography and conditions), and maintaining bare/mineral earth clearances at the base of poles with potentially hazardous equipment.

Limitations of the current UVM regulations

While the current regulated vegetation management practices reduce many potential vegetation-powerline conflicts, these practices cannot eliminate all risk of ignitions and outages, although some practices are more effective than others, and their effectiveness depends upon several factors that vary geographically. For instance, the regulations California Public Resources Code (PRC) Section 4293, the North American Electric Reliability Corporation's (NERC) FAC 003 and the California Public Utilities Commission (CPUC) General Order (GO) 95 Rule 35 require the electrical corporations to maintain vegetation clearances in their ROW of a minimum of four feet for specified distribution lines to 30 feet for transmission lines[v,vi,vii]. However, these regulations do not effectively mitigate against airborne hazards such as palm fronds nor do they mitigate against falling trunks or limbs from hazard trees standing outside of the utility ROW. Furthermore, the utilities lack the legal authority to mitigate off-ROW vegetation hazards in private property though they are obligated to maintain safe, reliable electric systems. The utilities can be held liable for fires that start due to off-ROW hazards striking their overhead electrical facilities even if they adhere to the existing regulations and maintain minimum vegetation clearance distances.[viii]

Similarly, GO 165, which concerns the inspection of distribution and transmission facilities, does not address inspections details specific to vegetation. The details about how and when to conduct vegetation inspections are left to the electrical corporations' discretion.[ix] Additionally, PRC 4291 and 4292 – which respectively require defensible space clearances around structures on utility-owned property of up to 100 feet and 10

feet radial bare/mineral earth clearances around the base of poles with equipment that are subject to clearance requirements (non-exempt equipment) due to potential ignition risks that they pose – [x][xi][xii] This will be described further in the following section. Furthermore, none of the regulations specify the use of remote sensing technologies to monitor vegetation growth and health or to warn electrical corporations of developing hazards.

Information from recent studies on vegetation management

The land use and vegetation management practices of today implemented by the electrical corporations and land management agencies, while effective in many contexts, may not always be the best suited for the various wildland areas in California. Recent studies have called into question the effectiveness of wildfire risk mitigation techniques such as thinning (pruning/removing) vegetation and shown drawbacks of fuel breaks. Banerjee (2020) found that thinning treatments can either reduce fire intensity or exacerbate it depending on how they are carried out. For instance, low levels of thinning may in some cases increase fire intensity and severity relative to untreated forest due to increased wind speeds, heat convection and decreased canopy fuel moisture.[xiii] This is the case particularly in severe fire weather conditions with strong winds, where embers can fly kilometers ahead of the fire front. Fuel breaks can also be problematic as they often fail to prevent the spread of fires across the landscape and can invite flammable, invasive grasses. Gannon et al. (2023) found that fuel breaks are only able to contain fires successfully less than 30% of the time and they are far less effective in the absence of fire suppression resources.[xiv,xv] Furthermore, Merriam et al. (2006) found that flammable, invasive, non-native plants were over 200% more prevalent in fuel breaks than in surrounding wildland as they are able to thrive in areas with reduced/limited canopy cover, frequently disturbed soils and limited duff/litter.[xvi] The study also found that fuel breaks act as seed sources for non-natives to colonize adjacent areas.[xvii]

Recent studies have also demonstrated the benefits of greenbelts, or irrigated buffer zones with either native or non-native plants, around buildings and infrastructure to slow the spread of wildfires. Gibbons et al. (2018) found that structure loss was lower with areas that had surrounding green vegetation.[xviii] Additionally, Keeley et al. (2020) found that lightly irrigated native shrubs planted saw the lowest rate of fire spread relative to thinned or no treatment.[xix] The studies suggest that greenbelts maintain higher vegetation moisture content than the surrounding wildlands and slow the spread of fires. Plants in greenbelts can furthermore catch or block embers that may otherwise land on and ignite dry vegetation or vulnerable structures.[xx]

UVM Management practices that may be appropriate for widespread use

There are several UVM management practices that are already in use by some of the electrical corporations in California that may be appropriate for more widespread use, including:

- **Fire Climate Zones** – SCE subdivides their service territory into 11 distinct regions with relatively homogenous topography, vegetation, weather/climate, and fire history for studying fire risk in its service territory and informing some of its operations to reduce wildfire risk.[xxi]
- **Right Tree, Right Place** – SDG&E and Liberty Utilities offer customers incentives to remove trees near powerlines that are incompatible (i.e., may grow into the powerlines or otherwise pose a fire hazard) and provide compatible replacements.[xxii]
- **Collaboration with adjacent land managers** – Since the electrical corporations are only responsible for managing vegetation within their ROW, many risks may remain in the adjacent lands such as hazard trees or dense fuel build up. Collaborative initiatives with federal and private land managers, such as the US Forest Service and Liberty Utilities Resilience Corridors in Lake Tahoe, may be an effective means to lower fire ignition and consequence risk outside of the utility ROW.[xxiii]
- **Tree Inventory Databases** – Some electrical corporations such as SCE and SDG&E maintain robust tree inventory databases where they can keep track of millions of trees near their lines and inform their vegetation management priorities.[xxiv]

The Board emphasizes that responsible, science-based vegetation management should be customized for each ecosystem, to account for the physiological adaptations and fire response strategies of the dominant species, the extent to which forest conditions have been altered, fire history, and the likelihood of fire occurring under different scenarios. Treatment type, configuration, and placement can significantly influence the effect on ignitions and fire behavior. Thus, a "one-size fits all" approach is inappropriate in many vegetation management contexts.

Recommendations

Utilizing their expertise and experience, the Board recognizes that the electric corporations have made great strides forward in their existing utility vegetation management programs. Looking toward the future, the Board finds that greater vegetation-related ignition risk can be achieved through updating the regulations and industry practices based on the gaps the Board has identified. The Board offers these recommendations to Energy Safety for its consideration and welcomes further discussion to determine applicability and phasing of implementation.

Recommendations on Management Practices:

- Electrical corporations should utilize daily fuel moisture data within various geographic regions in their service territories to help inform operational decisions such as initiating de-energization events or appropriate post-UVM cleanup activities. The electrical corporations consider initiating their own fuel moisture sampling programs for areas where they are not currently conducted by third parties.
- Electrical corporations should collect and utilize data on flammable invasive plant species in and adjacent to their ROWs in the HFTD for wildfire risk modeling and vegetation management program.
- "Right Tree Right Place" (RTRP) programs need to be better defined and promoted to encourage strategic tree planting near powerlines by electrical corporations and property owners alike. These programs minimize costs, maintenance needs, hazards, and increase grid reliability. For instance, certain tree species may never reach a height where they would need to be pruned if they are planted underneath or adjacent to powerlines.[xxv]
- Comprehensive UVM programs should incorporate "Trees for Energy Conservation" programs to help reduce energy demand and improve carbon sequestration which can help mitigate localized impacts from climate change risks such as increased heat waves on populations and potentially lower costs to ratepayers. Such programs align UVM work with energy efficiency and California's broader sustainability goals.[xxvi]
- Electrical corporations should pursue alternative circuit configurations or construction methods that account for existing/changing vegetation and planned or existing landscaping in any given area. This will help minimize vegetation impact and lower future UVM and maintenance costs while maintaining safety and reliability.[xxvii]
- The electrical corporations should establish comprehensive tracking mechanisms to monitor the environmental impacts of UVM programs, including to the ecosystem and carbon impacts. These mechanisms should not only assess the benefits of tree planting initiatives but also the environmental consequences of pruning, canopy reduction, tree removal and replacement. A comprehensive tracking approach can help align vegetation management efforts with broader sustainability goals while providing Energy Safety with measurable performance indicators and an ability to monitor progress.[xxviii]
- The electrical corporations should consider tracking and reporting expenditures on UVM that are performed by the electrical corporation or its contractors primarily for the benefit of the communications companies and if the communications companies reimbursed the electrical corporation or not.

Regulatory Recommendations:

- A separate vegetation inspection process should be included in an updated version of GO 95 Rule 35 or GO 165. Consideration should be given to the frequency and timing of patrol, detailed and intrusive inspections and UVM work in the HFTD. Consideration should be given to requiring that persons who perform GO 165 inspections be at least minimally trained to identify vegetation management concerns. This would provide a heightened capacity for identification of potential tree and power line conflicts. Consideration should be given to harmonizing these rules with NERC FAC-003, including "rights to do the work" defined in FAC-003.
- Consideration for any new vegetation inspections should include documentation of vegetation clearances around utility structures with defensible space clearances per PRC 4291.
- GO 95 Rule 35 should include guidance on the frequency of visual and intrusive inspections in the HFTD of trees within strike distance of the powerlines. This guidance should address 360-degree ground and aerial inspections, the use of remote sensing technologies, and intrusive core and root sampling as part of an assessment by a certified arborist. Such revisions should also address the inspections of trees within strike distance following heavy winter storms and drought years. Consideration should be given to aligning with the ANSI A300 tree risk assessment standard.
- GO 95 Rule 35 should codify the "mid-cycle" approach to conducting vegetation patrol inspections within the HFTD. This would require electrical corporations to conduct their vegetation inspections mid-way through their vegetation management cycles, to ensure compliance and eliminate encroachments into the minimum vegetation radial clearance distances.
- GO 95 Rule 35 minimum clearance distances should be updated based on the need for mitigation of fire, outages, and accidents or to at least align with the California Code of Regulations, Title 8 minimum approach distances (MAD) for energized lines for each voltage level.[xxix]
- GO 95 Rule 35 should explicitly require the electrical corporations to either send qualified electrical workers to manage vegetation that is within the MAD for each voltage level or de-energize the lines prior to employees or contractors beginning vegetation work.[xxx]
- The electrical corporations should each be required to maintain a database of trees and other tall plant species (including century plants, bamboo, etc.) at least within their HFTD, including those within strike distance of overhead facilities. They should also collect aggregate data on highly flammable plant species on and adjacent to their ROW and property to include in their databases. Consideration should be given to the sharing of data or granting state, local and/or federal government agencies access to the databases, which can help inform their land use planning and emergency response operations.

- Minimum training/qualifications for vegetation management workforce need to be developed for the electrical corporations' employees and contractors. Currently, there is no set, universally recognized training standard for qualified line clearance arborists and the training and qualification varies among contractors. Training/qualification standards could help reduce accidents, wildfire risk, and improve workplace protections and hiring prospects for experienced workers.[xxxi]
- GO 95 Rule 35 should provide guidance on the use of pesticides and herbicides for utility vegetation management and how pesticide and herbicide use is to be reported, and how the environmental impacts of their use should be assessed and remediated.
- GO 95 Rule 35 should provide guidance to the electrical corporations on the appropriate maximum limit for pruning no more than 25% of healthy branches for trees and when it is prudent instead to remove the tree regardless of its health in alignment with ANSI A300 standards. Additionally, a good removal should be defined, such as for any tree that requires height reduction more than once every 5-7 years or any tree that requires the removal of more than 25% of its canopy to achieve the required clearances. Such guidance should consider different species and regional factors such as soil, climate, and topography.[xxxii]
- GO 95 Rule 35 should be updated to clarify that pruning and removal work should be conducted in accordance with American National Standards Institute (ANSI) Z133, and applicable sections of ANSI A300.
- GO 95 Rule 35 should clarify the electrical corporations' role in the removal, chipping, scattering, recycling and/or burning of the biomass resulting from UVM activities. Consideration should be given to local geographical and environmental factors. Additionally, consideration should be given to the level of risk that remains if woody debris is scattered versus removed or burned and if it contributing to PRC Section 4291-related problems near structures.
- An update of GO 95 Rule 35 or Rule 48.1 may be warranted to clarify the appropriate repurposing of removed trees to be processed, treated, and used for utility pole applications.
- Consideration should be given to mechanisms for prioritizing UVM work, such as requirements or incentives, to help better prioritize programs such as RTRP programs which can prevent vegetation and powerline conflicts over the short and long term.[xxxiii]
- GO 95 Rule 35 should clearly delineate the responsibilities for the electrical corporations for on-ROW and off-ROW vegetation management work and clarify the areas that other entities are responsible for instead. This clarification could enhance cost appropriation and sharing where appropriate, avoid demarcation issues and reduce the ambiguity of responsibility for UVM work.[xxxiv]

- GO 95 should use industry-accepted terminology for UVM work consistent with ANSI A300 to ensure all involved parties interpret and execute practices consistently. For instance, this includes replacing non-standard terms like "trim" and "trimming" with precise alternatives such as "clearing" or "pruning".[xxxv]
- GO 95 Rule 35 should be revised to harmonize elements of PRC 4292 and 4293 to create uniform, comprehensive standards that apply statewide (including for federal, state, and local responsibility areas) and to reduce regulatory complexity.[xxxvi]
- GO 95 Rule 35 needs to include regulations related to hazard trees to make them specific, enforceable, and aligned with prudent industry practices and recent scientific understanding, and guidance in ANSI A300. This includes clearly defining terms such as "hazard tree", "strike tree", and "removal candidate".[xxxvii]
- GO 95 Rule 35 needs to establish clear roles and requirements for service drop vegetation management. There is currently a lack of consistent interpretation as to which party is responsible for the work to remove or prevent vegetation interferences with service drops. Clear guidelines will enhance accountability and enable electrical corporations to carry out UVM work by service drops with improved efficiency and reduced potential for disputes.[xxxviii]
- GO 95 Rule 35 should include a statement of purpose, which is to prevent outages, fires, and to ensure the safety of workers and the public. Including a statement of purpose can help ensure that interpretations and policies that are derived from the regulation remain aligned with the regulatory intent.[xxxix]
- GO 95 Rule 35 should require electrical corporations to adhere to established UVM-related best management practices, such as ANSI A300.[xl]
- GO 95 Rule 35 language concerning customer refusals for UVM work on their property should be strengthened and clarified. This includes updating refusal practices and including defined protocols for implementing power shut offs to non-compliant customers.[xli]
- Regulatory guidance should be developed for the electrical corporations to monitor and mitigate the environmental impact of tree removal and replacement. Such guidelines would promote environmental responsibility and accountability within UVM practices, ensuring that efforts to enhance grid reliability do not come at the expense of environmental sustainability and potentially worsen overall wildfire and climate change risk due to increased heat, aridity, and wind exposure associated with thinning and pruning.[xlii]

- Regulatory guidance should be given to the electrical corporations on the maintenance of defensible space for facilities on their property in the HFTD, such as generation facilities, substations, switchyards, and offices, and if shaded fuel breaks or greenbelts of irrigated, native vegetation would be appropriate within the defensible space zones, depending on the local conditions. Furthermore, consideration should be given to including RTRP provisions.
- Regulatory guidance should be given to maintaining utility ROWs and defensible space zones that can not only serve as a fuel break, but also accommodate fire suppression resources.

Procedural Recommendations:

- The Board recommends that the Office of Energy Infrastructure Safety (Energy Safety) host a follow-up scoping meeting within the next six months to discuss these recommendations, and industry best practices. The meeting should include written opening and/or post workshop comment opportunities.
- Energy Safety should take any additional stakeholder input on their proposed process for alignment of best practices that was introduced in the February 2023 scoping meeting and develop a timeline for the implementation of the best practices to incorporate them into the next wildfire mitigation plan submissions.
- Energy Safety should commission a study to measure and quantify the benefits of UVM work in both ROW and off-ROW contexts. Such a study should include collecting data from shaded fuel break and thinning projects like that of the Liberty Utilities and USFS Resilience Corridors to better understand if such projects would be appropriate for broader adoption.
- Energy Safety should commission a study to assess socio-economic and equity issues related to UVM work to evaluate if there is any disparity between those who see the benefits from UVM programs and those who pay for them.
- Energy Safety, in collaboration with CALFIRE and ecologists, should commission a study to better understand the environmental impacts of maintaining right of ways, and potential impacts on wildfire risk mitigation, such as serving as a fuel break and staging area for fighting fires.
- The electrical corporations should test or pilot the use of native, woody herbaceous shrubs and other less-flammable native plant species at the base of poles that would otherwise require 10-foot pole brushing clearances under PRC 4292.[xliii] The tests/pilots, which would be allowed under current regulations in the Federal Responsibility Area, should assess how well native plant species can reduce the risk of fire spread from equipment-related ignitions relative to bare/mineral earth clearances. Specific exemptions to PRC 4292 may be needed in the State and Local Responsibility Areas. This may require irrigating planted shrubs in the wildland-urban interface areas in the HFTD during fire season to

maintain high live fuel moisture levels. Consideration needs to be given to avoid interfering with pole climbing/pole access.

- The electrical corporations should also test or pilot the use of irrigated greenbelts around their facilities in the HFTD (such as in the wildland-urban interface where there is access to running water), to further assess how well native plant species can slow or reduce the spread of fires near utility facilities.
- In the instance where pesticides or herbicides are used to maintain regulatory compliance with UVM regulations such as PRC 4292, the electrical corporations should work with local and regional environmental experts to identify alternative measures for managing unwanted animal and plant species so they can reduce their pesticide or herbicide use in alignment with ANSI A300 Part 7.
- The electrical corporations should train their field employees, such as UVM and other operations and maintenance crews, to recognize and document violations of the defensible space requirements in PRC 4291 when they are out in the field or near homes and report this information to CAL FIRE to further reduce wildfire consequence risk.
- The electrical corporations should partner with relevant landowners and stakeholders to address various forest and tree pathogens and threats, such as bark beetles. For instance, these efforts should include testing bark beetle mitigation measures to reduce tree mortality and prevent healthy trees from becoming hazard trees. These measures could include the introduction of predatorial species, forest thinning, traps, genetic modification to reduce their ability to harm trees or reproduce, and targeted use of pesticides.
- The electrical corporations should work with industrial partners such as with biomass generation facilities, wood pellet producers, composting facilities, and mills to explore opportunities for transporting removed logs and biomass for economic purposes such as making lumber, agricultural compost, generating electricity or hydrogen, or wood pellets for heating.
- The electrical corporations should also partner with landowners and research organizations to test the selective breeding of plant species near powerlines to inhibit the growth, or to reduce the flammability of the plants.
- The electrical corporations should work with the city and county government partners and representative organizations such as the League of California Cities, the Rural County Representatives of California, and the California State Association of Counties to amend local tree ordinances to prevent the planting of incompatible trees and other plants such as bamboo and century plants near powerlines. The electrical corporations should also work with national and international resources such as the Arbor Day Foundation, American Forests and local chapters of the International Society of Arboriculture.
- The electrical corporations should collaborate with stakeholders to determine the appropriate protocols to mitigate customers refusals when vegetation work is

needed to comply with UVM regulations. This could include updating customer communication practices, power-shutoffs protocols, and the appropriate legal recourses.

- The electrical corporations should engage more closely with Native American tribes to incorporate traditional ecological knowledge into their landscape and forestry management efforts.

Approval

The California Wildfire Safety Advisory Board's Policy Paper on Updating Vegetation Management Regulations and Industry Practices was approved on January XX, 2024, and are hereby executed.

Jessica Block, Chair

Christopher Porter, Vice Chair

Ralph M. Armstrong Jr., Board Member

Diane Fellman, Board Member

Timothy Haines, Board Member

John Mader, Board Member

Alexandra Syphard, Board Member

References

[i] Hazard trees are described in ANSI A300 Part 7 as a subset of "danger trees," which are defined as "tree[s] on or off the right-of-way that could come into contact with electric supply lines by growing into, falling into, swaying into, or sagging"). ANSI A300 defines the term "hazard tree" as "a structurally unsound tree that could strike a target when it fails. As used here, the target of concern is electrical supply lines." See Tree Care Industry Association (2018), "Tree, Shrub, and Other Woody Plant Management Standard Practices (Integrated Vegetation Management a. Utility Rights-of-way)," ANSI A300 (Part 7)-2018, p.15, https://west-chester.com/DocumentCenter/View/10144/A300-7.

[ii] P.U.C. § 326(a)7 requires energy Safety to "Review, as necessary, in coordination with the California Wildfire Safety Advisory Board and necessary commission staff, safety requirements for electrical transmission and distribution infrastructure and infrastructure and equipment attached to that electrical infrastructure, and provide recommendations to the commission to address the dynamic risk of climate change and to mitigate wildfire risk." https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=326&lawCode=PUC.

[iii] Based on 2015-2022 ignition data aggregated from PG&E, SCE and SDG&E's Q3 and Q4 2022 Quarterly Data Reports that were submitted to the Office of Energy Infrastructure Safety's Docket #2022-QDR. See https://efiling.energysafety.ca.gov/Search.aspx?docket=2022-QDR .

[iv] CAL FIRE, "Top 20 Most Destructive California Wildfires," updated October 24, 2022, https://www.fire.ca.gov/our-impact/statistics.

[v] California Legislative Information, "California Code, Public Resources Code - PRC § 4293," accessed August 22, 2023, Public Resources Code 4293, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4293.&nodeTreePath=7.2.4&lawCode=PRC.

[vi] The NERC FAC 003 is a standard adopted and enforced on electric transmission entities by the Federal Energy Regulatory Commission, or FERC. North American Electric Reliability Corporation, "Reliability Standard FAC-003-4," accessed August 22, 2023, https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf.

[vii] California Public Utilities Commission. "CPUC GO 95 Rule 35." Accessed August 22, 2023. https://ia.cpuc.ca.gov/gos/go95/go_95_rule_35.html.

[viii] An additional limitation of UVM regulations arises from a misalignment with inverse condemnation which invokes strict liability for wildfires caused by utility facilities whether its conduct was prudent. In the case of wildfires, electric utilities can be held liable for damages caused by their equipment, including power lines and transformers, regardless of whether they acted in accordance with safety standards and regulations, such as maintaining minimum vegetation clearances in their ROW. See the Public Advocates Office (2023), "Ratepayer Impacts of Strict Liability and Inverse Condemnation," April 7, p. 2, https://www.publicadvocates.cpuc.ca.gov/press-room/reports-and-analyses/ratepayer-impacts-of-strict-liability-and-inverse-condemnation, Governor Newsom's Strike Force (2019), "Wildfires and Climate Change: California's Energy Future," April 12, 2019, p.29-30, https://www.gov.ca.gov/wp-content/uploads/2019/04/Wildfires-and-Climate-Change-California%E2%80%99s-Energy-Future.pdf, and "Final Report of the Commission on Catastrophic Wildfire Cost and Recovery," June 2019, p. 4, https://opr.ca.gov/docs/20190618-Commission_on_Catastrophic_Wildfire_Report_FINAL_for_transmittal.pdf.

[ix] The GO 165 "Standards for Inspection" for distribution require the electrical corporations simply to "conduct inspections of [their] distribution facilities, as necessary, to ensure reliable, high-quality, and safe operation" within specified timeframes of 1-2 years for patrol inspections and 5 years for detailed inspections of overhead facilities. Additionally, it requires the electrical corporations to conduct intrusive inspections within 10 years for new wooden poles and no more than every 20 years thereafter for poles that pass intrusive inspection. Similarly, the section "Transmission Facilities" only specifies that the electrical corporations "prepare and follow procedures for conducting inspections and maintenance activities for transmission lines." GO 165 does not make any mention of vegetation inspections. See California Public Utilities Commission, "General Order Number 165," June 2013, pg. 2, 4, 5, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M078/K606/78606034.PDF.

[x] California Legislative Information, "California Code, Public Resources Code - PRC § 4291," accessed August 22, 2023, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4291.&lawCode=PRC.

[xi] California Legislative Information, "California Code, Public Resources Code - PRC § 4293," accessed August 22, 2023, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4293.&nodeTreePath=7.2.4&lawCode=PRC.

[xii] This is especially the case in areas where the utility only maintains the clearances just before and during fire season as invasive, annual grass seeds can end up in the soil and/or germinate and grow in advance of fire season.
[xiii] Tirtha Banerjee (2020), "Impacts of Forest Thinning on Wildland Fire Behavior," *Forests,* August 22, 11(9), 918, p.10, **https://doi.org/10.3390/f11090918**.
[xiv] Without fireline and aerial drops fuel break success rate was only 12.7% compared to 68.1% for the fuel breaks observed that had both fireline and aerial drops. Benjamin Gannon et al. (2023) "A Quantitative Analysis of Fuel Break Effectiveness Drivers in Southern California National Forests," *Fire,* March 7, 6(3), 104, p.15 **https://doi.org/10.3390/fire6030104**.
[xv] Fuel breaks are less effective particularly during severe fire weather conditions with strong winds, where embers can fly kilometers ahead of the fire front.
[xvi] Kyle Merriam et al. (2006), "Fuel Breaks Affect Nonnative Species Abundance in Californian Plant Communities," *Ecological Applications*, 16(2), p.515, https://doi.org/10.1890/1051-0761(2006)016[0515:fbansa]2.0.co;2.
[xvii] Ibid., p.526.
[xviii] Philip Gibbons, et al. (2018), "Options for reducing house-losses during wildfires without clearing trees and shrubs," *Landscape and Urban Planning* 174, March 3, p.10, https://doi.org/10.1016/j.landurbplan.2018.02.010.
[xix] Jon Keeley et al. (2020), "Protecting the Wildland-Urban Interface in California: Greenbelts vs Thinning for Wildfire Threats to Homes," *Southern California Academy of Sciences,* May 25, 119(1), p.9, https://doi.org/10.3160/0038-3872-119.1.35.
[xx] Ibid., p.10.
[xxi] Tom Rolinski, "Fire Climate Zone Overview," presentation to the Wildfire Safety Advisory Board June 13, 2023, meeting, https://www.youtube.com/watch?v=qoZUwZGyFzM.
[xxii] SDG&E Wildfire Mitigation Plan 2023-2025, original version filed March 27, 2023,p.276, https://efiling.energysafety.ca.gov/Search.aspx?docket=2023-2025-WMPs.
[xxiii] The Resilience Corridors project involves various levels of vegetation treatments up to 1000 feet adjacent to 54 miles of Liberty's powerlines. US Forest Service, "Liberty Utilities Resilience Corridors Proposed Action," p.1, https://usfs-public.app.box.com/v/PinyonPublic/file/935071268584.
[xxiv] SDG&E 2023-2025 Wildfire Mitigation Plan original version filed March 27, 2023, p.2, SCE 2023-2025 Wildfire Mitigation Plan original version filed March 27, 2023, p.394, https://efiling.energysafety.ca.gov/Search.aspx?docket=2023-2025-WMPs.
[xxv] Ibid.
[xxvi] Ibid.
[xxvii] Ibid.
[xxviii] Ibid.
[xxix] This should align with the California Code of Regulations, Title 8, Section 2940.2 Minimum Approach Distances that were established by the California Organizational Safety and Health Administration (Cal/OSHA, also known as CalDOSH). See https://www.dir.ca.gov/title8/2940_2.html for more information.
[xxx].
[xxxi] Lawrence Kahn and Stephen Cieslewicz, meeting with Wildfire Safety Advisory Board Staff, November 16, 2023.
[xxxii] Ibid.
[xxxiii] Ibid.
[xxxiv] Ibid.
[xxxv] Ibid.
[xxxvi] Ibid.
[xxxvii] Ibid.
[xxxviii] Ibid.
[xxxix] Ibid.
[xl] Ibid.
[xli] Ibid.
[xlii] Ibid.
[xliii] California Legislative Information, "California Code, Public Resources Code - PRC § 4292," accessed August 22, 2023, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4292.&lawCode=PRC