Wildfire Policy for Electric Utilities: A Critical Assessment of Regulatory Tools and Governance Gaps

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Abstract: This paper evaluates wildfire policy for electric utilities through the lens of risk governance. Using four criteria, risk reduction, reliability, equity and customer protection, and enforceability, this paper assesses the main tools used in wildfire-prone jurisdictions, including mitigation planning, vegetation management, inspection and maintenance, operational controls such as EPSS and PSPS, system hardening, and risk modeling tied to performance metrics. The paper finds that California has developed the strongest utility-centered framework, particularly in planning, data transparency, model accountability, and oversight, but also shows that catastrophic wildfire risk cannot be effectively managed through utility regulation alone. Building codes, insurance markets, permitting, and land-use decisions in the wildland-urban interface shape whether an ignition becomes a disaster. The paper concludes that effective wildfire policy must shift from reactive compliance toward a broader, system-wide approach to managing risk.

1. INTRODUCTION

Wildfire risk has become a core utility governance issue in fire prone regions because electric infrastructure operates in conditions that may contribute to wildfire ignition risk. Wildfires are caused by a complex interaction of natural factors, such as drought, extreme heat, and wind, and human activities, including land management practices and infrastructure-related ignitions. Among human-caused ignition sources, electric infrastructure has drawn increasing regulatory and public scrutiny because of concerns regarding potential wildfire ignition risk associated with electric infrastructure.

The impacts of wildfires extend far beyond immediate physical damage. Utilities face growing obligations related to vegetation management, including more aggressive inspection, clearance, and maintenance practices intended to reduce ignition risk. Large wildfires also contribute significantly to greenhouse gas emissions, creating feedback loops that further exacerbate fire risk. In response to catastrophic events, regulators have frequently adopted new safety standards, liability frameworks, and planning requirements rather than address the risk through proactive, risk-informed approaches. Here, wildfire policy for utilities is assessed based on the following four criteria: ignition risk reduction, reliability impacts, equity/customer protection, and enforceability.

Globally, wildfire activity has intensified over the past two decades. Recent analyses document a marked increase in wildfire ignitions across the Americas since the early 2000s, reflecting changing climate conditions and expanding exposure of infrastructure to fire-prone environments [1]. This trend underscores that wildfire risk is not a localized or temporary phenomenon, but a systemic and escalating threat requiring coordinated regulatory intervention.

In this context, wildfire regulation and policy play a central role in reducing wildfire ignition risk associated with electric infrastructure by shaping behavior, investment decisions, and risk management practices. Effective regulatory frameworks can incentivize proactive mitigation, align planning with evolving hazard conditions, and balance safety, reliability, and affordability. As wildfire risk continues to grow in scale and consequence, the design and implementation of robust wildfire regulations will remain essential to reducing ignition risk and protecting communities, infrastructure, and the environment.

This paper treats effective wildfire policy as a governance framework that evaluates utility regulation across four criteria: ignition risk reduction, reliability, equity and customer protection, and enforceability. Using these criteria, it assesses how core regulatory tools such as vegetation management, inspection and maintenance, operational controls, system hardening, and risk-based planning perform in practice, while also emphasizing that utility-focused rules alone are insufficient. A central analytical premise of the paper is that governance gaps in building codes, insurance systems, permitting, and land-use decisions in the wildland-urban interface strongly shape whether ignitions, including those that involve electric infrastructure, become catastrophic disasters.

2. CORE WILDFIRE REGULATORY TOOLS FOR ELECTRIC UTILITIES

2.1. Regulatory oversight, vegetation management, operational controls, system hardening and design standards

Wildfire mitigation models serve as the analytical backbone for planning, prioritization, and regulatory accountability. Utilities use a range of models to estimate ignition likelihood, fire spread potential, asset vulnerability, and consequence severity, often integrating weather data, vegetation characteristics, asset condition, and spatial exposure. These models inform decisions on where to deploy technologies, harden infrastructure, or apply operational restrictions. Regulatory policies increasingly require transparency and rigor in these modeling approaches, mandating documentation, independent review, and alignment with regulatory risk frameworks. In some jurisdictions, mitigation models are explicitly linked to cost recovery and performance evaluation, with utilities expected to demonstrate that modeled risk reductions justify proposed investments. Wildfire mitigation modeling therefore functions not only a technical exercise but also a regulatory instrument that shapes how utilities quantify risk, compare alternatives, and demonstrate compliance with evolving wildfire safety mandates.

In many jurisdictions, vegetation management is governed more through general line-clearance rules, right-of-way maintenance obligations, and land or forestry law, often with less emphasis on public performance metrics, transparent risk modeling, or integration into a broader utility wildfire accountability framework. This pattern is visible in much of Canada and southern Europe, including countries such as Portugal, Spain, and Italy, where vegetation management around electric lines is often governed through general line-clearance rules, right-of-way maintenance duties, forestry law, and civil-protection frameworks rather than through a California-style utility wildfire mitigation regime. In these jurisdictions, utilities may still be required to inspect corridors, maintain clearance distances, and coordinate with land or emergency authorities during high-risk periods, but the regulatory emphasis is more often on compliance with general safety and fuel-management obligations than on public performance metrics, transparent ignition-risk modeling, or an integrated utility-specific wildfire accountability system.

Vegetation management, inspection, and maintenance in California are critical wildfire mitigation activities carried out by utilities under a comprehensive regulatory framework including California Public Utilities Commission (CPUC) General Orders, Public Resource Code requirements, NERC standards, and Wildfire Mitigation Plans. Vegetation risks are identified and prioritized based on a combination of ground-based inspections, Light Detection and Ranging (LiDAR), and remote sensing technologies. Inspection frequencies typically vary by asset type and fire risk zones. For example, patrols are more frequent in High Fire Threat Districts (HFTDs). Management activities include routine pruning and removal, integrated vegetation management techniques (manual, chemical, mechanical, and biological), and enhanced programs targeting high-risk “strike trees” using advanced assessment tools. Utilities support these efforts with structured workflows, emergency response protocols, fuel and wood disposal programs, and extensive QA/QC oversight involving third-party audits and performance metrics. Increasingly, digital systems and GIS-based platforms are used to track inspections and work execution, while environmental compliance, workforce training, and cost pressures further shape program implementation. Overall, these programs are highly data-driven, risk-informed, and continuously evolving to address changing wildfire conditions and regulatory expectations.

Utilities increasingly rely on advanced operational technologies to reduce wildfire ignition risk under hazardous conditions, most notably Enhanced Powerline Safety Settings (EPSS) and Public Safety Power Shutoffs (PSPS). EPSS modifies protection settings to de-energize lines more rapidly when fault signatures consistent with conductor contact or vegetation strikes are detected, thereby reducing the likelihood of conditions associated with ignition. PSPS, by contrast, is a preventative de-energization strategy used during periods of extreme fire weather to avert ignition risk, albeit at the cost of customer outages. Regulatory policies play a central role in shaping the deployment of these technologies by defining acceptable use cases, notification requirements, and performance expectations. In jurisdictions such as California, regulators require utilities to justify EPSS and PSPS usage through wildfire mitigation plans, demonstrate that alternatives have been considered, and assess public safety, equity, and reliability impacts. These technologies tend to be embedded within regulatory frameworks that seek to balance wildfire risk reduction against service continuity and societal costs.

Beyond operational technologies, wildfire mitigation is deeply influenced by technical design and maintenance decisions across transmission and distribution systems. Utilities implement measures such as covered conductors, pole and crossarm hardening, increased clearance standards, sectionalizing devices, and targeted undergrounding in high fire-risk areas. These interventions alter system behavior under fault conditions, and are intended to reduce ignition exposure under elevated risk conditions, and limit fire spread potential. Regulatory policies govern these investments by establishing design standards, inspection cycles, and capital recovery mechanisms, often differentiated by fire threat levels. Regulators also scrutinize how utilities prioritize T&D upgrades, requiring risk-based justification rather than uniform application across the system. Consequently, technical wildfire mitigation measures are closely tied to regulatory expectations around prudence, cost-effectiveness, and alignment with identified wildfire risk drivers.

2.2. Risk Modeling, data, and performance metrics

Risk modeling is the bridge between wildfire policy and utility decision-making. A credible regulatory framework should require utilities to do more than describe hazards; it should require them to explain how risk is calculated, what assumptions underpin that calculation, and how those results shape investment and operating decisions. California's statutory approach is useful in this respect because utilities must identify the metrics used to track plan implementation, explain the assumptions behind those metrics, show how prior metrics informed the next plan, and, where possible, estimate the relative risk reduction associated with mitigation investments. This makes wildfire modeling a regulatory tool for justification and accountability, not merely an internal planning exercise. [2]

Under Energy Safety's 2025 Wildfire Mitigation Plan Guidelines, utilities must present a risk analysis framework that summarizes key modeling assumptions, input data, and modeling tools, and must evaluate risk using, at minimum, equipment and asset condition, topography, weather, vegetation, and climate change. The guidelines also require utilities to distinguish between overall utility risk, wildfire risk, outage-program risk, PSPS risk, and Protective Equipment and Device Settings (PEDS) outage reliability risk, and to document both design-basis scenarios and extreme-event or high-uncertainty scenarios such as climate change, multi-hazard events, and low-likelihood, high-consequence events. This is a major strength of the California model because it recognizes that wildfire governance must account for both routine operating conditions and tail-risk events rather than relying on a single "average year" representation of risk. [3]

The data requirements are equally important. Energy Safety's Data Guidelines require quarterly GIS submissions, quarterly tabular wildfire mitigation data, annual end-of-year data, and annual WMP target, projection, and risk data before each plan filing. Utilities must use prescribed schemas and templates, and their tabular and geospatial submissions must be internally consistent. In policy terms, ,a model cannot be independently evaluated unless regulators can trace its inputs, compare them over time, and connect them to actual mitigation work on specific circuits and assets. [4]

Performance metrics should therefore be treated as the public test of whether modeling is useful. Energy Safety defines performance metrics as leading and lagging indicators that quantify the consequences of WMP implementation, including wildfire risk, PSPS risk, and other direct and indirect consequences of wildfire and de-energization. The guidelines also require utilities to set trackable qualitative and quantitative targets, including expected risk reduction, and to identify top risk-contributing circuits, segments, or spans. In parallel, the CPUC uses utility safety performance metric reports to compare progress across utilities and to evaluate effectiveness, safety improvement, and risk-spent efficiency in ratemaking. The critical takeaway is that counting activities alone is not enough; strong regulation requires utilities to link spending and operational activity to measurable reductions in circuit-level risk, while explaining when expected improvements fail to materialize. [3]

Finally, effective risk governance depends on quality assurance. Energy Safety requires utilities to document independent review of data collection and risk models, identify triggers for third-party review, and report the results and disposition of those reviews. That requirement is more significant than it may first appear: wildfire models shape where utilities harden lines, where they intensify vegetation work, and when they impose outage-based controls. If the models are not transparent, quality-controlled, and tested against outcomes, they become difficult for regulators and the public to trust [3].

3. GOVERNANCE GAPS BEYOND THE UTILITY BOUNDARY

3.1. Building codes and permitting

In recent years, California's wildfire risk has been under increased pressure even with utility technological advancement, regulatory enforced wildfire mitigation, and risk modeling. Inherent risks associated with climate shifts paired with the challenges and limitations of creating a more resilient electrical infrastructure have only increased concern mitigating wildfire risks.

In response to the Southern California wildfires of 2025 that caused impact damage to over 18,000 structures and displaced over 200,000 residents, state agencies developed mitigative strategies that focused on "home hardening" and "Zone Zero defensible space". These initiatives are focused specifically on the use of non-combustible siding, Class A roofs, double pane windows, and enclosed eaves, and additionally establishing a five-foot perimeter removal of combustible vegetation around homes. Although these actions are homeowner-managed, from the utility perspective, there is value in standardizing this initiative at the regulatory policy level. The biggest impact on utilities' customers is the inability to provide energy to the millions that they serve, but with the ever-changing climate there is an additional need to lessen the burden and impact that wildfires have on residents.

Risk categorization has been an important methodology used in the prioritization of resources and processes for a given location. These types of prioritizations such as, PG&E's tiered High Fire Risk Area (HFRA)/ High Fire Threat District (HFTD) framework for categorizing wildfire risk in connection with utility assets, could be effectively aligned with the requirements of Chapter 7A (Wildfire Prepared Home). More specifically, the building code requirements necessary for mitigating wildfire risk to residential homes can be modified to not only align with the utility identified risk but can also help manage the cost incurred by the homeowner. At the regulatory policy level, Chapter 7A is not inclusive of all geographical locations, and although the scope of Chapter 7A has enhanced, there may be a benefit to its expansion.

Stronger building codes in reference to home hardening have been brought up as a response at the California legislative level. California's Assembly Bill 306 (AB 306), which proposes to freeze state building code updates for residential units for October 1, 2025, to June 1, 2031, aimed at lowering housing construction costs, is seemingly in direct opposition to the response to wildfire mitigation [5]. California continues to face significant demand for additional housing (low-income, multi-unit, etc.) due to many factors seen throughout the state, in particular, the rising costs of building materials and associated costs. Even with the need for more affordable housing, the need for safety and mitigation against wildfire can reasonably be viewed as remaining the highest priority to avoid the impacts that have been observed over the years. There are allowances made for wildfire-related home hardening, but the requirements established in Chapter 7A would not be standardized, potentially posing risks to newly developed structures. There were many groups that were opposed to the approval of AB 306 including The American Property Casualty Insurance Association, The Association of State Floodplain Managers, California Fire Protection Officers, and the International Code Council, due to their evaluation of out-of-pocket potential costs associated with what insurance will not cover [6].

3.2. Global wildfire governance and insurance

There has been a clear correlation with increased insurability when properties are aligned with strengthened building codes, regarding wildfire resilience in areas that are prone to increased wildfires. This can be even more of a significant truth when rebuilding structures impacted by wildfire damage. Homes that were originally built in alignment with stronger wildfire resilient building codes saw insurance policy benefits when needing to comply with any additional updated building codes. Additional codes that can increase insurability are those related to improved energy efficiency and decarbonization codes, aimed at preparing for escalating climate risks.

Defensible space requirements and restrictions as a wildfire mitigative action have been discussed internationally in places like the United States, Australia, Portugal, and newly South Africa. More specifically, based on the International Association of Fire Chiefs analysis, "municipalities are increasingly incorporating fire-resistant design principles into local planning, including defensible space requirements and restrictions on flammable vegetation near homes – similar to FireSmart standards" [7]. The FireSmart is a Canadian operated program that provides homeowners and communities with tools to reduce structural ignition risks like incentives to install sprinklers, replace combustible roof materials and remove confer trees near the perimeter of the home. Programs that provide incentives for homeowners align with local and international best practices to reduce wildfire risks, have the potential to increase insurability due to the inherent reduction of liability needed on behalf of the insurer. Assessing the risks associated with wildfire property damage against what may be required as a payout by the insurer can create the challenges and limitations currently seen with homeowners' ability to obtain adequate insurance for the various factors (wildfire, flood, general).

Impacts from the limitations of and challenges of obtaining insurance, occurring in high fire threat regions are often at more risk of potential depreciation of property values, increased insurance premiums, and increased spending on recovery efforts [8]. When communities are required to compensate, restore, and maintain structures such as small businesses, public facilities, and even "at-risk" homeowners, that comes at a cost. In frequent cases, structure restoration to be built with more resilient materials can be more costly than budgets allow for. An example of this would be what is referred to as "the insurer of the last resort" defined as the government defaulting as the resource providing entity for those where insurance has become unaffordable or unavailable. These provided resources come at a cost to the community at large because all levels of the government are impacted by the reallocation of funds to support the uninsured and/or underinsured property owners. From local utilities that serve these sensitive communities it can cause a downstream impact, even with existing wildfire mitigation programs. For electric utilities that rely on support from the government for infrastructure resiliency and maintenance, it can pose an increased risk on the prioritization of work.

Insurance should be analyzed as part of wildfire governance, not merely as a mechanism for post-disaster compensation. In wildfire prone regions, insurance affects whether households can maintain coverage, whether mitigation investments are financially rewarded, how quickly damaged communities can be rebuilt, and how wildfire losses are distributed across property owners' insurers and residual market institutions. In California, this role has become more explicit in recent reforms: the Department of Insurance has linked wildfire insurance regulation not only to homeowners and communities, but also to mitigation efforts undertaken by governments and utility companies.

California has created a layered wildfire insurance regime with four core components: mitigation incentives, forward-looking ratemaking and availability rules, post disaster consumer protections, and a residual market backstop. (1)

3.3. California's residual market insurance

Mitigation incentives

The first function of insurance policy is to create parcel and community level mitigation incentives. California's Safer from Wildfires framework identifies ten mitigation actions at the structure, immediate surroundings, and community levels, and the Department of Insurance states that every listed action qualifies the policyholder for an insurance discount. These actions include a Class A roof, a five-foot ember resistance zone, ember resistant vents, enclosed eaves, upgraded windows, under deck clearance, defensible space compliance, and participation in recognized community wildfire programs. [9]

The California Department of Insurance in 2025 Homeowners Insurance Comparison Tool warns that many insurers apply wildfire related surcharges that can range from 15% to more than 300%, depending on the homes vulnerability and that those surcharges are not reflected in the base comparison premiums shown to consumers. Although mitigation may improve eligibility and relative pricing, it does not automatically make high risk properties affordable to insure. In other words, insurance discounts can reward hardening, yet they may still be asa a by the underlying hazard signal embedded in wildfire prone locations. [10]

Forward-looking ratemaking and availability rules

A second function of wildfire insurance policy is to address availability, not just price. California's recent catastrophe model and ratemaking reforms are significant because they attempt to move beyond a backward-looking system based primarily on historical loss experience.

In December 2024, the Department of Insurance announced a regulation under the Sustainable Insurance Strategy requiring major insurers to increase their writing of comprehensive policies in distressed wildfire areas to no less than 85% of their statewide market share. In July 2025, the Department of Insurance stated that insurers using Department reviewed wildfire catastrophe models would be required to write and maintain coverage in wildfire prone areas. The Department also emphasized that these models must account for mitigation efforts by homeowners, businesses, communities, governments, and utility companies. [11]

Residual market backstop

A third function is the residual market backstop, centered in California on the FAIR Plan. The FAIR Plan describes itself as an insurer of last resort that provides basic fire insurance when coverage is not reasonably available on the voluntary market. It is not comprehensive homeowners' insurance, and the FAIR Plan itself notes that policyholders often need a separate Difference in Conditions policy to approximate broader homeowners' coverage. The Plan also operates a clearinghouse intended to give admitted insurers the opportunity to offer homeowners and commercial policies to FAIR PLAN policyholders, and every insurer licensed to write basic property insurance in California is a FAIR Plan member. [12]

The problem, however, is that the FAIR Plan is becoming much more than a marginal backstop. According to its own statistics, as of March 2026, the FAIR Plan reported $750 billion in total exposure and 684,388 policies in force, both dramatically higher than in 2022. That growth is a strong indicator of structural market stress. A residual mechanism meant to be temporary is now carrying a very large share of wildfire exposed risk. [13]

Post disaster consumer protections

A fourth function of wildfire insurance policy is consumer protection after disaster. California's mandatory one year moratorium on insurance cancellations and nonrenewal applies to residential policyholders in wildfire perimeters and adjacent zip codes after a governor-declared state of emergency. [14]

The protection lasts for one year from the date of the emergency declaration and applies not only to homeowners who suffer partial damage, but also to some policyholders within the affected area who suffer no physical loss. This is an important equity measure because it prevents survivors from losing coverage immediately after a wildfire event. But it is also limited, it provides temporary breathing room, not a durable solution to the broader problem of availability and affordability in high-risk areas. [14]

Recent FAIR Plan actions also demonstrate how wildfire insurance has become a system level governance issue, not simply a homeowner problem. In July 2025, the Department of Insurance announced a temporary FAIR Plan commercial option with coverage up to $100 million per location through 2028 for certain high-value properties, while FAIR plan updates in early 2025 reiterated that, with the commissioner's approval, the Plan has statutory authority to assess admitted insurers to help pay FAIR Plan losses. This matters because wildfire losses borne in the residual market can spill back into the broader insurance system. For all these reasons, wildfire risk is increasingly being priced, pooled, and redistributed across institutions rather than remaining confined to individual property owners. [13], [15]

3.4. Land use and wildland-urban interface expansion

The wildland-urban interface (WUI) is defined as the areas in which buildings intermix with or are adjacent to natural vegetation [16]. Fire risk has created special attention on WUI areas that have had increased risk due to climate impacts, such as Mediterranean regions of Europe, Australia, and the United States. The value driven into these areas has been the cause of discussion in relation to the developed infrastructure, amenities, and desirability factors great for attracting large populations. WUI locations become attractive to those looking for a higher quality of life, enhanced by public services paired with an emphasis on natural resources.

In these areas wildfire mitigative strategies are inherent to the communities and preparation is prioritized. Additionally, policies for hardening structures and having property mitigated for wildland fires from a landscape perspective are implemented at the building code level [16]. Water conservation, environmental hazards and wildlife protection are the pillars of policy implementation, and that creates increased value of WUI communities. In Argentine provinces, the Native Forest Protection Act (NFPA), requires classifications for forests by Category I/High Conservation (cannot be modified), Category II/Medium Conservation (susceptible to sustainable use), and Category III/Low Conservation (can be deforested) which was developed with an aim at traditional urban development and agribusiness. The framework of incorporating natural vegetation into residential development reduces the need and reliance on traditional environmental agency oversight.

4. COMPARATIVE ASSESSMENT OF WILDFIRE REGULATION

Wildfire risk regulation for electric utilities differs widely by jurisdiction, but the biggest dividing line is whether wildfire is treated as a standalone utility safety domain (with dedicated plans, audits, and performance expectations) or instead addressed indirectly through general electric safety rules and vegetation management obligations. In the United States, especially in the western states, wildfire risks associated with electric infrastructure have driven a comparatively utility-centric approach that combines prescriptive operational requirements, planning and reporting, and strong financial incentives through liability exposure and cost-recovery review. In many other countries, wildfire policy is led primarily by forestry agencies, land-use planning, and emergency management authorities, with utility duties embedded within broader electrical safety codes and right-of-way clearance requirements rather than a comprehensive "wildfire mitigation plan" framework. [17]-[50]

In the U.S., most wildfire-related requirements for utilities are set at the state level through public utility commissions, state energy safety agencies, and legislation, with California representing the most developed model. Table 1 presents an overall assessment of wildfire regulation in different jurisdictions based on available public information, based on four criteria: risk reduction, reliability, equity and customer protection. Utilities are commonly required to file recurring wildfire mitigation plans that document risk assessments, inspection and vegetation programs, system hardening investments (e.g., covered conductor, sectionalizing devices, undergrounding in targeted areas), and operational strategies for high fire-weather days. Regulators increasingly govern operational tools directly, including public safety power shutoffs (PSPS) and sensitive protection settings (often described as enhanced powerline safety settings), by defining acceptable trigger conditions, customer notification and medical baseline protections, post-event reporting, and expectations to mitigate reliability and equity impacts. A distinctive U.S. feature is how closely wildfire regulation is tied to financial oversight. Utilities face significant civil liability for ignition-related damages in some states, and regulators then evaluate whether wildfire-related spending and claims are prudent for cost recovery. This linkage makes compliance, documentation, and auditable risk reduction central to utility governance, and it has accelerated the use of audits, enforcement actions, and performance metrics as wildfire risk has grown. [17]-[28]

Outside the U.S., Australia provides one of the clearest examples of a similarly explicit, utility-focused approach, particularly in Victoria, where bushfire risk is governed through the Electricity Safety Act 1998, the Electricity Safety (Bushfire Mitigation) Regulations 2023, and the Electricity Safety (Electric Line Clearance) Interim Regulations 2025. Oversight is concentrated in Energy Safe Victoria, which reviews bushfire mitigation plans, evaluates electric line clearance management plans, conducts audits, and enforces compliance across network operators and other entities responsible for overhead assets in hazardous bushfire risk areas. This gives Victoria a more formalized plan-and-assurance model than many jurisdictions that rely primarily on general electrical safety law. Network operators are required to maintain bushfire mitigation plans that explain how they will minimize bushfire danger from at-risk electric lines, and recent legislative changes shifted some specified operators from annual plan submission to a five-year submission cycle while preserving requirements to revise plans when conditions change or when directed by the regulator. [43]-[46]

The framework is complemented by detailed electric line clearance rules and a code of practice that prescribe vegetation clearance responsibilities, management procedures, and auditable standards intended to reduce both ignition risk and reliability disruptions caused by vegetation contact. In practical terms, the Victorian model combines statutory planning, regulator acceptance, vegetation management obligations, and compliance monitoring into a single governance system for bushfire risk from electricity infrastructure. Compared with the U.S., however, the emphasis is often more squarely on safety compliance, inspection, defect remediation, and clearance obligations, with less reliance on a U.S.-style interplay between tort liability, prudency review, and cost-recovery disputes to create incentives. Even so, both systems share a common structure: utility-specific planning, transparency, and accountability mechanisms designed to reduce ignition probability from electric infrastructure under extreme fire weather. [43]-[46]

In Canada and much of Europe, wildfire-related utility obligations more commonly sit at the intersection of general electrical safety regulation and land/vegetation management law. Provincial or national wildfire statutes typically govern public restrictions, suppression authority, and broader prevention duties, while utility regulators and technical codes address safe construction and operation of lines, right-of-way maintenance, and clearance distances. In fire-prone parts of southern Europe, this often translates into a corridor-based prevention model: utilities and landowners are required to maintain fuel-managed strips or vegetation clearance areas around lines, roads, buildings, and other infrastructure, with implementation tied to broader rural-fire prevention systems administered through forestry, civil protection, and municipal authorities. [29]-[37]

Portugal is a useful example. Its rural-fire framework relies heavily on legally required fuel management around buildings and infrastructure and on secondary fuel management networks, while power-line corridors are treated as part of a wider prevention landscape rather than through a stand-alone utility wildfire regulator. In practice, that means line safety is advanced through vegetation treatment cycles, access for inspection and maintenance, and coordination with municipal land-use plans and civil-protection institutions, rather than through a recurring utility mitigation plan scored against standardized wildfire metrics. Similar patterns appear elsewhere in southern Europe, where wildfire governance is often embedded in integrated landscape planning and emergency management arrangements that emphasize prevention zones, access roads, clearance obligations, and cross-agency coordination during high-risk seasons. [38], [39]

Where more utility-specific governance is emerging, it is often layered on top of that broader framework rather than replacing it. For example, formalized de-energization protocols during extreme conditions, special operating restrictions during periods of exceptional fire danger, or enhanced outage and restoration rules may be implemented through utility operating procedures, distribution-code requirements, tariff conditions, emergency protocols, or regulatory guidance. In Italy, for example, wildfire governance is strongly shaped by the regional civil-protection and prevention planning system, while the national energy regulator focuses more generally on service quality, network operation, and consumer protection than on a dedicated wildfire-planning regime. The result is a more fragmented but still functional model: utilities may face concrete operational expectations during high-risk periods, yet those expectations are dispersed across technical codes, emergency coordination arrangements, and administrative guidance rather than consolidated into a single regulator-reviewed wildfire plan with auditable risk metrics. [35]-[42]

This difference matters because it affects transparency and accountability. A utility can comply with clearance and emergency obligations without being required to disclose, in one place, how it modeled ignition risk, how it prioritized assets, or how it evaluated the tradeoffs between reliability and preventive outage decisions. For that reason, many European systems may be comparatively strong on fuel management and interagency coordination, but weaker than California-style frameworks in requiring a unified, public, performance-based demonstration of wildfire risk reduction. [35]-[42]

Table 1. Within this framework, “Y” denotes clear public evidence of implementation; “P” denotes partial or emerging implementation; “UD” denotes recently or still-developing measures; and “NA” denotes Insufficient publicly available evidence. The resulting scores should therefore be interpreted as an evidence-based comparative characterization of publicly documented practices rather than as a definitive statement of each jurisdiction’s full operational posture. [17]-[50]

Criterion	Program element	California, US	Texas, US	Colorado, US	Oregon, US	Washington, US	British Columbia, Canada	Alberta, Canada	EU-wide / Europe	Victoria, Australia	South Australia	Western Australia
Ignition risk reduction	Vegetation and fuel management	Y	P	Y	Y	Y	Y	Y	P	Y	Y	P
Ignition risk reduction	Asset inspection, maintenance, and hardening	Y	P	Y	Y	Y	Y	Y	P	Y	P	P
Ignition risk reduction	Protection settings and de-energization	Y	P	Y	P	Y	P	Y	NA	Y	P	P
Ignition risk reduction	Wildfire risk modeling and situational awareness	Y	P	Y	Y	Y	Y	Y	P	Y	P	P
Ignition risk reduction	Emergency coordination	Y	P	Y	Y	Y	Y	Y	P	Y	P	P
Reliability impacts	De-energization and restoration protocols	Y	P	Y	P	P	P	P	P	P	P	P
Reliability impacts	Critical infrastructure and backup resilience	Y	NA	P	P	P	P	P	Y	P	P	P
Reliability impacts	Reliability impact assessment and tradeoff documentation	Y	NA	P	NA	P	NA	NA	P	P	NA	NA
Equity / customer protection	Vulnerable customer identification and targeted notification	Y	P	P	P	P	P	P	P	P	NA	NA

Equity / customer protection	Customer support during outages	Y	P	P	P	P	P	NA	P	P	NA	NA
Equity / customer protection	Affordability and cost protection	Y	NA	P	P	P	NA	NA	NA	NA	P	NA
Equity / customer protection	Public participation and equity review	Y	NA	P	P	P	NA	NA	P	P	NA	NA
Enforceability	Mandatory plans and regulatory review	Y	Y	Y	Y	Y	P	P	P	Y	P	P
Enforceability	Implementation reporting and performance metrics	Y	P	P	P	P	P	P	P	P	NA	NA
Enforceability	Audits, penalties, and corrective actions	Y	NA	P	P	P	NA	P	P	P	NA	NA
Enforceability	Cost-recovery review	Y	NA	P	P	P	NA	P	P	P	NA	NA

5. CHALLENGES AND RECOMMENDATIONS

The central challenge in wildfire governance for utilities is that the policy problem is simultaneously technical, institutional, and distributive. Utilities are now expected to reduce ignition probability under increasingly extreme weather, maintain reliable service, protect medically and economically vulnerable customers from outage harm, and do so at costs that remain socially sustainable. California's framework has advanced further than most jurisdictions in making these tradeoffs visible through wildfire mitigation plans, risk modeling, data reporting, and oversight. Yet even this model remains incomplete because many of the drivers of catastrophic loss lie outside the utility boundary. Home vulnerability, local permitting, siting decisions in the wildland-urban interface, insurance market withdrawal, and uneven household capacity to undertake mitigation all shape whether wildfire events associated with electric infrastructure exposure escalate into catastrophic disasters. A governance regime that focuses only on utility operations risks overestimating what utilities alone can achieve.

A second challenge is implementation under uncertainty. Wildfire risk models are indispensable, but they are only as strong as their assumptions, data quality, and governance. If utilities are permitted to rely on opaque or weakly validated models, regulatory review can become formalistic rather than genuinely risk-reducing. At the same time, regulators must manage the tension between preventive outage tools and equity. Measures such as EPSS and PSPS may reduce ignition risk, but they can also impose serious burdens on customers who depend on electricity for health, mobility, communications, work, and basic household functioning. Similarly, system hardening and vegetation programs may be justified on safety grounds, but they raise recurring questions about who pays, how spending is prioritized, and whether benefits are distributed fairly across communities. These tensions are intensified when wildfire governance is fragmented across utility regulators, fire agencies, insurance regulators, local governments, and land-use authorities, each acting on only part of the risk system.

The comparative assessment in this article suggests that California currently offers one of the strongest utility-centered wildfire governance models because it requires utilities to plan, justify, measure, and publicly account for wildfire risk reduction in a structured way. Victoria provides a similarly explicit utility-focused example, though with stronger emphasis on statutory safety compliance and vegetation clearance. By contrast, many other jurisdictions address utility wildfire risk more indirectly through general electrical safety law, fuel management rules, and emergency coordination arrangements. Those approaches can still reduce risk, especially where vegetation clearance and civil-protection systems are strong, but they often provide less transparency about how utilities assess ignition risk, prioritize mitigation, and balance safety against reliability and affordability. The broader lesson is that good wildfire policy is not simply a matter of adopting more rules. It requires institutional arrangements that connect utility operations to public accountability, performance measurement, and broader resilience policy. [17]-[50]

Here is what a review of this consolidated material provides:

1. Regulators should preserve and strengthen utility-specific wildfire planning requirements that force utilities to identify top risk-contributing assets, disclose modeling assumptions, set trackable targets, and subject major analytical methods to independent review.

2. Wildfire policy should move beyond activity counting and place greater weight on demonstrated risk reduction, risk-spent efficiency, and the distributional effects of mitigation measures.

3. Outage-based tools such as PSPS should remain available but should be governed as exceptional measures, with stronger requirements for alternatives analysis, customer protection planning, and post-event evaluation of necessity and proportionality.

4. Hardening, inspection, and vegetation management programs should be coordinated with public building-code and community-hardening policies so that utility mitigation is not operating in isolation from parcel-level and neighborhood-level vulnerability reduction.

5. Insurance regulation should be treated as part of wildfire governance rather than as a downstream compensation issue. Policies that recognize parcel and community mitigation require continued market participation in distressed areas, and monitor the growth of residual market exposure can help align private insurance signals with public risk-reduction goals.

6. States and local governments should directly confront the land-use dimension of wildfire by tightening development standards in high-hazard wildland-urban interface areas, aligning permitting with fire hazard maps, and expanding retrofit and home-hardening requirements for existing structures, including ember-resistant defensible space requirements such as Zone Zero.

7. Regulators should treat wildfire governance as an iterative learning system. Because climate conditions, exposure patterns, and technology are changing rapidly, plans and rules should be regularly updated based on performance data, near-miss events, post-fire investigations, and independent evaluation.

6. CONCLUSION

Wildfire policy for utilities is most effective when it is embedded in a broader governance framework that connects utility safety obligations with building resilience, insurance availability, and land-use control. The long-term objective should not be merely to reduce wildfire exposure associated with electric infrastructure, but to reduce the probability that any single ignition becomes a catastrophic social, economic, and environmental event.

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