LOAD REDUCTION AND WILDFIRE MITIGATION: SURPRISE SYNERGY?

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ABSTRACT

Wildfire mitigation and prevention are growing concerns for electric utilities in areas at risk. As utilities develop wildfire mitigation strategies, they typically implement investments in system hardening, situational awareness, and vegetation management to reduce the likelihood of ignition and limit damage if it occurs. But one of the oldest tools in the utility toolbox, load reduction programs (sometimes referred to as energy efficiency programs), can mitigate damage while reducing the total cost of mitigation efforts. In fact, insurers already incentivize homeowners to act by hardening building shells and improving controlled ventilation to reduce structural damage and infiltration of wildfire smoke.

This paper makes the case for load reduction programs as a wildfire mitigation strategy with clear benefits for customers by bringing the discrete fields of load reduction and wildfire mitigation together. It begins by identifying the operational and business risks that wildfire mitigation plans attempt to reduce. It summarizes utility use of load reduction measures and programs as a resource for meeting load growth and engaging with customers, including the multi-benefit approaches to measure design. It then provides the potential capabilities for load reduction measures to reduce fire damage and improve indoor air quality during events, highlighting where these technologies overlap with insurance industry incentives, and outlining the potential for benefit inclusion in common cost-benefit tests. Finally, it recommends a six-step approach to unify these fields by valuing wildfire risk reduction in load reduction cost benefit calculations and including building hardening in utility wildfire mitigation plans.

Introduction

Wildfire mitigation planning encompasses three prongs of mitigation, first preventing wildfire ignition by utility equipment, second withstanding wildfires near facilities and customers, and third recovery from wildfire events. Wildfire also introduces operational and business risks due to liability and damages that result if a utility causes a wildfire ignition. The resulting time and financial investment in reducing ignition risk is significant, and the impact on liability and damages is often uncertain and varies by state (Barlow et al. 2025).[1]

We propose that utilities can strengthen their wildfire mitigation planning programs and reduce total implementation cost by taking advantage of frameworks already in place to administer load reduction programs as wildfire damage mitigation (see Figure 1). Specifically, utilities can integrate efficient building upgrades and retrofits into wildfire mitigation planning. By incorporating mitigation of wildfire and associated health impacts into load reduction

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planning, utilities can simultaneously reduce risk and help respond to load growth. A comprehensive plan can allow utilities to provide community service within their service territory, reduce electricity costs, and potentially reduce the costs of implementing wildfire mitigation.

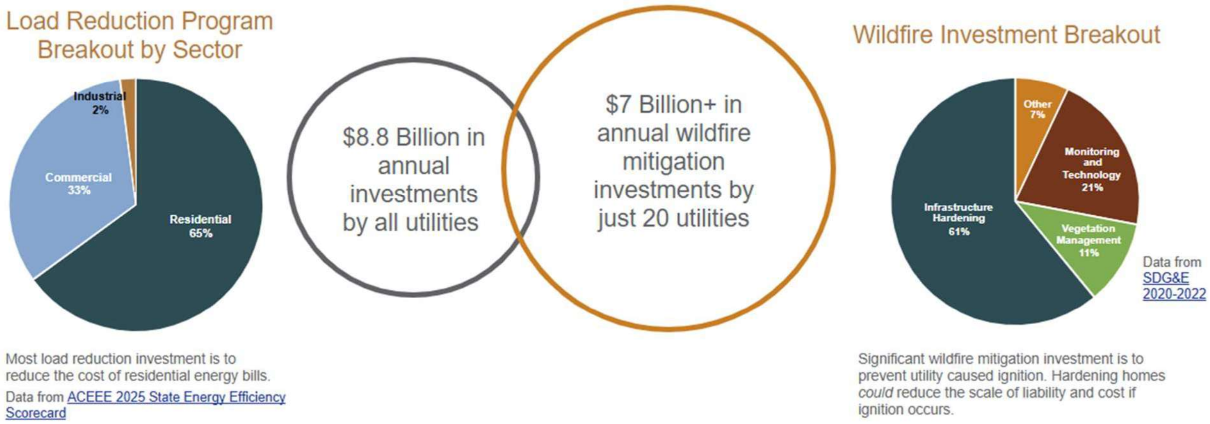

Figure 1. Load Reduction and Wildfire Mitigation Spending Overview

This analysis follows Pacific Northwest National Laboratory (PNNL) research to understand the drivers behind wildfire mitigation costs and the opportunities to reduce them.[2] As part of this analysis, PNNL discovered that utility wildfire mitigation spending is driven by an attempt to reach a near-impossible metric of zero utility caused ignitions and therefore community hardening against wildfire may support overall cost reduction. In this paper we investigate the opportunity to utilize existing building hardening measures delivered through load reduction programs as a strategy for hardening buildings and communities against wildfire if it occurs as an approach to accompany utility equipment hardening efforts and potentially reduce overall cost.

Wildfire Mitigation Planning is Required in Many Fire-Prone Areas

Electric utilities in wildfire-prone regions face what is increasingly an existential risk arising from two distinct but interrelated wildfire threats. First, wildfires pose a direct physical threat to utility infrastructure. Fire damage can destroy or degrade generation, transmission, and distribution assets directly. A second, more financially destabilizing, risk that utilities face is that their own equipment may ignite wildfires. The resulting liabilities can reach tens of billions of dollars, far exceeding annual revenues and threatening creditworthiness and access to capital.

One approach that utilities have taken to address this risk is the adoption of Wildfire Mitigation Plans (WMPs), which are formal documents that outline a utility's wildfire ignition risk reduction strategy. New WMPs are continually produced, but as of February 2026, there are 178 utilities with active WMPs, operating in 19 U.S. states and one Canadian province. Several states require utilities to prepare and submit WMPs. California and Nevada were the first to require WMPs in 2019, and ten additional states have since enacted WMP legislation. Existing

[2] See Wildfire Risk and Changing Utility Business Models | PNNL for comprehensive research into wildfire costs and business risks.

laws generally require submission of a WMP to the state Public Utilities Commission (PUC), though applicability and oversight structure varies between investor-owned utilities and consumer-owned utilities. Importantly, states have taken differing approaches to linking WMPs to liability and damages: six states require a WMP as a component of qualifying for reduced risk or reduced damages, while other states modify liability and damages by statute without tying those changes to WMP requirements (O'Neil et. al (2) 2025). Although it varies by state and regulatory framework, WMPs often play an important role in reducing not only a utility's ignition risk, but its liability risk as well (Barlow et al. 2025).

A typical WMP outlines a portfolio of operational and capital investments designed to reduce ignition risk. Common strategies include vegetation management to reduce fuel contact with overhead lines and robust inspection and monitoring protocols and technologies. Utilities will also employ system hardening measures such as covered conductors, pole and equipment replacement, undergrounding, and installation of sectionalizing devices and other grid-enhancing technology. One key operational tool employed to avoid powerlines igniting a wildfire is the de-energization of lines during extremely dry windy weather, before a wildfire occurs. This practice, called "Public Safety Power Shutoffs" (PSPS), is outlined in over 90 utility wildfire mitigation plans in the West, including plans for customer communication protocols and coordination with emergency management agencies. For electricity customers, this means that over a high-risk weather window, they must prepare to be out of power (O'Neil et al. 2025).

Utility wildfire mitigation spending has grown rapidly in recent years. A quick assessment of wildfire mitigation costs across just five western states (CA, WA, OR, UT, MT), total annual wildfire mitigation spending was approximately $8 billion, with California utilities accounting for the vast majority. The costs of mitigation actions translate directly into increased customer charges. Among utilities with explicit wildfire mitigation line items, mitigation costs range from approximately $.0011 to $.006 per kWh, with an average of $.003 per kWh. These relatively modest charges do not include the increased risk due to liability and payouts following catastrophic wildfire events (Kincaid et al. 2025).

In addition to utility mitigation spending, increased insurance expenditures and reactive recovery costs including rebuilding and restoring infrastructure after a wildfire also impact utility rates. In California, which has seen the largest state-level increase in inflation adjusted average retail prices from 2019 to 2024, the cumulative costs are particularly acute. Of the drivers of rate increases for retail consumers of electricity from regulated utilities in California, wildfire costs make up the largest share (accounting for an increase in $0.043/kWh on customer bills) (Wiser et al. 2025). What was initially seen as primarily a West Coast issue has become an emerging concern for utilities in many other states that may similarly impact rates in the future.

Wildfire mitigation strategies primarily focus on measures to reduce the likelihood that utility equipment will ignite a wildfire and secondarily focus on mitigating the reliability and customer impacts created by those preventive measures. In contrast, investment on the customer side is an overlooked opportunity. Home hardening is not included in the vast majority of WMPs even though it offers a potentially significant reduction in wildfire consequence.

Utility Energy Load Reduction Is Required as part of Least Cost Planning in Many Areas

Load reduction programs are utilized to meet two primary goals: reducing utility load and/or reducing utility costs for program participants. Policy goals for implementation vary similarly with some viewing the programs as an energy resource and purchasing it through customer incentives and others utilizing them as a mechanism to ensure that customer bills remain affordable for program participants. Financial support for load reduction programs is provided through a variety of mechanisms that expand beyond just utility investment including utility, non-profit, state, and federal funding in the form of up-front assistance, repayment, financing, and tax credits. Utility incentives are encouraged through a range of regulatory policies including direct cost recovery, which allows for the recovery of costs related to administration and implementation, fixed cost recovery, which allows for recovery of fixed costs lost when volumetric consumption is reduced, and performance incentives, which reward utilities for reaching performance goals (Edison Foundation Institute for Electric Efficiency 2012).

Implementation of measures is encouraged through utility regulatory treatment, tax policy, tax-funded programs, and resource standards (U.S. Environmental Protection Agency n.d.). These policies combined led to the operation of more than 450 utility and third-party load reduction programs in 2024, providing more than 2,400 GWhs of incremental energy savings (US Energy Information Institute 2023). Savings achievements were gained through, in part, more than $3 billion in reported customer incentives with more than 90 percent of the incentives provided for commercial and residential investments (US Energy Information Institute 2023). Federal and state tax credit and rebate programs have historically provided additional funding on top of these incentives, with the 2022 Inflation Reduction Act, for example, authorizing a one-time additional $8.8 billion in home energy rebates (US Department of the Treasury n.d.).

These robust implementation and financial incentive mechanisms provide existing pathways to promote and finance building hardening and damage mitigation efforts that can be applied to wildfire mitigation.

Synergy Exists Between Wildfire Mitigation and Load Reduction Programs

Some utilities and load reduction programs already recognize the benefit of continuous insulation, airtight construction, high performance windows, high performance ventilation systems, and non-combustible enclosures as measures that can harden homes against wildfire risk (Passive House Network n.d.). Other programs recognize the ability of weatherization tools to mitigate unhealthy air quality during wildfire events (Comfort Ready Home n.d.). Similarly, insurers recommend, and offer discounts for, upgraded skylights, windows, doors and non-combustible siding retrofits for existing homes (Insurance Institute for Business and Home Safety n.d.). While the benefits are recognized through piecemeal approaches, a simplified holistic approach to integrate the use of these measures into wildfire mitigation planning and quantify the benefits in load reduction program cost-effectiveness tests could simultaneously offer additional solutions to both challenges while potentially reducing implementation costs.

Utility, State, and Federal government supported load reduction measures have robust, well-established financing and implementation mechanisms that could be used to support home hardening and impact mitigation. While these programs have been designed to reduce utility loads and consumer costs, the existing implementation mechanisms and customer focused services have cross-over potential for use in wildfire mitigation efforts that reduce the risk of structural damage and health impacts in areas where wildfire ignition has occurred. The energy audits provided to confirm energy savings opportunities also provide an opportunity for utilities to conduct fire safety audits for their customers and promote mitigation efforts.

Some Load Reduction Measures Also Mitigate Wildfire Risk

The benefits of load reduction measures in reducing wildfire impacts to buildings fall into three separate categories:

1. The reduction of structural damage from direct fire contact
2. The reduction of health impacts from particulate matter and wildfire air toxins
3. The reduction of impacts from Public Safety Power Shutoffs (PSPS) during potential ignition events

First, wildfire poses structural threats to buildings in at risk areas. Shell hardening measures such as airtight construction, double or triple pane windows, steel, fiberglass, or solid core door retrofits, exterior air sealing, fireproof siding, and fireproof attic vents can reduce the likelihood of home ignition where wildfire is present. High efficiency windows, doors, and fireproof siding already qualify building owners for insurance discounts in some areas (Kasperowicz 2025), and The U.S. Dept. of Energy Building America Solution Center acknowledges several load reducing technologies as wildfire resistant in new and existing construction (Building America Solution Center n.d.).

Second, wildfire can significantly reduce air quality and impact health in areas near fires. Fine particulate matter, known as PM 2.5, is a well-known hazard that results from wildfire smoke, but additional toxins are increasingly measured in fires in the wildland/ urban interface (U.S. Environmental Protection Agency Wildland Fire Research 2026). Infiltration reduction measures such as exterior air sealing and well-fitting windows and doors can help prevent the infiltration of PM 2.5 and air toxins in wildfire smoke. Further, specific efficient air filtration measures can help remove toxins from the air to improve indoor air quality during events (U.S. Department of Energy Building America Solution Center n.d.).

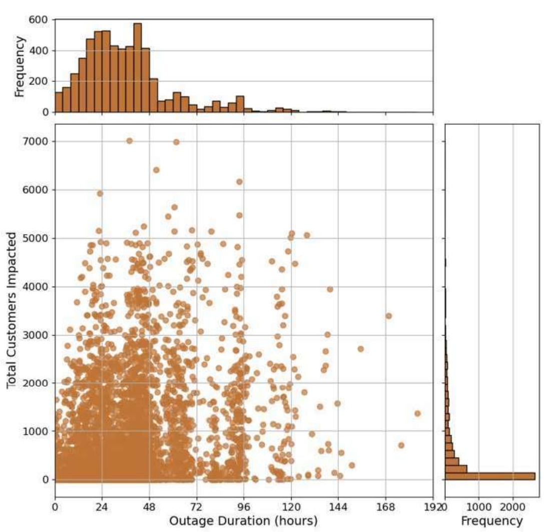

Figure 2. Duration and Scale of PSPS Events by Regulated Utilities in California

Third, public safety power shutoffs, can result in power outages for time periods ranging from a couple of hours to multiple days. During these power outages, households can lose food and refrigerated medications when refrigerators and freezers become warm. While no refrigerator could maintain consistent temperatures during long-duration outages, well insulated refrigerators could keep food and medication cold longer, potentially reducing damage from the 32 percent of historical PSPS events that lasted less than 24 hours.[3] When reviewing the duration and number of customers de-energized during each of the 6.375 circuit de-energizations taken by regulated utilities in California, most events last less than 48 hours, with 32% of events lasting less than 24 hours, and an additional 49% lasting between 24 and 48 hours.

[3] The authors would like to recognize and thank Eric Mullendore of Bonneville Power Administration for his suggestion of this additional benefit.

California has the longest history of PSPS protocols in the U.S. and maintains the most robust reporting requirements for utilities (see figure 2) (Abernethy-Cannella et al. 2026).

Estimating Areas of High Fire Risk

Prior to the process of incorporating wildfire mitigation into load reduction efforts and including load reduction measures in wildfire migration planning, it is necessary to know *where* the benefit of risk reduction is applicable. Unlike programs that utilize low-energy use design as part of rebuilding efforts post-wildfire, mitigation requires defining risk areas and utilizing qualitative and quantitative methods to determine where to target mitigation efforts and how to calculate their benefit. While wildfire risk maps have proven controversial in some areas, tools such as the Wildfire Risk Evaluation of the System Tool exist to map probability of wildfire threats to electrical infrastructure by translating weather-driven and preemptive shutoff events into maps of at-risk grid segments (Chalishazar et al. 2023). These tools can be utilized by utilities to correlate areas where damage mitigation would be most beneficial and narrowly target mitigation efforts where they will have the greatest impact.

Valuing Wildfire Mitigation Benefits Requires Integration into Load Reduction Program Cost Benefit Calculations

Utilities and regulators apply a range of approaches for determining whether an investment in load reduction is appropriate and therefore "cost-effective." Some approaches focus on the value of measures compared to other sources of energy while others focus on the value of measures including health and environmental benefits that result from the measure either to society or individual participants. Regulatory or prudence treatment of wildfire damage reduction from load reduction measures will vary depending on the approved cost effectiveness test for each utility considering the approach. For this analysis we utilized the well-recognized framework for inclusion of health and environmental benefits in utility cost tests developed by Environmental Economics and Regulatory Assistance Project in 2008 to outline our analysis of whether benefits are readily quantifiable for each cost test (see Table 1) and added the more recently developed Northwest Power and Conservation Council Resiliency Framework for quantification of equipment resilience benefits during outages (Northwest Power and Conservation Council 2023).

Table 1. Cost Effectiveness Tests and Health and Environmental Benefits in traditional cost-effectiveness tests[4]

Cost-effectiveness Test	Summary Approach	Summary of costs and benefits included	Avoided utility environmental compliance costs	Societal environmental benefits	Societal health benefits	Participant health benefits
Total Resource Cost Test (TRC)	Comparison of program administrator and customer costs to utility resource savings	Costs and benefits to utility system and impacts on program participants	✓			✓

[4] Adapted from Environmental Economics and Regulatory Assistance Project 2008.

Societal Cost Test	Comparison of society's costs of measures to resource savings and non-cash costs and benefits	Test impacts plus impacts on society	✓	✓	✓	✓
Utility Cost Test	Comparison of program administrator costs to supply side resource costs	Costs and benefits that affect utility system operation and service	✓			
Participant Cost Test	Comparison of costs and benefits of the customer installing the measure	Costs and benefits to program participants				✓
Rate Impact Measure	Comparison of administrator costs and utility bill reductions to supply-side resource costs	Costs and benefits plus estimates of utility lost revenues created by program	✓			

Each of the cost effectiveness tests in this framework demonstrates some ability to quantify either the avoided costs from avoided utility environmental compliance costs or the societal or participant environmental and health benefits from wildfire mitigation. Quantitative tests for reduced environmental compliance costs have historically been based on deferred pollution from generating resources, but it is technically feasible to calculate the environmental impacts of wildfires and value them as part of this methodology. Approved methodologies exist for calculating the environmental and health benefits from load reduction programs and it is similarly feasible to utilize existing methodologies to calculate the benefits from wildfire mitigation where proxy values are not used (Energy and Environmental Economics, Inc. 2008).

Wildfire Mitigation Benefits Can be Integrated into Some Cost Benefit Approaches

Once utilities and service providers determine *where* to target load reduction measures based on increased wildfire risk utilizing tools such as the Wildfire Risk Evaluation of the System Tool, they can begin determining *how* to quantify benefits. Reduction in wildfire risk from load reduction measures could be quantified and valued in cost effectiveness tests in four different ways:

1. Calculation of environmental costs and benefits,
2. Calculation of societal and participant health benefits,
3. Calculation of measure life for building hardening measures in areas with high wildfire risk, and/ or
4. Quantifying the resiliency benefits of measures.

Our analysis of which benefits are quantifiable included review of existing peer reviewed sources for quantitative data on the structural, environmental, and health impacts of wildfire and the capabilities of specific technologies in mitigating damage from them. We then reviewed available quantitative data within the Environmental Economics and Regulatory Assistance Project framework to determine feasibility of utilization in cost tests based on data availability. Because existing data sets are highly location specific and there is significant current research that may soon provide potential additional citable data for analysis, we provide only summary findings with reference to source material below.

In summary, we found a shortage of quantifiable data necessary to calculate environmental costs and benefits from wildfire mitigation impacts of load reduction measures is anecdotal at this time, and therefore challenging to quantify, however it is possible to include the measures as part of damage mitigation efforts in utility wildfire mitigation plans. Data to support calculation of societal and participant health benefits from reduced pollutant exposure for utilities using the total resource, societal, or participant cost tests is robust and likely mature enough for inclusion in cost effectiveness calculation. A methodology for calculating the resilience benefits of measures that prolong performance during power outages exists. It may also be possible to increase the measure life of shell measures that mitigate flammability in areas with high wildfire risk (see table 2).

Table 2. Cost Effectiveness Tests and Health and Environmental Benefits in traditional cost-effectiveness tests adapted to include availability of peer reviewed data for quantification of wildfire mitigation benefits

Cost-effectiveness Test	Summary Approach	Summary of costs and benefits included	Avoided utility environmental compliance costs	Societal environmental benefits	Societal health benefits	Participant health benefits
Total Resource Cost Test (TRC)	Comparison of program administrator and customer costs to utility resource savings	Costs and benefits to utility system and impacts on program participants	Not enough data currently available, may be feasible with additional cost data			Reliable data exists on a measure-by-measure level
Societal Cost Test	Comparison of society's costs of measures to resource savings and non-cash costs and benefits	Test impacts plus impacts on society	Not enough data currently available, may be feasible with additional cost data	Not enough data currently available, may be feasible with more impact data	Reliable data exists and is readily available	Reliable data exists on a measure-by-measure level
Utility Cost Test	Comparison of program administrator costs to supply side resource costs	Costs and benefits that affect utility system operation and service	Not enough data currently available, may be feasible with additional cost data			
Participant Cost Test	Comparison of costs and benefits of the customer installing the measure	Costs and benefits to program participants				Reliable data exists on a measure-by-measure level

Rate Impact Measure	Comparison of administrator costs and utility bill reductions to supply-side resource costs	Costs and benefits plus estimates of utility lost revenues created by program	Not enough data currently available, may be feasible with additional cost data			

Avoided Environmental Compliance Costs and Societal Benefits Calculations

When calculating the total resource, societal, utility, and rate impact measure cost effectiveness tests, the cost of avoided environmental compliance costs could potentially be included in the benefits of load reduction measures where utility wildfire mitigation planning is mandated. This formula is typically utilized to quantify avoided pollution reductions from measures by determining the pollution mix of the deferred generation based on the utility's average resource mix (Arnold-Keifer et al. 2025). While avoided environmental compliance costs are the most commonly included environmental cost in cost-effectiveness tests, they are also the most challenging to directly correlate to wildfire mitigation impacts from measures due to minimal data to date and the fact that many states provide standard values for utilities to use. As wildfire mitigation approaches and compliance matures, costs and associated risk reduction may become more standardized and therefore easier to value in avoided compliance costs.

The societal cost test also allows inclusion of societal environmental benefits in cost effectiveness tests. A 2018 ACEEE Topic Brief in this area, however, found that most states that utilize this test utilize a proxy value for environmental benefits, though at least one state utilizes utility specific damage costs for avoided generation (National Action Plan for Energy Efficiency 2008). Currently, data for additional calculation of societal environmental benefits from utility wildfire mitigation measures that reduce load appears incomplete for necessary calculations and further monitoring and analysis is likely needed.

Societal Health Benefits Calculations

The pollutants and health concerns from wildfire smoke include harms from gaseous pollutants, hazardous air pollutants, and particle pollution, with particle pollution representing the principal public health threat (U.S. Environmental Protection Agency 2025). Health effects attributed to wildfire smoke include irritation of the eyes and respiratory tract, respiratory symptoms such as coughing and difficulty breathing, respiratory effects including reduced lung function, increased risk of asthma and exacerbation of lung diseases, and cardiovascular effects such as heart failure and stroke, and increased risk of premature death, and reduction in long-term lung function (U.S. EPA 2025). Researchers have developed methodologies to calculate the impact of wildfires on population health which could be used to determine societal health benefits for cost effectiveness calculations of measures that reduce wildfire spread, such as fire resistant building exteriors, and applied directly to the societal health benefits component of the societal cost-effectiveness test (Stanford Institute for Economic Policy Research 2020; Deryungina 2016).

Participant Health Benefits Calculations

The Environmental Protection Agency (EPA) recognizes the benefits of specific measures to mitigate health risks from wildfire smoke, several of which are consistent with load reduction measures. As part of planning, the EPA recommends controls for central or room air systems, installation of high efficiency furnace filters, and sealing doors and windows to minimize the harm to internal air quality during events. Measure-by-measure analysis of the positive and negative effects of load reduction measures on indoor environments, estimates of indoor particulate exposure during wildfire events, and impacts of interventions to reduce exposure to particulates during wildfires already exist (Berkeley Lab Indoor Air Quality Scientific Findings Resource Bank n.d.).

The measures that reduce infiltration of hot and cold air into buildings as part of load reduction programs have similar capabilities to reduce infiltration of pollutants during wildfire events. It is possible to correlate reductions in air infiltration rates, as measured by blower doors, to reductions in pollution infiltration during events on either a project-by-project or measure-by-measure approach and applied to the participant health benefits component of the total resource, societal, and participant cost tests. A similar process could be used to determine the impact of controlled ventilation measures on infiltration reduction when outside air is restricted during events.

Measure Life

Utilities consider the length of time that load reduction measures save energy as part of cost effectiveness calculations. This is typically calculated by determining the effective useful life of the measure by determining the average number of years that a measure can operate and the time that a measure actually lasts.[5] Utilities typically use approved state, regional, or national average data but program administration typically allows different lifetimes for individual measures based on specific circumstances and policy guidance. Modifications may be appropriate for building hardening efforts that make structures more resilient and durable to wildfire and other events for reflection in longer measure lives.

Resilience Valuation

Resilience valuation is an emerging area for energy efficiency cost-effectiveness calculations that developed after the Environmental Economics and Regulatory Assistance Project framework. The Northwest Power and Conservation Council has established a methodology and tool for quantifying the resilience value of load reduction measures (Northwest Power and Conservation Council 2023). This tool, or an appropriately adapted one for specific utility circumstances, could be utilized to quantify the value of PSPS outage mitigating provided by refrigerators and water heaters that are able to maintain setpoints for longer without electricity.

[5] For a detailed explanation of measure life calculations see Ian M. Hoffman et. al. Berkley Lab Electricity Markets & Policy Group Technical Brief, Energy Savings Lifetimes and Persistence: Practices Issues and Data. Available at savings-lifetime-persistence-brief.pdf

Existing Delivery Mechanisms Exist for Load Reduction Programs

Utility load reduction programs have a robust history reaching back to the early 1980s, and additional tax credit, rebates, and grant programs offered through state and federal governments comprehensively provide a well-recognized and commonly utilized framework. Combined, these create a robust implementation network of utilities, non-profits, and government agencies that could be utilized to further outreach on wildfire home hardening and infiltration reduction efforts. These programs provide direct customer contact and engagement and often demonstrate utility participation and investment in the communities where they provide service. Utilities have the potential to utilize these existing networks to expand mitigation efforts beyond utility-centric approaches to community-based ones.

Ultimately, wildfire mitigation and event response efforts require direct engagement with community members. Load reduction programs provide an opportunity for utilities to communicate directly with residents and business owners about the services utilities provide and an opportunity to ensure they are aware of wildfire planning approaches.

Including Load Reduction Measures in Wildfire Mitigation Plans

The typical Wildfire Mitigation Plan (WMP) focuses on reducing wildfire ignition risk at the utility asset level. However, the investments in WMPs often reach beyond the utility's assets, incorporating customer-focused mitigation efforts such as the importance of direct communications with property owners. Some publicly owned electric utilities in Oregon provide information on mitigation efforts that homeowners can make directly including fire-safe practices such as fuel breaks, thinning, pruning, and landscape modifications, and fire-safe tree planting (Hermiston Energy Services 2022; West Oregon Electric Cooperative 2022; Midstate Electric Cooperative 2024).

Very few WMPs describe direct utility investments in customer premises. Several utilities offer assistance or rebates for subsidized de-energization mitigation, such as battery backups and portable generators (Pacific Gas & Electric Company 2026; Southern California Edison 2026). Anaheim Public Utilities (APU) might be the only electric utility that incorporates direct investments in homes for wildfire mitigation, including rebates for fire-resistant attic insulation and vents (Anaheim Public Utilities 2024).

Synergistic Treatment of Load Reduction and Wildfire Mitigation Planning is a Feasible Way to Reduce Both Risk and Implementation Costs

Utilities can receive co-benefits by including wildfire mitigation efforts in their load reduction programs and including load reduction measure implementation in their wildfire mitigation plans. Some benefits are readily quantifiable in programmatic costs effectiveness tests including societal health impacts of reduced PM 2.5 in Societal Cost Test calculations, participant health impacts of reduced interior PM 2.5 in Total Resource, Societal, and Participant Cost Test calculations, and resiliency benefit calculation. Further calculation of avoided utility compliance costs and societal environmental benefits may be possible given emerging datasets.

Utilities can strengthen wildfire mitigation plans by expanding programs to include mitigation. Including fire safety audits as part of utility energy audits and expanding home and business fire safety audits to include energy audits provides immediate co-benefit. Offering incentives for load reduction measures that mitigate wildfire damage and reduce the impact of power shutoffs and including information about energy audits and potential incentives in their community outreach plans further enable a holistic approach to customer services.

In order to effectively synergize these efforts, we propose a six step process to target coordination:

1. Utilize existing data to determine areas at greatest risk of weather driven and PSPS events and apply synergistic treatment to them
2. Include fire safety audits in energy audits, and energy audits in wildfire safety audits
3. Highlight the wildfire mitigation impacts of appropriate load reduction measures in measure promotion activities
4. Include wildfire health impacts in participant health impacts and resilience benefit calculations in load reduction measures now
5. Monitor data for potential inclusion of benefits in environmental compliance costs, societal benefit, societal health calculations and measure life in the future
6. Include load reduction measure-based damage mitigation practices such as building hardening, reduction of indoor air quality impacts, and PSPS durability in utility wildfire mitigation plans

This multistep process can increase the effectiveness of utility wildfire mitigation efforts while offsetting increased electric costs by reducing electric use for participating customers.

REFERENCES

Abernethy-Cannella, K., J. Brown, C. Sleiman, A. Jackson. 2026. *Public Safety Power Shutoffs in Wildfire Mitigation Plans*, PNNL Report – PNNL-SA-216543.

ACEEE Topic Brief, 2018. Cost-Effective Tests: Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency, 2.

Arnold-Keifer, S., J. Müller, T. Mandel. 2025. "Integrating Environmental Costs when Calculating the Energy Efficiency Potential." *Cleaner Environmental Systems*. June 2025.

Barlow, J., D. Powell, J. Kincaid, K. Abernethy-Cannella, and D. Boff. 2025. *Wildfire Risk: Review of Utility Industry Trends.* Richland, WA: Pacific Northwest National Laboratory.

Berkeley Lab Indoor Air Quality Scientific Findings Resource Bank. n.d. *Building Energy Efficiency Measures; Wildfires.* Berkeley, CA: Lawrence Berkeley National Laboratory.

Building America Solution Center. n.d. *Disaster Resistance – Wildfires.* Richland, WA: Pacific Northwest National Laboratory.

Chalishazar, V. H., J.K. Westman, J.M. Deines, S. Datta, J.D. Tagestad, A. Coleman, E.L. Barrett, et al. 2023. "Wildfire Risk Evaluation Framework for Grid Operations and Planning." In *2023 IEEE Power & Energy Society General Meeting (PESGM)*, 1–5. Orlando, FL. https://doi.org/10.1109/PESGM52003.2023.10252841.

Comfort Ready Home. n.d. *Weatherize Your Home to Keep Harmful Air Out.* U.S. Department of Energy.

Deryungina, T., G. Heutel, N. H. Miller, D. Molitor, J. Reif, 2016. "The Mortality and Medical Costs of Air Pollution: Evidence from Changes in Wind Direction." Working Paper 22796. Cambridge, MA: National Bureau of Economic Research.

Edison Foundation Institute for Electric Efficiency. 2012. *State Electric Efficiency Regulatory Frameworks.* Washington, DC: Institute for Electric Efficiency.

Hermiston Energy Services. 2022. *Wildfire Mitigation Plan 2022.* Hermiston, OR: Hermiston Energy Services.

Hoffman, I. M., S. R. Schiller, A. Todd-Blick, M. A. Billingsley, C. A. Goldman, L. C. Schwartz. May 2015. *Energy Savings Lifetimes and Persistence: Practice Issues and Data.* Berkeley, CA: Lawrence Berkeley National Laboratory Electricity Markets & Policy Group.

Insurance Institute for Business and Home Safety. n.d. *Level Up: Home Upgrades for Added Wildfire Protection.* Tampa, FL: IBHS.

Kasperowicz, L. 2025. *Wildfire Mitigation Discounts.* Foster City, CA: QuinStreet, Inc.

Kincaid J.B., R.M. Tapio, K.G. Abernethy-Cannella, S. Nagaraja Sudhakar, and R.S. O'Neil. 2026. "Cost Recovery Mechanisms for Utility Wildfire Mitigation." PNNL-38980. Richland, WA: Pacific Northwest National Laboratory.

Los Angeles Department of Water and Power. 2024. *Wildfire Mitigation Plan 2024.* Los Angeles, CA: Los Angeles Department of Water and Power.

Midstate Electric Cooperative. 2024. *Wildfire Mitigation Plan 2024.* La Pine, OR: Midstate Electric Cooperative.

National Action Plan for Energy Efficiency. 2008. *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy Makers.* Washington, DC: Energy and Environmental Economics, Inc., and Regulatory Assistance Project.

Northwest Power and Conservation Council. February 2023. *Energy Efficiency Resilience Valuation Methodology Study.* Portland, OR: Northwest Power and Conservation Council.

O'Neil, R., J. Brown, C Sleiman, K. Abernethy-Cannella. 2025. *PSPS Protocol Characteristics Tracker – PNNL-SA-218911*. Richland, WA: Pacific Northwest National Laboratory.

R. O'Neil, K. Abernethy-Cannella, J.B. Kincaid, V.A. Hamilton. 2025. Utility Wildfire Risk and Liability Legislation Tracker. PNNL-SA-216556. In "Wildfire Mitigation Plans Database - Analysis." Richland, WA: Pacific Northwest National Laboratory.

Pacific Gas and Electric Company. 2026–2028. *Wildfire Mitigation Plan 2026–2028.* Oakland, CA: Pacific Gas and Electric Company.

Pacific Northwest National Laboratory. n.d. *Wildfire Risk Evaluation of the System Tool (WREST).* Richland, WA: Pacific Northwest National Laboratory.

Passive House Network. n.d. *Fire Smart Building Fact Sheet.* New York: Passive House Network.

Southern California Edison Company. 2025–2026. *Wildfire Mitigation Plan 2025–2026.* Rosemead, CA: Southern California Edison Company.

Stanford Institute for Economic Policy Research. 2020. *Managing the Growing Cost of Wildfire.* Stanford, CA: Stanford University.

U.S. Department of Energy Building America Solution Center. N.d. *Disaster Resistance Wildfires.* U.S. Department of Energy.

U.S. Department of the Treasury. n.d. *Coordinating DOE Home Energy Rebates with Energy-Efficient Home Improvement Tax Credits: An Explainer.* Washington, DC: U.S. Department of the Treasury.

U.S. Energy Information Administration. 2023. *Annual Electric Power Industry Report, Form EIA-861 Detailed Data Files.* Washington, DC: U.S. Department of Energy.

U.S. Environmental Protection Agency. 2025. *Why Wildfire Smoke Is a Health Concern.* Washington, DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. n.d. *State Energy and Environment Guide to Action: Energy Efficiency Programs and Resource Standards.* Washington, DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. 2026. *Wildland Fire Research: What is in Smoke.* Washington, DC: U.S. Environmental Protection Agency.

West Oregon Electric Cooperative. 2022. *Wildfire Mitigation Plan 2022.* Vernonia, OR: West Oregon Electric Cooperative.

Wiser, R., G. Barbose, P. Cappers, J. Deason, S. Forrester, W. Gorman, E. O'Shaughnessy, R. Hledik, L. Lam, and A. Yan. 2025. *Factors Influencing Recent Trends in Retail Electricity Prices in the United States: What Do We Know? Where Are the Gaps?* Berkeley, CA: Lawrence Berkeley National Laboratory and The Brattle Group.

Woolf, T., C. Neme, M. Kushler, S. Schiller, and T. Eckman. 2017. *National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources.* Framingham, MA: National Efficiency Screening Project.

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