

Microgrids with Hydrogen as the Long-Term Solution to California's Insurance Crisis

A Policy Brief for the next
California Insurance Commissioner

September 30, 2026



WORLD BUSINESS ACADEMY
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Overview

Utility transmission and distribution infrastructure is responsible for a significant percentage of California's most destructive wildfires, contributing significantly to California's insurance crisis. Premiums are too expensive for consumers yet yield a net loss for insurance companies. Insurers are leaving the state, and a plan of last resort is becoming an overstrained primary coverage option for many. The most effective long-term solution is to address the root cause of wildfire-driven insurance losses.

California's centralized transmission system has long carried wildfire risk. As infrastructure has aged and wildfire conditions have intensified, those risks now outweigh the grid's benefits. Now, with new resilient, efficient, and affordable technology, there is no logical or logistical reason to carry on with the system that has helped to create the insurance crisis in California today.

The World Business Academy urges the next California Insurance Commissioner to advocate legislation that will support the implementation of microgrids and hydrogen fuel cells as the future of reliable energy generation in California. Additionally, we urge the next commissioner to coordinate with the necessary entities to encourage resilience standards. As outlined in this brief, this transition will target the primary cause of the insurance crisis and replace it with a more efficient, resilient, and cost-effective solution for Californians.

California's Insurance Crisis

As major wildfires in California become exceedingly common, California Property and Casualty insurers are experiencing unprecedented underwriting losses and many are leaving the state altogether. From 2012-2021, the direct underwriting profit for California homeowners' insurance companies was -13.1%, compared to the national

average of about 3.6% over the same time period.¹ Insurers in California are losing money, with no current prospect for a turnaround.

The severity and prevalence of wildfires in California are increasing in tandem with an aging and over-strained electrical transmission system. Between 1994 and 2003 the average number of acres burned due to wildfires per year was 533,690. From 2014 to 2023 that number jumped to 1,351,471 acres burned per year.² That is a 153% increase in acreage burned annually in just 20 years.

Insurance companies cannot keep up with the rising level of Property and Casualty claims that California insurance customers demand. The amount claimed in wildfire losses has largely outweighed the amount collected in insurance premiums over the past decade, and has led to the recent surge of insurers leaving or limiting policies in the state³ and the heavy straining of the California FAIR plan.⁴ The average California homeowner's insurance cost has risen between 50–84% since 2020.⁵ Yet, this is still under the national average for comparably catastrophe-ridden states⁶ due to state insurance regulations. This makes the California market even less profitable for insurance companies.

¹ Kristian Fors, "Why California's Homeowners' Insurance Market Collapsed—and How to Fix It," *Independent Institute*, May 12, 2025 [<https://www.independent.org/article/2025/05/12/why-californias-homeowners-insurance-market-collapsed-and-how-to-fix-it/>].

² Ibid.

³ António Miguel Martins, *et al.*, "The Impact of Wildfires on US Insurance Firms: Evidence for the Costliest Wildfire in California," *The Quarterly Review of Economics and Finance*, June 2026 [<https://www.sciencedirect.com/science/article/pii/S1062976926000554>].

⁴ Mark Rosanes, "FAIR Plan Rate Hike Adds to California Homeowners' Insurance Strain," *Insurance Business*, August 19, 2026 [<https://www.insurancebusinessmag.com/us/news/catastrophe/fair-plan-rate-hike-adds-to-california-homeowners-insurance-strain-586659.aspx>].

⁵ "California's Home Insurance Crisis Spreads Beyond Wildfire Country," *Stanford Report*, June 16, 2026 [<https://news.stanford.edu/stories/2026/06/california-home-insurance-crisis-wildfire-country>].

⁶ Megan Fan Munce, "California's Home Insurance Crisis Is Getting Worse – but Rates Are Still Cheap Compared to Florida," *San Francisco Chronicle*, October 5, 2024 [<https://www.sfchronicle.com/california/article/california-florida-home-insurance-19798573.php>].

State insurance regulations intended to protect consumers have not adequately addressed the primary driver of California's insurance crisis: catastrophic wildfire risk. Proposition 103 limits how quickly insurers can increase premiums and restricts allowable profits, making it difficult for rates to fully reflect the growing cost of insuring high-risk properties.⁷ As wildfire losses have increased, these constraints have contributed to persistent underwriting losses in California's homeowners insurance market. The current Insurance Commissioner's Sustainable Insurance Strategy seeks to modernize the implementation of Proposition 103 by allowing insurers greater flexibility in ratemaking in exchange for expanded coverage in high-risk areas, while also relying on an expanded role for the California FAIR Plan. However, the FAIR Plan has come under increasing financial strain as more homeowners have turned to it after losing access to traditional insurance.⁸

High premiums are only a symptom of the root cause of California's insurance crisis, which is wildfire prevalence and severity caused in large part by California's aging electrical transmission lines.

Microgrids to Reduce Fire Risk and Stabilize the Insurance Market

Transmission lines are responsible for a significant percentage⁹ of wildfire ignitions in California and are aging beyond reliability, efficiency, and safety. Due to these aging and over-strained transmission lines, hundreds of billions of dollars are being considered

⁷ Ibid.

⁸ Mark Rosanes, "FAIR Plan Rate Hike Adds to California Homeowners' Insurance Strain," *Insurance Business*, August 19, 2026 [<https://www.insurancebusinessmag.com/us/news/catastrophe/fair-plan-rate-hike-adds-to-california-homeowners-insurance-strain-586659.aspx>].

⁹ Jeremy White, "Many of California's Most Destructive Fires Were Caused by Power Lines," *The New York Times*, January 13, 2025 [<https://www.nytimes.com/interactive/2025/01/13/us/los-angeles-fires-cause.html>].

to replace or bury the utility lines.¹⁰ Rather than accommodating a flawed and expensive system, we need to reimagine our approach to energy generation and delivery for a modern, low-fire risk California. Small-scale microgrids with backup storage provide the solution California needs.

Microgrids are localized, Direct Current energy systems powered by solar or another renewable energy source that can connect to the main statewide grid or disconnect and run independently. California already has vast solar infrastructure, hitting a new record of over 50% of electricity generated by solar in May of 2026.¹¹

Solar energy is only generated during daylight hours and thus needs storage to provide energy during nighttime hours. Currently, this solar storage is lithium-ion batteries. Lithium-ion batteries have a limited lifespan and pose a thermal runaway threat and an environmental hazard upon disposal. A new technology has been developed which can store excess solar energy for nighttime deployment and generate additional energy with zero environmental hazards and zero pollutants: hydrogen fuel cells.

Excess solar electricity captured by microgrids can be used as the Direct Current (DC) energy source required in the process of electrolysis involved in creating hydrogen as a fuel source. The only other input necessary in creating hydrogen as a fuel source through electrolysis is water. Fortunately, due to California's high standard of wastewater purity, the state has ample wastewater which can be used (after being fully purified) as the other input in electrolysis.

¹⁰ "CPUC Undergrounding Programs Description," California Public Utilities Commission, Accessed September 30, 2026 [<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/undergrounding-program-description>].

¹¹ Blanca Begert, "California Produced Over Half Its May Electricity from Solar, a World Record," Los Angeles Times, July 31, 2026 [<https://www.latimes.com/environment/story/2026-07-31/california-produced-over-half-its-may-electricity-from-solar-world-record>].

Using the DC of solar captured by microgrids and California wastewater, massive amounts of zero-emission hydrogen energy can be created and stored for long periods of time.¹² This hydrogen can also be combined with other fuel sources such as battery-stored solar, wind, and geothermal to power infrastructure and vehicles and increase grid stability.

While it is an efficient solution with virtually zero risk, hydrogen fuel does require upfront capital costs. Because this technology is cutting-edge, the infrastructure required for hydrogen fuel generation and storage is in early stages. However, as lithium-ion batteries expire and microgrid infrastructure is expanded in the state, backup will be necessary - and this is the safest, most efficient form of solar storage and additional clean energy generation available.

Solar energy with hydrogen fuel cell and battery backup is happening now in California. The Calistoga Resiliency Center is California's first hybrid clean-energy microgrid, combining 6 hydrogen fuel cells with lithium-ion batteries to provide 8.5 megawatts of power, which is 48 hours of emergency backup power for about 1,600 customers.¹³

The implementation of microgrids as California's primary energy source - accompanied by battery storage and eventually hydrogen fuel cells - is an incremental solution. From every individual microgrid serving a portion of a community to solar farms and hydrogen fuel cell facilities, each increment alleviates strain on the current electrical

¹² Pinakin Patel and Ludwig Lipp, "Ultra-high Efficiency, Lower-Cost, Green Electrolytic Hydrogen for Microgrids in California," California Energy Commission, February 21, 2024 [<https://www.energy.ca.gov/publications/2024/ultra-high-efficiency-lower-cost-green-electrolytic-hydrogen-microgrids>].

¹³ Calistoga Resilience Center, Energy Vault, Accessed September 30, 2026 [<https://www.energyvault.com/projects/calistoga>].

transmission system in California.¹⁴ Microgrids with battery backup and hydrogen fuel cells immediately begin - and already have begun - solving the problem of California's transmission system-associated fire risk.

As of 2023, California had roughly 90 larger microgrids capable of powering multiple buildings or incorporating multiple energy resources, while state programs and regulatory reforms continue to facilitate the development of additional community-scale microgrids.¹⁵ Implementing microgrids with hydrogen fuel cells is less expensive than undergrounding the current transmission lines,¹⁶ while providing more resilience and decreased risk. Additionally, it is a renewable energy solution, which is key in achieving California's goal in accordance with Senate Bill 100 of 60% renewable energy generation by 2030.¹⁷

Microgrids with backup storage and generation yield virtually none of the fire ignition danger the current transmission system in California does,¹⁸ eliminating the majority of the principal source of catastrophic insurance losses. The back-up battery associated with solar generation poses a low-grade fire risk primarily due to thermal runaway. This

¹⁴ Juan Castaneda and Andrew Ioan, "Electric Access System Enhancement: Assessment of a Distributed Energy Resource Management System for Enabling Dynamic Hosting Capacity," California Energy Commission, June 21, 2024 [<https://www.energy.ca.gov/publications/2024/electric-access-system-enhancement-assessment-distributed-energy-resource>].

¹⁵ Emma Foehringer Merchant, "Study: Microgrids Could Reduce California Power Shutoffs - To a Point," Inside Climate News, July 7, 2023 [<https://insideclimatenews.org/news/07072023/study-microgrids-could-reduce-california-power-shutoffs-to-a-point/>].

¹⁶ "2023 General Rate Case," Pacific Gas and Electric Company, July 11, 2022 [<https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2106021/5195/493506986.pdf>] and "CPUC Undergrounding Programs Description," California Public Utilities Commission, Accessed September 30, 2026 [<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/undergrounding-program-description>].

¹⁷ California Senate Bill 100, September 10, 2018 [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100].

¹⁸ Will Cooper, "Microgrids and Wildfire Resilience: A Case Study of California Fires," Integral, January 2025 [<https://www.integral-corp.com/resources/microgrids-and-wildfire-resilience-a-case-study-of-california-fires/>].

occurrence is extremely rare, with an annual failure rate of about 0.005%.¹⁹ While disposal is not without environmental hazard, it is minimal in comparison to the fire danger California's current transmission system poses, and provides more efficiency and resilience at a lower cost than undergrounding the current transmission system does.

By reducing reliance on long-distance transmission infrastructure – the leading source of utility-caused catastrophic wildfire ignitions – widespread deployment of microgrids has the potential to substantially reduce wildfire-related insurance losses and rates over the long term while improving grid resilience and achieving the state's sustainability goals.

The Pitfalls of Undergrounding

Undergrounding the current electrical transmission system is a popular solution among the major utilities and some politicians. Senate Bill 884 took effect in 2023,²⁰ establishing a plan for the three largest California utilities to secure funding for the undergrounding of transmission lines in California to reduce wildfire risk. The estimated cost of burying power lines is \$3-4 million per mile.²¹ While this plan has a high upfront cost, those paying for it long-term will be consumers due to its rate-base return model.²²

¹⁹ "Overlooked Solar Battery Safety Best Practices for Home Energy Storage in 2026," Sunpal, March 13, 2026 [<https://www.sunpalpv.com/overlooked-solar-battery-safety-best-practices-for-home-energy-storage-in-2026/>].

²⁰ "Electrical Undergrounding Expediting Program - SB 884," California Public Utilities Commission, Accessed September 30, 2026 [<https://www.cpuc.ca.gov/about-cpuc/divisions/safety-policy-division/risk-assessment-and-safety-analytics/electric-undergrounding-sb-884>].

²¹ "Overhead Vs. Underground," Xcel Energy, Accessed September 30, 2026 [<https://corporate.my.xcelenergy.com/s/transmission/about/overhead-underground>].

²² Katie Brigham, "Why Burying Power Lines Is an Effective, but Very Expensive Way to Prevent Wildfire," CNBC, October 21, 2023 [<https://www.cnbc.com/2023/10/21/burying-power-lines-for-wildfire-prevention-is-effective-but-expensive.html>].

The high cost is exacerbated by the inefficiency of long-distance transmission lines with Alternating Current (AC). California's long-distance transmission system relies on AC, which allows transformers to easily step up voltage to minimize resistive line losses over hundreds of miles before stepping it back down for distribution. However, transporting power across these vast distances creates inherent line losses and exposes miles of overhead conductor to high-risk wildfire corridors. In contrast, localized microgrids generate and consume power where it is needed, eliminating long-distance transmission inefficiencies and avoiding the catastrophic ignition risks inherent to centralized overhead lines.

The model of independent microgrids serving individual entities or small regions allows for energy to be obtained locally to where it is consumed, reducing reliance on long-distance transmission. These microgrids can interconnect with one another and to the main electrical grid, so energy can be locally distributed to optimize efficiency. They are able to disconnect from the main grid while continuing to provide energy to essential and individual infrastructure in periods of high fire danger that induces a Public Safety Power Shutoff (PSPS).²³

Undergrounding power lines reduces wildfire risk, but increases susceptibility to heavy rains, rising water tables, and flooding.²⁴ Risks of outages remain and their duration could be extended due to limited access.²⁵ To bring down insurance costs in a time of crisis, replacing one risk with another is not the solution. Because microgrids reduce the need for extensive transmission infrastructure, they can avoid many of the upfront

²³ Rinaldo Brutoco, "Microgrids with Hydrogen: Supporting Energy Systems for the 21st Century," *POWER Magazine*, May 14, 2025 [<https://www.powermag.com/microgrids-with-hydrogen-supporting-energy-systems-for-the-21st-century/>].

²⁴ "How Weather Affects Underground Utility Lines," *UtiliSource*, March 1, 2025 [<https://utilisource.us/how-weather-affects-underground-utility-lines/>].

²⁵ "Slow Progress on Burying Power Lines Leaves US Grid Vulnerable to Extreme Weather," *Stanford Doerr School of Sustainability*, October 27, 2025 [<https://sustainability.stanford.edu/news/slow-progress-burying-power-lines-leaves-us-grid-vulnerable-extreme-weather/>].

capital costs associated with undergrounding thousands of miles of distribution lines while providing resilience benefits at the community level.

Sustainable Insurance Strategy (SIS): Improvements and Continuation

Insurance Commissioner Lara’s Sustainable Insurance Strategy (SIS) includes provisions which help to conserve stability in the insurance market and encourage preservation measures such as home hardening. The plan has worked with insurers to expand coverage to vulnerable areas and use catastrophe-modeling in rate setting, as well as invested billions of dollars in wildfire risk reduction such as home-hardening.²⁶ However, since its creation in 2023, insurance premiums in California have drastically increased,²⁷ and wildfires have cost Californians hundreds billions of dollars - and insurance companies billions of dollars in losses.

Through the SIS, homeowners receive a discounted premium for “home hardening,” or making their home more fire resilient. It has also secured Property and Casualty insurance coverage for high-risk and vulnerable areas of the state. The SIS targets a variety of important symptoms of California’s insurance crisis. However, it cannot alone eliminate the physical wildfire risk of California’s electrical transmission system, and thus must be implemented alongside the modernization of the grid itself.

Home Hardening

Home hardening is the process of using fire-resistant materials and maintenance practices to provide fire resilience to a home or business. It has proven to be an

²⁶ “Sustainable Insurance Strategy,” California Department of Insurance, Accessed September 30, 2026 [<https://www.insurance.ca.gov/01-consumers/180-climate-change/sustainable-insurance-strategy.Cfm>].

²⁷ Rob Jordan, “California’s Home Insurance Crisis Is Spreading Beyond Wildfire Country,” Stanford Woods Institute for the Environment, June 16, 2026 [<https://woods.stanford.edu/news/californias-home-insurance-crisis-spreading-beyond-wildfire-country>].

extremely effective strategy for protecting homes from burning for hours or up to days in the face of fire.²⁸ Therefore, it is a contributing factor in a Property and Casualty insurance rate risk assessment, and can decrease premiums and the potential for losses. This is why we encourage the next Insurance Commissioner to continue the SIS measure which subsidizes home-hardening by requiring a discount of premiums for those who complete home-hardening.

The SIS measure that subsidizes home hardening is a great first step to making California's infrastructure more fire resilient and thus help decrease Property and Casualty rates. However, in addition to a premium discount, the World Business Academy believes in modern home safety standards which would require any newly constructed house to meet a 24-hour fire resilience standard. This should be a minimum requirement given the availability of fire-safe home and building resources and the ever-present danger of wildfire threat to homes and communities. A cutting-edge example of this is the 3D printing of homes, which uses robotic concrete extrusion to build non-combustable, steel-reinforced cement walls.

Policy Recommendations

The World Business Academy urges the next California Insurance Commissioner to pursue the following policy recommendations:

1. Advocate for legislation which would support microgrids with hydrogen fuel cell backup as the future of California's energy generation, effectively eliminating well over half of California's wildfire risk.
 - 1.1. Support Senate Bill 1339¹, the Microgrid Incentive Program (MIP)², and other regulatory efforts to instate community microgrids in California.

²⁸ Kara Manke, "California Communities Can Reduce Wildfire Damage by Half. Here's How.," UC Berkeley News, August 28, 2025 [<https://news.berkeley.edu/2025/08/28/california-communities-can-reduce-wildfire-damage-by-half-heres-how/>].

- 1.2. Champion proposed legislation and projects that would increase the scope of microgrid and hydrogen fuel cell development.
2. Coordinate with necessary entities and existing programs.
 - 2.1. Continue policies associated with the Sustainability Insurance Strategy such as insurance subsidies for home-hardening measures, guaranteed coverage for vulnerable regions, and catastrophe-modeling and mitigation consideration in rate-making.
 - 2.2. Eventually roll-back Proposition 103³ Property and Casualty rate-capping policy. Instead, encourage forward-looking catastrophe modeling for insurance rates in light of the transition to wildfire risk-reduced microgrid and hydrogen fuel cell energy generation and home-hardening measures.
 - 2.3. Communicate with the California Public Utilities Commission (CPUC), California Independent System Operator, and other entities to collaborate on the transition from electrical transmission lines to microgrids and hydrogen fuel cells as California's primary energy source.

Conclusion

California's insurance market will remain unstable so long as catastrophic wildfire losses continue to outpace insurers' ability to price and manage risk. Insurance reform can improve market function, but it cannot eliminate the underlying hazard. Reducing dependence on long-distance transmission infrastructure through distributed microgrids, supported by resilient backup generation such as hydrogen fuel cells, offers an opportunity to address the root cause of a significant share of utility-caused wildfire losses while improving grid reliability, lowering long-term infrastructure costs, and restoring confidence in California's insurance market.

About the World Business Academy

The World Business Academy is a Santa Barbara-based 501(c)(3) organization founded in 1985 on the conviction that siloed, single discipline approaches cannot solve the systemic challenges of our time. While traditional institutions operate in vertical columns, today's crises — led by climate change, energy, governance, food security, technology, and human survival — are multidisciplinary and interconnected.

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