Residential Building Electrification in California:

An Equity-Focused Policy Analysis

EXECUTIVE SUMMARY

California's building sector generates roughly 25% of the state's annual greenhouse gas emissions from onsite fossil fuel consumption and electricity demand. The California Energy Commission's 2021 Building Decarbonization Assessment identifies building end-use electrification as one of the first strategies in a plan to cut building sector emissions by at least 40% below 1990 levels by 2030. Governor Gavin Newsom has reinforced these ambitious targets by setting goals of three million climate-ready homes by 2030 and seven million by 2035, alongside the installation of six million heat pumps by 2030.

The scale of the investment that will be needed to comprehensively electrify the existing building stock in California is significant: estimates for the costs of electrifying space conditioning and water heating end-uses alone range from $72-150 billion. Although some households can afford, and may voluntarily choose, to retrofit their homes, financial incentives remain necessary to accomplish near universal electrification, especially for lower- and moderate-income households. Maintaining the status quo or rushing to expedite this transition will likely only continue the current, inequitable patterns of technology adoption. This will lead to further impacts for California's disadvantaged communities.

This policy brief examines the equity implications of building electrification, including existing and future costs of electrification, barriers to adoption, and specific concerns for renters in multi-unit buildings, drawing on a multi-year interdisciplinary analysis conducted by the California Center for Sustainable Communities.

1. California Is Not On Track To Meet Its 6 Million Heat Pumps Goal And Lacks A Coordinated Investment Strategy

California's climate goals require large-scale residential electrification, yet the state lacks an integrated roadmap to guide this transition. Current efforts remain fragmented across numerous organizations, implementors, and incentive programs that operate without centralized coordination or data tracking.

Space heating electrification is increasing but remains far below target. According to American Community Survey (ACS) estimates, about 4.1 million California households used electric space heating as their primary fuel in 2022-an increase of only 540,000 households since 2015. The 2023 ACS 1-Year Estimate showed no statistically significant change from 2022. Data from the Department of Energy's Residential End-Use Consumption Survey (RECS) indicate that ~500,000 California households possessed heat pump HVAC systems as of 2020. Industry data from Heating, Air-Condition and Refrigeration Distributors International (HARDI), a major heat pump manufacturer and distributor trade association, suggest that this figure increased to ~800,000 by 2022. Taken together, these sources indicate that heat pumps represent only 12–20% of California's electric-heated households - with the rest making use of far less efficient electrical resistance based technologies. To reach Governor Newsom's target of six million heat pumps by 2030, California would need to install an average of 520,000 new units per year– over six times the current annual rates of adoption.

Table 1. Electric Space Heating Adoption Trends

	2019	2020	2021	2022
% of households using electric space heating (ACS)	26.6%	N/A	29.7%	30%
Estimated % of electric space heating attributed to incentive claims	0.002%	0.39%		0.41%

Energy efficiency (EE) programs, which were designed and implemented long before the development of the state's policy initiatives around electrification, remain a central policy priority and continue to focus primarily on reducing energy use rather than on fuel substitution. Budget data reported through the California Energy Data and Reporting System (CEDARS) shows that electrification measures constitute a small share of total EE program spending. In 2023, electrification accounted for just 8.5% of total EE budgets-the highest level to date, but still only a fraction of the hundreds of millions invested annually (Figure 1). Most funding continues to support traditional EE programs, including incentives for replacing older gas appliances with newer, more efficient gas models. This is internally inconsistent: even as the budgets for many electrification programs grow, other programs remain in place which continue to incentivize the purchase of new gas equipment.

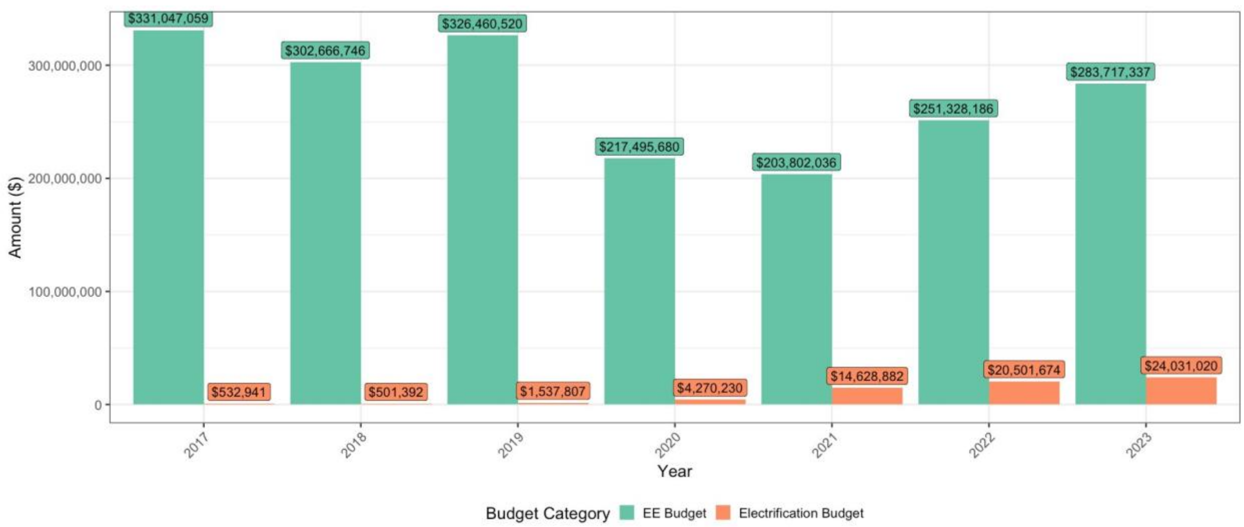

Figure 1. Total Residential Energy Efficiency and Electrification Budgets, CEDARS

A more comprehensive strategy for both building- and energy system-level decarbonization is needed across the state. Continuing with a piecemeal approach to regulating and incentivizing residential end-use electrification is likely to result in piecemeal patterns of fuel-substitution measure implementation. This is anticipated to have negative impacts on the gas system, where revenue requirements are dominated by fixed infrastructure operations and maintenance (O&M) expenses. Over time, ad-hoc, uncoordinated implementation of end-use appliance electrification threatens to create a situation where fixed gas distribution infrastructure O&M costs must be distributed across a declining share of volumetric sales, necessitating significant retail gas rate increases. A potential solution to this problem which is currently being explored involves the targeted decommissioning of gas infrastructure in conjunction with the coordinated electrification of all existing gas end-uses among a contiguous group of customer premises.

The recent passage of Senate Bill 1221 (September 2024) seeks to pilot this approach to "zonal decarbonization" through the development of up to 30 decommissioning projects across the state's IOU gas service territories (not effecting more that 1% of each IOUs customer base, in total). The nascent implementation challenges associated with identifying viable pilot project sites has exposed the urgent need for greater coordination between end-use electrification incentive programs and gas infrastructure system planning efforts across the state. Current incentive structures for electrification are not well suited to the implementation of these types of zonal decarbonization efforts, because they do not provide funding for the comprehensive electrification of all existing gas end-uses. Funding programs should be holistically redesigned to promote the adoption of incentives among a cohort of customers who are all connected to the same set of gas distribution infrastructure assets, such that these assets would be technically feasible to decommission. This approach represents a level of coordination that is currently absent from incentive program designs.

Programs remain skewed toward single family homes and toward space and water heating end-uses. Nearly 70% of available incentives are for these two categories, with far fewer offerings for multifamily retrofits, panel upgrades, or cooking electrification. Despite improvements in equity targeting—TECH reports 46% of incentives going to equity communities—newer CEDARS data shows that claims from disadvantaged communities still represent less than 1% of all electrification claims.

Research Gaps

Renter perspectives and behaviors remain poorly understood, including how electrification choices interact with housing priorities, appliance preferences, and landlord relationships, as well as how households navigate incentives and post-installation maintenance. Understanding these factors is critical for designing programs that effectively support adoption among these groups.

Recommendations

- **Establish a centralized statewide electrification roadmap with shared data tracking across agencies and programs.**
- **Phase out incentives for replacing gas appliances with newer, more efficient gas models.** These programs extend fossil fuel infrastructure and are internally inconsistent with state climate goals.
- **Develop a coordinated strategy for zonal decarbonization under SB 1221** that aligns building-level retrofit incentives with neighborhood-scale gas system decommissioning.

2. Upfront Costs And Infrastructure Gaps Block The Most Vulnerable Households

Zero-emission appliances can be price-competitive with polluting alternatives, but total installed costs are consistently higher due to ancillary infrastructure requirements. Panel upgrades, new electrical outlets, ductwork modifications, and utility service upgrades can add thousands of dollars to a project-costs that current incentives rarely cover.

Barriers relating to upfront costs and infrastructure gaps fall hardest on multifamily properties and disadvantaged communities (DACs). Research shows that at least half of single-family homes have sufficient panel capacity (≥200 amps) to electrify space and water heating with minimal upgrades. Only about one-third of multifamily structures meet the same threshold. Single-family homes in DACs are four times more likely than non-DAC homes to have undersized panels (<100 amps); multifamily homes in DACs are twice as likely.

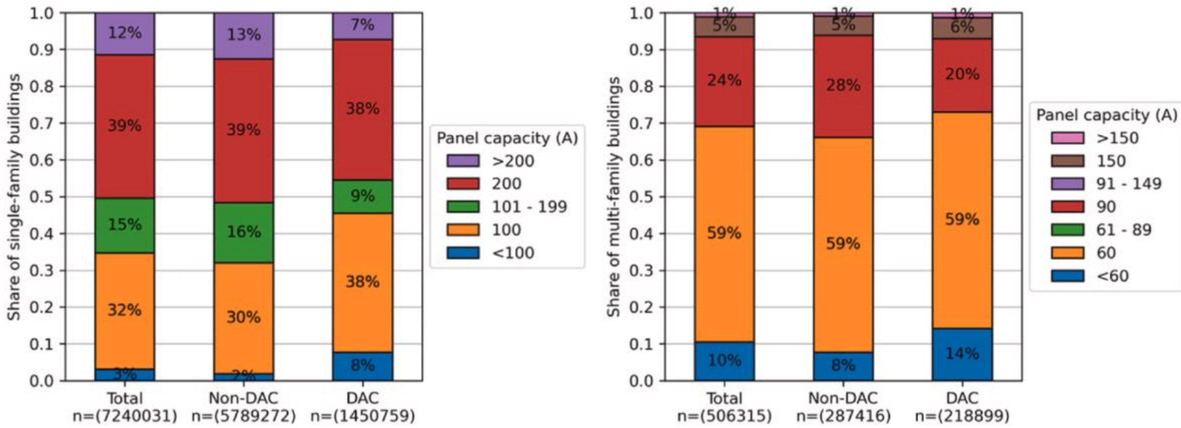

Figure 2. Estimated panel size ratings for California single-family (left) and multi-family (right) properties, both in total and disaggregated by DAC status. [1]

Survey research by FM3 found that renters in disadvantaged communities prioritize low upfront costs over long-term bill savings (*Figure 3*)–implying a high "discount rate" for the time value of money. Multifamily property owners also identified cost as the most significant barrier, with nearly all citing insufficient funding for infrastructure upgrades like panel or service capacity increases. Many reported that these expenses made projects financially infeasible even with incentives, leading some to abandon or scale back plans.

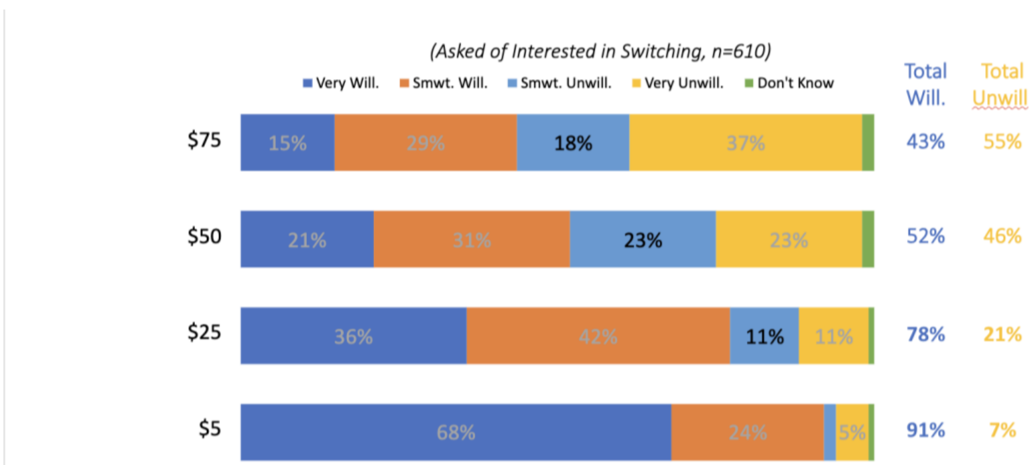

Figure 3. Renter Survey Responses When Asked How Much They Were Willing To Spend Monthly To Switch

[1] Fournier, Eric D., et al. "Quantifying the electric service panel capacities of California's residential buildings." Energy Policy 192 (2024): 114238. https://doi.org/10.1016/j.enpol.2024.114238

Multifamily property owners across the board identified cost as the top barrier–particularly for panel and service capacity upgrades–with many abandoning or scaling back electrification plans even when appliance incentives were available.

Utility delays are a major hidden barrier. Multifamily property owners described working with utilities-PG&E, SoCal Edison, and LADWP-on service upgrades as 'a nightmare,' 'painful,' and 'terrible.' All participants reported projects took longer than expected, primarily due to utility non-responsiveness and approval delays. Several owners missed incentive deadlines because utilities failed to provide required services or information in time. These experiences explain why most interviewed owners pursued only partial electrification and why many have not attempted full building retrofits.

High electricity rates compound these barriers. Renters reported significantly lower monthly gas bills than electricity bills, and 31% expressed extreme concern about electricity costs. Property owners cited rising rates as a deterrent, with some canceling electrification plans altogether. Renters surveyed reported far lower monthly gas bills compared to electricity bills *(Figure 4)*, and 31% expressed "extreme concern" about electricity costs (versus 20% for natural gas). Multifamily property owners also highlighted rising electricity rates as a deterrent, with some abandoning electrification plans altogether.

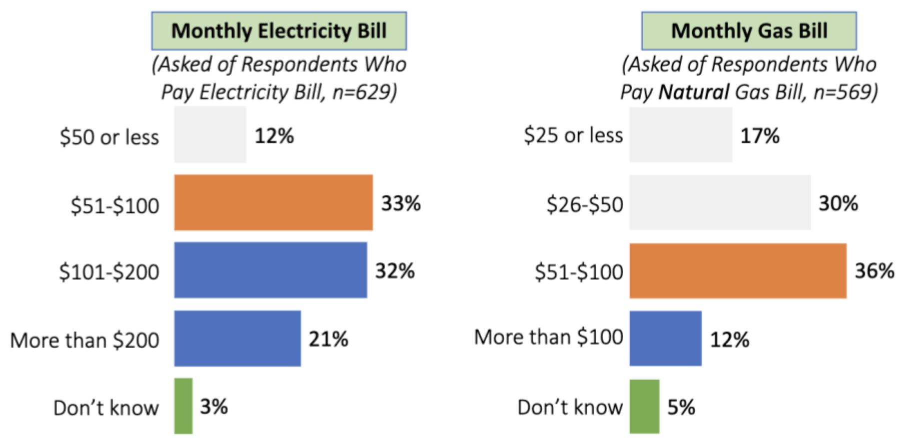

Figure 4. Renter Survey Responses When Asked How Much They Spend On Utility Bills

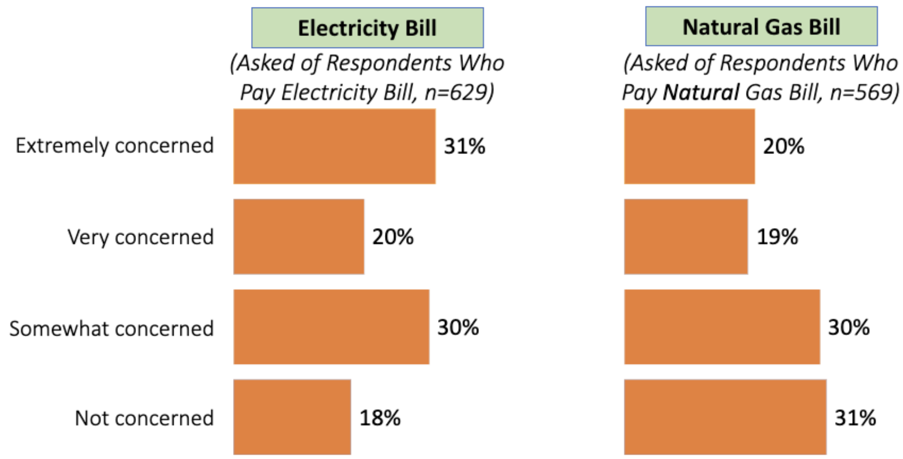

Figure 5. Renter Survey Responses When Asked Concern About The Cost of Utility Bill

There is cause for long-term optimism, however. Electrification of heating loads–which peak in winter–is unlikely to increase grid peak demand (which occurs in summer). This means broader adoption could actually improve grid utilization and put downward pressure on rates over time. In the near term, however, high rates remain a real barrier.

Current federal programs fall far short of need. The HEEHRA program offers up to $14,000 per low-to-moderate income household, but even if California's full ~$40 million multifamily allocation were deployed, it would cover at most 2,857 households–compared to the nearly 1.5 million low-income multifamily households statewide.

More holistic planning around household power use is equally critical. Rather than making appliance decisions reactively, homeowners and building managers should be encouraged to adopt long-term electrification strategies that anticipate the comprehensive electrification of all end-uses in the future. Incentives can support the use of low-power appliances, circuit splitters, load management software, multifunctional equipment, and whole-home efficiency retrofits, each of which helps minimize the need for panel upgrades. Proactive planning also avoids the risk of costly, oversized upgrades triggered by emergency equipment failures.

Finally, greater integration of distributed energy resources (DERs) and demand flexibility can further reduce peak loads and lower household energy costs. Aligning electrification with the load modifying capabilities of inverter-based resources will help minimize avoidable utility capital investments while advancing statewide electrification goals.

Research Gaps

Total building-level costs and infrastructure constraints require deeper study. Current incentives frequently fail to cover the full scope of electrification project expenses, and contractors often default to panel upsizing rather than exploring lower-cost load management alternatives. Research should quantify total costs and evaluate the potential of smart appliances, circuit optimization, and coordinated retrofit programs.

Recommendations

- **Expand incentives to cover electrical infrastructure prerequisites**–panel optimization, outlet installation, and service capacity upgrades–not just appliances. This is especially critical in multifamily and DAC properties.
- **Establish utility performance standards and timelines for service upgrade approvals**, with accountability mechanisms for delays that cause households to miss incentive deadlines.
- **Increase transparency in utility grid capacity assessments** (ICA and GNA processes) by publicly releasing methods, data, and assumptions to enable third-party review and better planning.
- **Introduce income-qualified utility tariffs that guarantee electrifying households pay no more than their combined pre-electrification gas and electricity bills**, with cost increases capped at inflation.
- **Adopt cost-share models to protect tenants from displacement.** Programs like LA's Seismic Retrofit Cost Recovery Program and the CEC's Equitable Building Decarbonization Direct Install Program offer useful templates–including rent increase caps, eviction protections, and construction timeline limits.

3. The Future Is Electric–Planning For The Long-Term Is Essential

Most households replace appliances only when existing equipment fails-meaning electrification decisions are made under duress, with a strong preference for the cheapest, fastest option. This reactive pattern has several costly consequences:

- Functioning gas appliances are repaired repeatedly to avoid replacement costs, delaying electrification and locking in emissions.
- When households do switch, they often select less efficient or lower-capability electric equipment because it is faster to install.
- Panel capacity issues–which could often be resolved through load management–instead trigger full panel upsizing, because contractors are unfamiliar with alternatives and building codes set standardized calculations (NEC Sections 220.83 and 220.87) that routinely overestimate real-world peak demand.
- Upstream costs to the grid are unclear: widespread individual panel upsizing may prompt unnecessary utility investments in distribution infrastructure.

Evidence of this dynamic is visible in the impacts of air quality district furnace rules: when low-NOx requirements pushed consumers away from gas furnaces, heat pump sales did not rise proportionally. Instead, households repaired existing furnaces or installed cooling-only systems to avoid switching–a sign that reactive decision-making dominates when proactive support is absent.

Because electrification is an established policy objective, proactive investment in wiring and panel infrastructure has assured long-term value. Planned upgrades are less expensive and create more options than emergency replacements.

Research Gaps

Real-world data on household electricity use is needed to refine panel sizing and load management strategies, and coordinated electrification with building envelope improvements could reduce energy demand and costs, especially in low-income communities. Finally, the upstream impacts of customer panel upsizing on utility distribution and transmission infrastructure remain unclear. Independent studies are necessary to assess whether overprovisioning of panel capacity at the individual property level will cause utilities to make unnecessary investments to increase the capacities of interconnected distribution system components.

Recommendations

- **Update building codes to require smart breakers or grid-interactive capabilities for major loads (e.g., water heaters) in new construction**, phased in alongside gas appliance phase-out regulations.
- **Require utilities to track installed panel capacities and use AMI meter data to measure actual peak loads**, enabling more accurate sizing decisions.
- **Expand contractor training and create incentives for implementing load management strategies**–circuit splitters, smart controls, and low-power appliances–as alternatives to automatic panel upsizing.
- **Incentivize manufacturers to develop configurable, cost-effective low-power appliances for space and water heating** that can operate within existing panel constraints without sacrificing comfort.
- **Develop building-level load management strategies for multifamily properties**, including approaches to shared loads like laundry and EV charging that differ meaningfully from single-family profiles.
- **Align electrification programs with demand flexibility and distributed energy resources (DERs)** to reduce peak loads, lower household costs, and minimize avoidable utility capital investment.

Appendix

Table 1. Common ancillary expenses associated with zero-emission air and water heating appliance installation projects within the existing residential building sector.

Issue	Solution[2]	Cost Range[3]	Likelihood
Insufficient interior space for equipment installation (Heat pump hot water heater specific)	Relocate the water heater in a new indoor location in the main structure	Difficult to express in monetary terms	Moderate
	Build new weatherized enclosure external to the main structure and run insulated water service lines back into the main structure	$5,000 - $20,000+ (Highly variable - depends significantly on the site context)	Low
Insufficient exterior space for equipment installation (Heat pump HVAC specific)	Affix condenser unit to wall mounted bracket	$300 - $500	Moderate
	Affix condenser unit to roof mounted platform	$500 - $800	Moderate
Insufficient duct size to provide adequate airflow (Ducted Heatpump HVAC specific)	Ductwork modification or replacement	$930 - $6,311 (Depends on extent of modification and if it includes insulation upgrades or complete replacement)[4,5]	Moderate
No available electrical outlet	Install new 120V wall outlet	$250 - $500	Very High
	Install new 240V wall outlet	$500 - $1,200 (Depends on breaker amperage/wire gauge ratings/cable run distance)	Very High
	Hard-wire appliance to a dedicated breaker on the main panel	$300 - $800	Very High

[2] Proposed solutions exclude complex panel optimization strategies that could involve an array of different technologies, installed in different configurations, depending upon site specific needs.

[3] Rough order of magnitude costs associated with labor and materials.

[4] High end estimates from Frontier Energy & Misti Bruceri & Associates, "2022 Cost-Effectiveness Study: Existing Single Family Residential Building Upgrades" (2022), pp. 22, available at: https://localenergycodes.com/content/resources.

[5] Low end estimates from E3, "Residential Building Electrification in California" (2019), pp. 59, available at: https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

		(Depends on breaker amperage/wire gauge ratings)	
Insufficient panel breaker slots	Upgrade electrical service panel - without upsizing amperage capacity	$1,000 - $3,000 (Depends on pre-existing panel capacity rating/size)	Moderate
	Install new sub-panel	$800 - $2,000 (Depends on sub-panel capacity rating & number of breaker slots)	Moderate
Insufficient panel amperage capacity	Upsize electrical service panel amperage capacity	$3,000 - $5,000+	Low
Insufficient utility service capacity	Upsize utility distribution service capacity	$5,000 - $40,000+ (Highly variable - depends on the need for sub-surface trenching as well as upstream hardware upgrades to feeder circuit conductors & transformers)	Low
Permitting and related fees	Submit required plans, pay required permitting fee, be present for local code officer inspection following completion of work	$500 - $1,000+ (Highly variable - many contractors bill by the hour for permitting related time and expenses)	Moderate
Miscellaneous needs	Cap existing gas service line, patch / fill drywall holes	$100 - $500	High