

Bay Area Region's Priority Climate Action Plan Greenhouse Gas Reduction Measure: Holistic Building Decarbonization for Clean, Healthy, and Secure Housing

The San Francisco Bay Area (Bay Area) is uniquely positioned to demonstrate an equitable and accelerated transition to zero-emission homes through building decarbonization,¹ given its distinctive constellation of programs and first-of-its kind building appliance regulation. This proposed measure for the Priority Climate Action Plan (PCAP) accelerates electrification and energy efficiency retrofits in existing homes, prioritizing frontline communities,² through an integrated approach that maximizes co-benefits, applies economies of scale and strategic targeting, sends important market signals, and helps build the workforce necessary for a full and just transition. This measure will provide a replicable model for moving beyond status quo of current retrofit efforts that have tended to be siloed and have achieved only incremental residential building decarbonization to date - to a comprehensive, strategic, multi-faceted pathway for achieving widespread home decarbonization that significantly reduces greenhouse gas (GHG) emissions from residential buildings and benefits frontline communities.

Background

Major GHG Emissions Source

Residential and commercial buildings in the Bay Area are a significant source of regional GHG emissions, surpassed only by transportation and industrial sources. Burning gaseous fossil fuels for energy in homes creates almost half of those building-related regional GHG emissions. Due to state and local policies and actions, the electricity grid in California - and particularly the Bay Area - is much cleaner than in most of the rest of the country.³ As a result, there is a GHG reduction premium when switching from gas to electricity in the Bay Area that does not occur in many other locations. Residential building decarbonization can also decrease exposure to health-damaging air pollutants such as nitrogen oxides and particulate matter that are by-products of fossil fuel combustion.⁴

¹ Building decarbonization refers to a broad group of strategies to reduce greenhouse gas emissions from residential and commercial buildings. Energy efficiency and building electrification (or replacing fossil fuel-dependent appliances and equipment with electric ones) are two critical components. Throughout this document, residential building decarbonization will refer primarily to these two strategies. Other strategies for building decarbonization may include: the use of zero-carbon electricity, energy storage, demand flexibility, and the use of very low- or no-GWP refrigerants and refrigerant emission leak reduction.

(<https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-f-building-decarbonization.pdf>)

² For the purpose of the PCAP, frontline communities are defined using: 1) [EPA IRA Disadvantaged Communities](#), 2) [AB 617 communities](#), and 3) [MTC Equity Priority Communities](#), and visualized together in [this map](#).

³ California's Renewables Portfolio Standard (updated by SB 100) targets 60 percent of retail electricity sales in 2030 and 100 percent by 2045. In the Bay Area, Pacific Gas and Electric Company (PG&E) and seven community choice aggregators (CCAs) have already exceeded these targets. According to its 2022 Climate Strategy Report, "PG&E delivers some of the nation's cleanest electricity to customers, with 93% from greenhouse gas-free resources in 2021. The associated emissions rate is nearly 90% cleaner than the latest national average among energy providers." The CCAs aim to deliver cleaner electricity than PG&E's benchmark.

⁴ <https://coeh.ph.ucla.edu/2020/04/29/study-gas-powered-appliances-may-be-hazardous-for-your-health/#:~:text=The%20UCLA%20fielding%20School%20of,that%20exceeded%20both%20state%20and>

Priority for local governments in the region

Local governments (cities and counties) across the Bay Area region⁵ identified equitable residential building decarbonization as a priority for the PCAP. Their commitment to decarbonizing homes is demonstrated in their adopted climate action plans and policymaking. They also expressed it as a top focus for the PCAP in response to various engagement efforts conducted by the Bay Area Air Quality Management District (Air District) and partners to inform PCAP development from April 2023 to October 2023 (e.g., surveys, interviews, meetings, etc.), with a particular emphasis on existing low-income homes. Frontline communities have shared with local governments that their key priorities related to home decarbonization include housing security and affordability (including tenant protections), health and safety upgrades, and reduced energy costs (or at the very least no increased costs) and reliability.⁶ Communities of color and low-income communities regularly experience poor housing quality and disproportionate exposure to environmental hazards as the result of racist and discriminatory policies and practices.⁷

Local governments throughout the Bay Area have been leading the nation on building decarbonization, with their early actions, such as those focused on codes and ordinances for new construction, influencing similar efforts across California and the country.⁸ For the past several years, Bay Area policy and program activities have turned to focus on the challenge of decarbonizing the existing building stock.

Rich constellation of existing efforts

Local government policies are just part of a broader constellation of programs by community choice aggregators (CCAs), Bay Area's investor-owned utility PG&E, the Bay Area Regional Energy Network (BayREN), local governments, regional agencies, and non-profits in the Bay Area region dedicated to incentivizing and subsidizing residential electrification and energy efficiency retrofits in a way that benefits all residents.

The Bay Area is also home to many innovative pilots focused on identifying the most effective and equitable solutions to advance residential decarbonization.

- **Home Electrification Equity Project (HEEP):** Four cities in the Bay Area region are partnering with Habitat for Humanity East Bay/Silicon Valley, with funding from Google.org and ICLEI, to develop a data-driven approach to serve low-income homeowners by incorporating electrification into traditional “health and safety” home upgrade programs. Other partners include California State University East Bay, Rebuilding Together, and GRID Alternatives.⁹
- **Bay Area Healthy Homes Initiative (BAHHI):** The District leads this program that seeks to improve health outcomes and climate resilience for Contra Costa and Alameda County asthma patients and residents living in the areas most impacted by traffic-related air pollution. The program brings asthma services and home retrofits to address health triggers, electrify

⁵ The Bay Area region includes Alameda, Contra Costa, Marin, San Francisco, San Mateo, and Napa Counties and the portions of Solano and Sonoma counties located in the Air District's jurisdiction.

⁶ These priorities come from an analysis of outputs from recently conducted (within the past 3 years) community engagement activities provided by local governments.

⁷ <https://www.nrdc.org/sites/default/files/2023-12/housing-justice-health-equity-building-decarbonization-ib.pdf>; <https://policycommons.net/artifacts/2683765/income-qualified-program-innovations-to-reduce-deferral-rates/3706414/>

⁸ <https://www.sierraclub.org/articles/2021/07/californias-cities-lead-way-pollution-free-homes-and-buildings>

⁹ https://icleiusa.org/wp-content/uploads/2022/11/ICLEI-USA-Action-Fund-Recipient_Home-Electrification-Equity-Project.pdf

appliances and improve energy efficiency, and keep outdoor pollution out of the home through a unique partnership with Contra Costa Health Services, Alameda County's Asthma Start, BayREN, StopWaste, and local energy non-profit Association for Energy Affordability.¹⁰

- **Just Transition Residential Electrification Pilot:** The City of Berkeley is working with the non-profit Rebuilding Together East Bay North to advance high-road, family-sustaining workforce opportunities through aggregated residential building electrification retrofits in existing affordable housing and/or low-to-moderate income households.
- **Neighborhood-scale electrification analyses and pilots:** The CCA Ava Community Energy and Gridworks analyzed eleven neighborhoods to assess the benefits and costs along with the practical feasibility and requirements of neighborhood-scale electrification, which involves targeted electrification and decommissioning of gas infrastructure in a specific neighborhood.¹¹ The City of Albany recently received a Department of Energy (DOE) Energy Efficiency and Conservation Block Grant to pilot community engagement approaches for neighborhood-scale electrification. UC Berkeley's EcoBlock research project focuses on designing and implementing cost-effective retrofits at the block scale for full decarbonization and independence from the utility grid, including an effort in Oakland.¹²

While a good start, these efforts must be accelerated for existing homes to meet local climate goals (e.g., carbon neutrality, all-electric buildings combined with capped and/or decommissioned natural gas lines¹³) and support the state's goals for achieving carbon neutrality by 2045, reaching 3 million and 7 million all-electric and electric-ready homes (new and existing) statewide by 2030 and 2035, respectively, and installing 6 million heat pumps in homes statewide by 2030. In the Bay Area, the current number of homes relying on natural gas ranges from 20-88 percent depending on the county.¹⁴

First-in-the-nation regulatory approach

The Bay Area is uniquely positioned to set a precedent for the rest of the nation in the building appliances space with the regulation adopted by the Air District to reduce health-damaging emissions of nitrogen oxides (NOx) from these appliances. The rule will prohibit the sale and installation of NOx-emitting appliances for indoor space and water heating in the Bay Area, focusing on replacement upon burnout using a phased approach that begins in 2027. A recent analysis by the Air District found that NOx and particulate matter emissions from home and water heating disproportionately impact communities of color.¹⁵ Implementation of the rule is estimated to avoid up to \$890 million per year in

¹⁰ <https://www.baaqmd.gov/community-health/bay-area-healthy-homes-initiative>

¹¹ [Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California \(ethree.com\)](https://www.ethree.com/benefit-cost-analysis-of-targeted-electrification-and-gas-decommissioning-in-california)

¹² <https://ecoblock.berkeley.edu/about/>

¹³ This requirement focuses on all-electric buildings (or all-electric conversions) and the capping and/or decommissioning of all fuel gas plumbing lines by a certain date, which can be called "end of flow." For example, the City of Half Moon Bay adopted an end of flow ordinance in March 2022 focused on end of flow by 2045.

¹⁴ This information is based on a national dataset, NREL's ResStock.

¹⁵ Appendix E: Assessing Ambient Air Quality and Health Impacts from Natural Gas Building Appliances in the Bay Area (https://www.baaqmd.gov/~media/dotgov/files/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gas-fired-water-heaters/2021-amendment/documents/20221220_sr_app_e_rg09040906-pdf.pdf?rev=f05e1e6f12874600a0382b178b04ab0d), Appendix F: Exposure and Equity Assessment of Natural Gas Appliances in the San Francisco Bay Area (https://www.baaqmd.gov/~media/dotgov/files/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gas-fired-water-heaters/2021-amendment/documents/20221220_sr_app_f_rg09040906-pdf.pdf?rev=c7a8dc1225b243298e7bd9395a292844)

health impacts by reducing exposure to NOx and particulate matter.¹⁶ While the purpose of the rule is to reduce NOx emissions, it will also likely deliver important GHG emission reduction co-benefits, as currently the only compliant technologies are electric appliances.¹⁷ As a first-of-its-kind regulation, its success will determine the direction of subsequent regulatory efforts across California and the nation. A critical component to success is ensuring that important market players – such as technology developers, manufacturers and distributors, installers, contractors, and builders – are ready to support and comply with the regulation. Another is addressing concerns related to a potential inequitable burden of the rule on frontline communities. This regulatory approach could serve as a model for the rest of the nation, once successfully implemented. When combined with the state of California’s aggressive building decarbonization goals, policies, and regulatory direction, it is already sending strong market signals to appliance manufacturers, building developers, contractors, and building- and homeowners.

Key barriers and gaps

The aforementioned efforts across the Bay Area region have illuminated key barriers and gaps to rapid and equitable home decarbonization. This PCAP measure addresses several near-term critical barriers and gaps to create a more holistic approach for residential buildings that can be replicated elsewhere. This includes addressing:

- Possible cost barriers, such as incremental up-front costs of electric appliances as well as potential related infrastructure costs (panel upgrades, etc.)
- Significant levels of deferred maintenance and health and safety concerns that often hinder or significantly delay energy efficiency and electrification retrofits, especially in low-income housing¹⁸
- Inadequate number of trained and/or certified contractors, including from frontline communities
- Dynamics in the rental housing market that may deter participation in retrofit programs, including split incentives, fear of displacement (on the part of tenants), fear of code enforcement for past violations and risk of additional costs to address newly discovered remediation needs (on the part of building owners)
- Lack of up-to-date data on costs and limited appliance model availability for specific use-cases (e.g., small space constraints)

¹⁶ Infographics – Proposed Amendments to Rules 9-4 and 9-6

([https://www.baaqmd.gov/~media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20200313_infographics_rules0904and0906-pdf.pdf?rev=1dc3359b09e4476087ddea65a5fa1cd0](https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20200313_infographics_rules0904and0906-pdf.pdf?rev=1dc3359b09e4476087ddea65a5fa1cd0))

¹⁷ The regulation itself is technology neutral, and natural gas-fired zero-NOx appliances may or may not be developed (<https://www.baaqmd.gov/rules-and-compliance/rule-development/building-appliances#:~:text=2%2F6%2F2023-,Description%3A,fired%20water%20heaters%20and%20boilers>).

¹⁸ Health and safety issues (such as mold, moisture, asbestos, etc.), structural issues, code violations, or other major issues may lead to homes being deferred from low-income energy upgrade services (like the federal Weatherization Assistance Program (WAP) and utility energy incentives programs) until issues are addressed (or remediated), especially if the total remediation cost exceeds the amount allocated for remediation in the program budget. In addition, most large decarbonization projects require permits and inspections for code compliance. For more information, see: <https://policycommons.net/artifacts/2683765/income-qualified-program-innovations-to-reduce-deferral-rates/3706414/>, https://buildingdecarb.org/wp-content/uploads/home_decarbonization_8.14.23.pdf, BEI-Berkeley Residential+Funding+Gap+Analysis_Feb+2023.pdf (squarespace.com)

Priority GHG Reduction Measure: Holistic Building Decarbonization for Clean, Healthy, and Secure Housing

The over-arching goal of this measure is to speed the transition away from residential natural gas use to healthy and low-emission housing. This measure will accelerate electrification and energy efficiency retrofits in existing homes, prioritizing homes located in frontline communities, to achieve an equitable transition to clean, healthy, and secure housing.¹⁹

A program or programs to implement this measure should include:

Retrofits through Incentives and Direct Installations

- Retrofit homes to use electricity instead of natural gas, with a focus on exploring how to aggregate residential projects for economies of scale and strategic targeting (e.g., neighborhoods with similar small multifamily buildings; in locations that PG&E has identified as most ready for neighborhood-scale electrification)²⁰
- Build upon and augment programs that upgrade residential properties to address deferred maintenance and health and safety concerns (such as lead, asbestos, mold, etc.) to increase the amount of updated housing units in frontline communities ready for decarbonization; this issue is a critical concern raised by frontline communities that diminishes living conditions and one that must be corrected before energy efficiency and electrification retrofits can proceed²¹
- Implement efficiency measures for building envelopes and heating distribution systems, along with demand response, load shifting, and resident education measures (such as smart thermostats and enrolling households in load flex programs) to help save money on bills, reduce the size and cost of the retrofits, and lay the groundwork for future virtual power plants²²
- Stack (or layer) new rebates, incentives, and financing for electrification, health and safety, and energy efficiency retrofits with existing federal, state, and local rebates, incentives, and

¹⁹ This measure first and foremost seeks to benefit and serve frontline communities. Recent efforts focused on retrofitting low-income households who had high exposure to air pollution met unexpected hurdles which necessitated flexibility in approach to meet the goals of the effort. This language reflects the need to preserve flexibility while focusing on these communities for implementation of the measure.

²⁰ Aggregating projects has the potential to reduce per-unit cost through price negotiations with installers and suppliers. It might also help lower barriers to future neighborhood-scale electrification along a common section of a natural gas line.

²¹ See footnote 18. Given limited budgets for health and safety remediation in many programs, other funding is often leveraged to close the funding gap to complete the necessary upgrades. For more information, see https://www.mwalliance.org/sites/default/files/meea-research/deferrals_aceee_paper.pdf

²² A virtual power plant is made of hundreds to thousands of households and businesses that together have the potential to support the electric grid, through their thermostats, batteries, appliances (heat pumps, HVAC equipment, other appliances), EVs and chargers, and solar arrays. When these small-scale energy-resources are aggregated and coordinated with grid operators, they support grid reliability (and provide compensation for this service to households and businesses). VPPs can also lessen the need (and associated costs) for new energy resources and infrastructure. Source: <https://rmi.org/clean-energy-101-virtual-power-plants/>.

financing in a user-friendly way to make retrofits affordable for low-income families, affordable housing owners, and non-profit housing developers who acquire and retrofit older housing

- Incorporate electric vehicle charging-readiness and measures to increase energy resilience, such as distributed solar and storage, where strategic and feasible
- Provide incentives to reclaim and recycle refrigerants from heat pump water and space heaters and other appliances using refrigerants at end of life to prevent emissions of these high global-warming-potential gases

Community Work Group

- Establish a group that includes community-based organizations (CBOs), community members, and other partners to advise on and participate in implementation so that frontline community members' needs are prioritized

Workforce Development and Contractor Support

- Partner with and support/augment local workforce training programs for electricians, plumbers, and other decarbonization-related roles, particularly those that target workers from frontline communities, formerly incarcerated people, and people with other barriers to employment
- Seek to develop and implement regionally consistent workforce standards for retrofit projects to increase the number of family-supporting/high-road jobs
- Provide streamlined contractor support (e.g., increase awareness of and access to incentives, improve communication tools with customers)

Housing Security and Policy Support

- Identify and implement housing security and anti-displacement best practices for retrofits and health and safety upgrades, with policy support from regional agencies, and best practices to engage and encourage rental property owners' participation in retrofits
- Provide policy support to local governments and CBOs to address implementation barriers as they emerge

Key implementing agencies

Implementation of this measure involves a diverse network of agencies across the region:

- Regional agencies, such as the Air District and BayREN (a program of the Association of Bay Area Governments), to lead on policy development, coordination and alignment, and potentially overall program management
- Cities and counties to assist with recruiting homeowners and property owners, convening multi-partner collaborations, and implementing best practices related to housing security
- Community choice aggregators, utilities, and BayREN to administer rebates and incentives
- Research institutions to partner on research efforts

Several non-agency organizations may play key roles as well, including non-profit organizations that conduct retrofits, workforce development organizations, CBOs, and non-profit housing developers.

Implementation Schedule and Milestones

Year	Implementation Activity or Targeted Milestone
2024	<ul style="list-style-type: none"> • Determine program design and how best to leverage existing efforts for retrofits • Launch community work group • Identify workforce training partners • Begin to engage contractors to understand support needs • Research on rental property owner engagement • Identify best practices for renter protection • Identify and prioritize topics for policy development and adoption
2025	<ul style="list-style-type: none"> • Launch full program/ beta offering for retrofits through incentives and direct installations while continuing research • Develop tool/approach for streamlined contractor support • Begin pilot project to implement landlord engagement research findings • Work with 4-6 cities and retrofit programs to begin implementing renter protection best practices related to residential building decarbonization
2030	<ul style="list-style-type: none"> • At least 10-20 cities implement renter protection policies related to residential building decarbonization • <i>(Final PCAP will have a milestone for homes retrofit through program)</i> • <i>(Final PCAP will have a milestone for contractors available regionally for retrofits)</i>

Achievement of these milestones is contingent upon sufficient funding to implement the measure.

Authority to implement

Implementation of this measure involves voluntary actions (versus regulatory actions). No additional authority must be acquired by implementing partners to implement the measure. Below is a list of key existing authorities related to the administration of rebates, incentives, and financing, as well as renter protections.

- ABAG/BayREN has the authority to administer rebates and incentives.²³
- Cities and counties have the authority to implement renter protections in their respective jurisdictions under California law.
- Community choice aggregators and utilities have the authority to administer rebates and incentives.

Geographic scope

The geographic scope of this measure includes Alameda County, Contra Costa County, Marin County, Napa County, City and County of San Francisco, San Mateo County, and the portions of Sonoma and

²³ ABAG is the administrator of BayREN, which is a Regional Energy Network (REN) that was authorized by California Public Utilities Commission D. 12-11-015. CPUC D. 12-11-015 authorized BayREN as a pilot to begin independently administering programs funded through ratepayers without oversight by an Investor-Owned Utility, such as PG&E, for the program year 2013-2014. Subsequent decisions continued to authorize BayREN to administer energy programs, and CPUC D.23-06-55 formalized the RENs as established program administrators, rather than pilots.

Solano counties that are in the Bay Area air basin, with a priority on frontline communities in those counties.

Metrics for tracking progress

The following metrics will be used to track progress.²⁴ They may be reassessed periodically with implementation partners based on data availability:

- Reductions in GHG emissions and NOx and PM2.5 emissions from retrofits
 - In frontline communities, and in overall region
- Energy costs in low-income households overall and in frontline communities
- Number of retrofits by type (e.g., full electrification, partial, health & safety, energy efficiency)
 - In frontline communities, and in overall region
- Dollars spent on incentives and direct installs
 - In frontline communities, and in overall region
 - Average cost per install by equipment type
- Number of trained contractors to conduct retrofits
 - From frontline communities and areas with high unemployment, and in overall region²⁵

The full PCAP will include the following components for this measure: quantified GHG emission reductions, assessment of the impacts on frontline communities, brief discussion of intersections with other available funding and workforce needs.

²⁴ The Air District will report on measure progress in its 2027 Status Report to EPA.

²⁵ To the extent feasible, implementing agencies will assess whether these trained contractors are serving frontline communities.