

City of Santa Barbara CAP

Analysis of Costs and Benefits

The City of Santa Barbara (City) is setting an aggressive goal to achieve carbon neutrality by 2035, more aggressive than the State of California's goals to reduce greenhouse gas (GHG) emissions 40% below 1990 levels by 2030 (SB 32) and 85% below 1990 levels or net zero by 2045. The City is developing a Climate Action Plan (CAP) to serve as a roadmap to achieve these GHG emissions reduction targets and to promote a higher quality of life for its residents. Achieving GHG emissions reduction requires strategic investments related to the measures and actions contemplated within the CAP including policies, infrastructure, technology, and programs that support behavioral change. To provide transparency around the City's investment priorities, Hatch and Rincon evaluated the potential benefits and costs of implementing a subset of the City's CAP measures and actions. This memo also identifies funding and financing strategies that can support the implementation of the select measures and actions.

Benefit and Cost Considerations

The goal for this benefit and cost evaluation is to provide the City with insights into the variability of the impact of key measures and actions to the City, its residents, local property and business owners, and other stakeholders.

Some of the key variables that may affect cost effectiveness of measures and actions in the CAP include upfront costs, lifecycle costs, incremental or marginal costs, the time value of money, and the cost of inaction.

- **Upfront vs. Lifetime Costs**

It is important to differentiate between upfront costs and lifetime costs of implementing a measure. Upfront costs include the labor and material costs of an intervention (e.g., the purchase of an electric vehicle and the installation of an at-home electric vehicle charger). Lifetime costs include the upfront costs as well as the costs of operating, maintaining, renewal and disposing of the intervention upon renewal (e.g., annual service or unplanned repair of both the electric vehicle and its charger). Lifetime costs are estimated over a finite period and are discounted to reflect net present value. While electric vehicles may be more expensive at the time of purchase than an internal-combustion engine, its lifecycle costs (e.g., its maintenance over the lifetime of ownership) are significantly lower than traditional vehicles, providing a significant return on investment.

- **Incremental or Marginal Costs**

An incremental or marginal cost is the difference in cost between a new intervention versus the old or typical approach. For example, purchasing an average sale price of a new electric vehicle in 2023 is \$60,000, roughly 20 percent more than the sales price of a traditional car. While the marginal or incremental cost in the *short-term* is significant in this example, it may be zero or near zero in the *long-term* because of reduced fuel costs and maintenance costs (e.g., fluid replacement, transmission repair, etc.) throughout the *lifetime* of the electric

vehicle. In many cases the difference between choosing an emission reducing intervention versus the traditional alternative is negligible especially when considering the ongoing costs of the intervention.

- **Financing: Time Value of Money and Savings or Avoided Costs**

Financing includes mechanisms (e.g., loans, bonds, etc.) that cover costs of a large investment such as upfront capital for infrastructure, equipment, or building re/development that must eventually be repaid over time. Financing leverages the time value of money and utilizes future revenues to back large investments today. In the case of revenue bonds, the repayment dollars may be from the large investment's revenue stream. This return on investment (ROI) allows high-cost investments to be low, or no-cost over time given the potential savings and avoided costs gained over the useful life of an investment. Partnerships with third parties such as financial institutions and/or utilities can be structured against a capital investment's cost savings or revenue streams. For example:

- Energy efficiency retrofits can generate cost savings of more than 30 percent for 15 to 20 years. If external partners are involved, such as with an energy savings performance contract (ESPC), cities may not need to provide any upfront capital, but the project's cost savings would accrue with a private third party and be ceded by the city.
- An anaerobic digester may need \$5 million to \$10 million in upfront capital but could also generate \$1 million to \$2 million annually in natural gas delivery revenue. Scaled over a 20-year period, the annual revenue can be an attractive financial investment for a city.

In addition to identifying the measures prioritized for this memo, the following table outlines approximate **upfront cost estimates** to assist in measure implementation. For each measure, both internal upfront (municipal-focus) and external costs (community-focus) are considered. The upfront costs presented in the tables do not consider the exact scale of the measures and do not represent the precise calculations of exact measure costs. Rather, these approximate upfront costs are presented to illustrate the order of magnitude of cost impacts to parties affected. Given the unpredictability of maintenance required and variables that affect operations, lifecycle costs are excluded in this analysis. Sunk costs or expenses already incurred and committed--such as salaries, lease payments, deposits, or cost of any investments made upfront--are also excluded from this analysis. The approximate upfront costs are sourced from various municipalities in California and are presented in today's value (as of the time of writing, 2023). Additionally, upfront costs presented in this memo do not consider inflation, any potential for cost changes beyond inflation, or any future unforeseen fluctuations in cost (e.g., escalation of construction material costs due to supply shortages).

The findings from this memo may be utilized for prioritizing actions for implementation, for identifying more detailed scopes of work for an action, and as a discussion document when engaging with internal City departments and divisions for planning and implementation of measures and actions.

Funding and Financing Strategies

Local governments already face challenges in meeting their constituents' needs for investment in many types of critical infrastructure and programs. This memo examines approaches that go beyond

the use of general fund monies to pay for climate-related infrastructure; funding and financing sourced outside municipal sources is central to unlocking investments that generate benefits for a wider group of constituencies in Santa Barbara and beyond. Funding and financing strategies that go beyond publicly-led approaches may also reduce the burden on low-income residents to fund investments that broadly support all residents and businesses in the City of Santa Barbara. This analysis identifies funding and financing approaches and relevant case studies in building electrification, building performance standards, and zero-emissions off-road equipment that result in emissions reductions.

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Analyzed CAP Measures/Actions

To facilitate the City’s CAP implementation, this memo seeks to identify benefits and costs variables and to refine funding and financing approaches for a subset of measures and actions in the City of Santa Barbara CAP. The four subsets of measures and actions selected by the City for analysis are below.¹

#	Measure	Actions
1	Electrification Programs and Policies for Multifamily Residential Properties	
	BE-5: Reduce Existing Residential Natural Gas Consumption by 10% Below 2019 Levels by 2030 and 17% Below 2019 by 2035	5.13: Establish a program that provides targeted direct install services and cost share for specific electrification measures with multi-unit residential development owners. City to cover incremental cost in addition to an incremental electricity rate from SBCE. 5.14: Develop and implement a multi-family residential property regulation by 2028 to promote phased building energy efficiency and decarbonization. The regulation would require periodic energy inspections and prescriptive energy efficiency and decarbonization points requirements from a standardized checklist, with required performance increasing over time.
2	Residential Electrification at Time of Renovation and Time of Sale	
	BE-5: Reduce Existing Residential Natural Gas Consumption by 10% Below 2019 Levels by 2030 and 17% by 2035	5.1: Adopt a time of renovation energy efficiency and electrification requirement by 2025, effective 2026. This ordinance could require replacement of HVAC systems, hot water heaters, and other appliances to be all electric and low hydrofluorocarbons (HFC) gas emitters or provide a checklist of cost-effective efficiency and electrification options for renovations to complete based on the scope of the project. Adopt an electrification ordinance for existing residential buildings by 2028, effective 2029, to be implemented through the building permit process, which bans expansion or reconnection of natural gas infrastructure.
3	Commercial and Mixed-Use Energy Benchmarking Programs and Building Performance Standards	
	BE-6: Reduce Commercial Natural Gas Consumption 10% Below 2019 Levels by 2030 and 18% by 2035	BE-6.2: Develop and implement a commercial and mixed-use building benchmarking program for commercial and multifamily buildings over 20,000 square feet by 2025, effective 2026. The program would include reporting electricity and natural gas usage (and any other energy source) data through energy star portfolio manager. It would establish monetary penalties for non-compliance. Residential portions of buildings that are part of a mixed-use development would be exempt. Create incentives for buildings not covered to encourage voluntary compliance.

¹ Example funding tools and financing mechanisms are not exhaustive, rather provides recent examples and prioritizes approaches applicable to California or have local precedence. Additional funding sources and financing opportunities can also be found in the Better Building Financing Navigator managed by the U.S. Department of Energy.

4	Off-road Equipment Electrification and Decarbonization
T-8: Electrify or otherwise decarbonize 6% of off-road equipment by 2030 and 20% by 2035	All actions including alignment with or exceeding AB 1346 (ban on gas powered small offroad engines by 2024)

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Measure/Action 1: Electrification Programs and Policies for Multifamily Residential Properties

This set of measures and actions is associated with residential multi-unit electrification programs and policies.

BE-5: Reduce Existing Residential Natural Gas Consumption by 10% Below 2019 Levels by 2030 and 17% by 2035

BE-5.13: Establish a program that provides targeted direct install services and cost share for specific electrification measures with multi-unit residential development owners. City to cover incremental cost in addition to an incremental electricity rate from SBCE.

BE-5.14: Develop and implement a multi-family residential property regulation by 2027 to promote phased building energy efficiency and decarbonization. The regulation would require periodic energy inspections and prescriptive energy efficiency and decarbonization points requirements from a standardized checklist, with required performance increasing over time.

Enacting BE-5.13 and 5.14 would allow the City to meet the targets set in the CAP, reduce existing residential natural gas consumption by 10% below 2019 levels by 2030 and 17% by 2035. Currently, the City does not have programs or policies that prohibits natural gas use in existing residential properties; however, it adopted a natural gas prohibition in newly constructed buildings in 2022.²

The City is considering equity and funding of electrification in multi-unit properties by incorporating targeted direct install services and cost sharing. Cost sharing for multi-unit electrification would typically be partially funded by customers rather than fully incurred by the utilities. A phased approach to adopting multi-unit electrification would also grant the City the time to develop financing strategies on incremental costs and further its partnership with Santa Barbara Clean Energy (SBCE) and Southern California Edison (SCE) to negotiate an incremental electricity rate. It will also lessen the cost burden for many building owners.

Benefits and Cost Considerations

Benefits

Direct install rebates and cost-sharing of incremental costs for the electrification of multi-unit residential buildings have a variety of benefits to help meet zero-emission goals, although electrification requirements for multi-unit residential properties may vary. Some state and/or local governments provide financial support to audit the capacity for electrification at such properties. In New York, the Multifamily Buildings Low-Carbon Capital Planning Support program offers cost-share incentives through New York State Energy Research and Development's (NYSERDA) Flexible Technical Assistance (FlexTech) program to help pay for an energy study for a multifamily portfolio.³ Services cost-shared by the FlexTech program includes general energy feasibility studies, peak-load reduction and load management, and long-term energy master planning. These services are designed to

² City of Santa Barbara Natural Gas Prohibition, FAQ 2022

³ Multifamily Buildings Low-Carbon Capital Planning Support - NYSERDA

support commercial, industrial, institutional, government, and not-for-profit sectors with objective and customized information to help inform energy decisions.

Other municipalities, such as Piedmont in California, also have lending programs that provide residents—renters or homeowners—with loaner electric appliances. This includes programs that provide induction cooktops, an electric alternative appliance, that can replace natural gas stoves and reduce emissions.⁴ The replacement of gas stove tops with induction stove tops would help decrease the negative effects of harmful pollutants to residents, which often can cause headaches and fatigue, and at very high levels, brain and heart damage.^{5,6} Santa Barbara Clean Energy also has a similar program where induction cooktop kits are available for loan through the Santa Barbara Public Library.⁷

Though the specific budget of these programs is not publicly available, existing program information from the City of Piedmont indicates that the main costs of these initiatives are staff time, which is used to set up and monitor partnerships (e.g. with the library), and funding to procure induction cooktops. These cooktops are \$100 or less.⁸ In the case of Piedmont’s induction cooktop lending program, induction cooktops were procured through partnerships with AVA (previously East Bay Community Energy). Replicating these successful partnerships and expanding existing programming through Santa Barbara Clean Energy could be helpful for the City of Santa Barbara in reducing programmatic costs associated with material procurement and staff time.

Another successful program for multifamily building electrification and energy efficiency is the Bay Area Multifamily Enhancements Program (BAMBE). BAMBE offers rebates starting at \$500 per unit to help multifamily property owners (5+ units) lower the cost of energy efficiency upgrades while providing technical assistance. It also includes an ‘adder’ for building electrification, with total potential incentives coming in at \$5,000 or more per unit. Since BAMBE began programmatic work in 2013, the program has upgraded over 45,000 units across the Bay Area and has provided over \$34 million in direct rebates to multifamily property owners.

BAMBE’s climate impact through energy savings of these initiatives is significant, totaling 0.85 gross GWh and 87,000 gross therms saved as the direct result of programmatic work. According to the BayREN 2022 annual report, BAMBE program expenditures for the calendar year added up to a total of \$2,951,888. It should be noted that these program expenditures encompass multiple programmatic areas beyond just building electrification (e.g. energy efficiency). In 2022, BayREN spent \$477,650 on administration, \$224,119 on marketing, \$1,933,520 on direct implementation no incentive costs (DINI), and \$316,600 on incentives.^{9,10}

Another successful program for multifamily building electrification is a 2018 Pacific Gas and Electric (PG&E) multifamily rebate program that covered a range of energy-efficient upgrades and measures

4 Induction Cooktop Lending Program | City of Piedmont

5 Indoor Air Pollution from Cooking | California Air Resources Board

6 Combustion Pollutants & Indoor Air Quality | California Air Resources Board

7 Induction Cooktop Kits, Santa Barbara Clean Energy

⁸ <https://www.nytimes.com/wirecutter/reviews/best-portable-induction-cooktop/>

⁹ Bay Area Regional Energy Network (BayREN 2022 Annual Report) | BayREN <https://www.bayren.org/multifamily-property-owners/building-improvements>.

¹⁰ BayREN Increases Rebates for Multifamily Rebates, Yemi Reyes for CivicWell.org. <https://www.bayren.org/sites/default/files/2023-05/BayREN%20AR%2011x17.pdf>

such as lighting upgrades, heating and cooking systems, water heating, building envelope improvements, appliances, and energy audits.¹¹ These incentives were recommended based on assessment results in order to provide comprehensive, whole-building energy savings.¹² The program aimed to promote long-term energy benefits through energy efficient solutions including those that would incentivize customers to eliminate unnecessary energy use, reduce carbon footprints, and save money.¹³

To be able to pay for the incremental costs of electrification, cost-sharing between utilities (and community choice aggregators) and residents would help with upfront costs that would otherwise be infeasible if solely paid for by one party. The City would achieve its decarbonization goals, while residents get support transitioning to all-electric buildings. Additionally, some states, like New York, have implemented bill relief programs that help support low-income customers or even exempt low-income customers from cost-sharing to allow for more equitable access to the electrification transition.¹⁴ Other states like California have programs for income-qualified residents and owners to receive energy-efficient appliances at no or minimal charge.¹⁵

These cost sharing programs help reduce the marginal cost to upgrade appliances from gas to all-electric. The increase in the marginal cost of appliance replacement is seen as the main cost hurdle for procuring and installing electric appliances, and thus, building electrification. In some cases, the incentives and cost sharing structures described above can even bring the cost of multifamily building electrification to be equal to the cost of gas upgrades that would have happened anyway in a 'business as usual' scenario.

Benefits to Community

Direct install rebates allow residents and property owners to move toward electrification of multifamily residential buildings with financial incentives to invest in electric alternatives. Ultimately, cost-sharing allows building owners to share the upfront costs of energy efficiency upgrades with the utilities and residents. As stated above, utilities benefit through more efficient appliances (heat pumps) and strategies such as storing thermal energy with hot water heaters equipped with mixing valves or demand response programs.¹⁶

This cost-sharing allows for multiple parties to be invested in supporting zero-emission goals and will reduce electricity bills for both residents and property owners in the long-term. In this way, the community has a direct contribution to lowering emissions in multifamily buildings. For the building owners, cost-sharing with residents would also allow for a faster return on investment as well as improved building value, as compared to other less energy efficient buildings. As federal policy towards electrification continues to advance, building owners that participate in cost-sharing will meet the requirements for energy saving earlier rather than later.

11 Multifamily Property Program Energy-Efficiency Rebates Catalog | PG&E

12 High-Impact Programs Targeting Regional Multifamily Energy Savings Opportunities, July 2021 | ACEEE

13 PG&E Energy Efficiency Annual Report, 2018

14 Electric and Gas Bill Relief Program | New York State

15 Energy Savings Assistance | California Public Utilities Commission

16 Water Heaters Have Battery Potential | IEEE

Benefits to City

The main benefit to the City of electrification is the achievement of decarbonization goals associated with electrification. Incentivizing electrification at the most cost-effective time and preparing the community for this transition is a primary goal of the City.

Across the City of Santa Barbara, multi-unit residential properties use a total of 4,027,341 therms of natural gas every year. It is important to break out this natural gas use by appliance type, as building electrification will ultimately depend on the replacement of natural-gas burning appliances as they fail ('burnout') replaced with electric alternatives. These appliances will function anywhere from 10-22 years. When all multi-family housing units in Santa Barbara are accounted for, the appliance units used for a multifamily household are collectively expected to emit 421,284 MT CO₂e across their functional lifespan. As shown in Table 1, the City would reduce 86 therms of natural gas per year for each water heater that is electrified, 88 therms for each furnace, and 20 therms for each stove on average. Other includes all other gas uses, likely clothes dryers, pool heaters, and other less common uses.

Table 1: Multifamily Building Electrification (GHG Savings & Marginal Cost)

Household Appliance Type	Water heating	Spacing heating/cooling	Cooking	Other	Total
Appliance Lifespan (Years)	13	22	12	10	N/A
Total annual natural gas use (therms/year)	86	88	20	32	226
Total therms (lifespan)	1,119	1,899	245	317	3,580
Appliance Lifespan GHG Emissions (MT/CO₂e/Source/Unit)	7	13	2	2	24

*Total emissions includes both combustion and associated leakage

Although the City is expected to cover the incremental costs of some rebate programs which adds to the City's upfront costs, the cost-sharing approach will alleviate and reduce some of the upfront cost to the City. Long-term energy reduction will ultimately benefit the management of the City's grid and utilities. The reduction of overall energy demand in the City will help conserve natural resources and encourage a more sustainable energy ecosystem. While electrification of buildings and vehicles will ultimately require grid upgrades to handle additional electricity use, it is important to identify the nuances of how building and transportation electrification will impact future electrical load. Heat pumps, when combined with weatherization upgrades can reduce summer peak electrical demands, and reduce electricity use by 50 percent in comparison to traditional HVAC systems.¹⁷ Heating and cooling buildings take up the largest percentage of total building electrical loads, with HVAC electrical loads ranging from 25-33 percent of total household energy load.¹⁸ Most relevant to Santa Barbara's climate, a Natural Resources Defense Council (NRDC) analysis on air conditioning replacement with heat pumps came to the conclusion that California's electric grid, which is "summer-peaking" would experience reduced risk of heat-induced blackouts through the installation of heat pumps in place of older air conditioning units.¹⁹

Jobs Impacts

It is hard to challenge the fact that electrification is on the rise and the increasing need for skilled labor workers to keep up with the demand of end-use technology transformations for stove-tops, hot water heaters, furnaces, and the necessary home and commercial electrical upgrades (breaker boxes) to electrify buildings, as well as grid infrastructure updates. A [2020 study](#) shows that decarbonization can create millions of well-paying American jobs with opportunity to become an exporter of clean energy technologies also increasing job growth.

A Hatch-led study for the City of Santa Cruz shows that capital expenditures ranging from \$80 million to \$100 million for electrification of existing commercial and residential buildings in the city may result to 50 to 55 California jobs annually.

It is also important to consider future projections for vehicle electrification when thinking about future electrical loads related to building electrification. New State targets for vehicle electrification, target 12.5 million electric cars on California's roads by 2035, is expected to increase electric loads across the State. As an example State grid planners are projecting a more modest estimate of 3.7 million electric vehicles by 2035 an increase of 35,000 GWH by Though these grid planning efforts are factoring in rates of new renewable energy procurement to shape this demand, designing in future flexibility and incentives for strategic vehicle charging will be critical in allowing for continued grid reliability.^{20,21} Though building electrification offers significant opportunities to reduce peak summer loads, increases in EV adoption may need to be met with incentives for flexible charging, and more aggressive energy efficiency moves. These energy efficiency initiatives could be partially achieved through reductions in commercial building energy usage through BE-6, which aims to establish efficiency standards in the often oversized and energy-intensive commercial building sector.

¹⁷ Pump Up Your Savings with Heat Pumps, May 30, 2023 | Energy.gov [U.S. Department of Energy]

¹⁸ Duty-cycling buildings aggressively: The next frontier in HVAC control, Agarwal et al. 2021; Proceedings of the 10th ACM/IEEE International Conference on Information Processing in Sensor Networks

¹⁹ Want to Cut Heating Costs? Replace Your AC! Kiki Velez, October 2022 | Natural Resources Defense Council

²⁰ Race to Zero: California's bumpy road to electrify cars and trucks, Jan 2023, Nadia Lopez | CalMatters

²¹ 2021 IEPR California Energy Demand Forecast Summary

Additionally, energy efficiency programs have potential to create jobs in various sectors and can stimulate local economic growth and provide employment opportunities.²² The initiatives supported by the City may also resonate with the larger public and rally more environmentally conscious residents and businesses towards the effort.

Costs

Although there are many benefits to direct install rebates and cost-sharing, there are regulatory uncertainties, potentially substantial upfront financial costs, and technological information gaps that may become challenges for both the community and local governments.

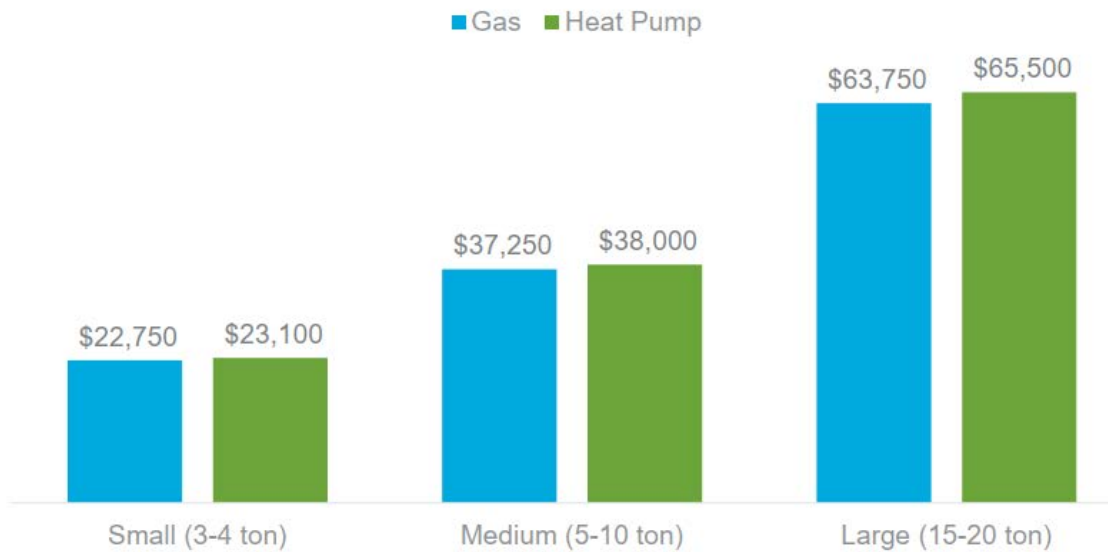
Costs to Community

Multi-family housing utilizes a wide variety of equipment and electrical infrastructure depending on the age and design of the building and the number of units. Some multi-family buildings utilize the same equipment as those found in single-family residential units (the costs for which can be found in Figure 4 under Action 2). In some cases, equipment such as water heaters may even serve multiple units resulting in lower per unit costs. However, other larger buildings could utilize rooftop package units, hot and chilled water loops, boilers, or other technologies. Each of these equipment types as well as other physical attributes of the specific building will have significant impacts on costing. While it is possible to identify costs associated with specific appliances, it is difficult to identify general costs for electrical infrastructure upgrades associated with multifamily buildings, such as panel and service upgrades due to the nuances associated with age, scale and design of multifamily buildings. The cost of infrastructure up-grades requires a significant study that falls outside of the scope of this analysis.

One potential area for the City to focus on is rooftop heat pump package units which have been shown to be cost competitive and have similar footprints to gas package units. Data provided by Peninsula Clean Energy in San Mateo County details different sized heat pump package units only slightly increasing costs compared to gas package units, as shown in Figure 1. This near-cost parity between existing gas and electric technologies means that transitioning rooftop heat pump package units offers an opportunity to electrify buildings with no, or minimal upfront costs.

²² Mobilizing for a Zero Carbon America | Laskey and Rewiring America

Figure 1 Median Rooftop Packaged Heat Pump Installation Costs (PCE Decarbonization Plan)



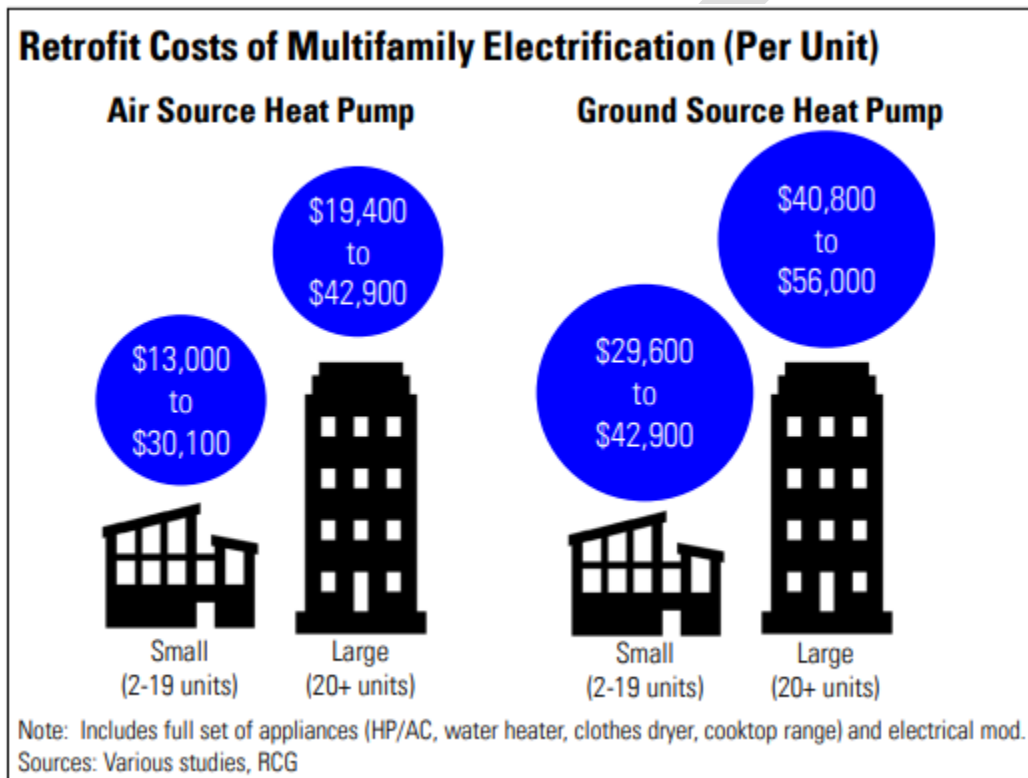
Larger buildings also tend to have systems that are oversized which can lead to inefficiencies. As documented in the 2023 City of Sacramento Existing Building Electrification Strategy, interviews with local contractors and facility managers concluded that commercial building infrastructure is mostly oversized. From the vantage point of commercial building/facility managers, oversizing building heating and cooling systems was considered easier in guaranteeing heat and hot water performance rather than fine-tuning the needs of a smaller system to match the timed demand for heating and cooling.²³

When electrifying, it will be important to understand the buildings existing electrical infrastructure and actual heating and cooling needs and to identify any cost-effective efficiency actions to allow for downsizing of new electric equipment. Balancing the heating and cooling needs with the electrical service and infrastructure of each building is critical to limiting added infrastructure costs related to building electrification. To fully understand the costs associated with multi-family housing electrification in Santa Barbara, additional research should be conducted on the most common building electrical infrastructure and heating and cooling systems and their electric alternatives. In addition, depending on the on-bill savings (which are heavily dependent on the difference in cost between gas and electric), some investments in electrification may also have lengthy payback periods where the long-term benefits are not seen by the residents nor the property owners until many years later. Both property owners and residents may be reluctant to commit to improvements that they will not see in their time living in the complex or owning the property.

²³ City of Sacramento Existing Building Strategy, 2023 | City of Sacramento

Some studies have estimated average retrofit costs for the full electrification of multifamily buildings. Detail from a study completed in New York State is shown in Figure 2.²⁴ This is the total upfront cost to install all new electric appliances and infrastructure. To understand the marginal cost, the single-family gas installation cost could be used as an estimate. Smaller multifamily buildings are likely to use similar appliances as single family units but may even share a single appliance between two units, decreasing the per unit cost to upgrade.²⁵ Based on data from the San Francisco Bay Area the marginal cost to install all new gas appliances is between \$11,000 and \$18,000 depending on whether an air conditioning is in place. This results in an average marginal cost of \$8,000 to \$25,000 per unit.

Figure 2 Retrofit Costs of Multifamily Buildings Per Unit (NY State; all-appliance replacement)



Costs to City

For Action 5.13 the City’s costs would be based on the number of direct install projects completed and the per unit costs described in Figure 4. If the City’s project covered larger systems, like boilers, those costs could be significantly higher. In addition, the City would likely need dedicated staff to support this program as well as for potential technical consulting support, the cost of which would be dependent on the size of the program and the program needs.

²⁴ <https://www.nyscrda.ny.gov/-/media/Project/Climate/Files/2022-Comments/NY-Building-Electrification-Cost-Full-Report-June2022>
²⁵ U.S. Households are Using Less Energy, 2018 | Joint Center for Housing Studies of Harvard University

For Action 5.14 the City would need to develop an ordinance and checklist, which could be completed by a consultant or City Staff for an estimate of approximately \$100,000. However, the City would also likely need additional staff to support the program and to conduct inspections. Likely between 1 and 2 full time staff at a minimum would be needed to actively manage the program and complete the inspections.

Current Rebates and Incentives

Figure 3 includes a list of rebates and incentives that are currently available for multifamily buildings in Santa Barbara based on information from The Switch Is On which compiles rebates for each geographic area. These rebates were accessed on September 15, 2023 and are subject to change. Additional low-medium income upfront incentives are expected to be made available by the Inflation Reduction Act in early 2024.

Figure 3 Multifamily Electrification Rebates For City of Santa Barbara

Multi-Family Electrification Rebates			
Appliance	Funder	Incentive Amount	Source
Heat Pump Hot Water Heater (HPHWH)	3C-REN: Low-range	\$500	https://incentives.switchison.org/rebate-profile/3c-ren-500-750-heat-pump-water-heater-multifamily-building-project-s?view=residents&origin=directory
	3C-REN: High-Range	\$750	https://incentives.switchison.org/rebate-profile/3c-ren-500-750-heat-pump-water-heater-multifamily-building-project-s?view=residents&origin=directory
	IRA*	\$2,000	CityofSanMateo CostData Clean V2.xlsx; backed up by: https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
Total HPHWH Incentives- Low-Range		\$2,500	
Total HPHWH Incentives- High-Range		\$2,750	
Heat Pump HVAC	3C-REN: Ductless (Mini-Split) low-end	\$500	https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=6
	3C-REN Ductless (Mini-Split) high-end	\$750	https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=7
	IRA*	\$2,000	CityofSanMateo CostData Clean V2.xlsx; backed up by: https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
Total Heat Pump HVAC Incentives; Low-End		\$2,500	

Multi-Family Electrification Rebates			
Appliance	Funder	Incentive Amount	Source
<i>Total Heat Pump HVAC Incentives; High-End</i>		\$2,750	
Panel Upgrade	IRA*	\$600	CityofSanMateo_CostData_Clean_V2.xlsx; backed up by: https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
<i>Total incentives for Panel</i>		\$600	
Whole-Home Electrification Credit (All-Systems)	CA Energy Smart Homes	\$3,550	https://incentives.switchison.org/rebate-profile/energy-smart-homes-whole-house-rebate-multi-family?view=residents&origin=directory
<p><i>*Incentive values reflect available rebates and incentives written upon the writing of this memorandum during late summer of 2023.</i></p> <p><i>IRA rebates may vary in timing and applicability of availability of funding. TECH and 3C-REN incentives should be continually monitored by City staff as funding availability and deadlines change often.</i></p>			

Additional Funding and Financing Strategies

Strategies to fund or finance projects resulting from the implementation of BE-5.13 and 5.14 include the use of state and federal grants as well as co-funding; ratepayer energy efficiency programs for multifamily properties; low or no interest loans from utilities and other state-run organizations; and on-bill financed programs. Rebates and assistance programs are widely available particularly for affordable multifamily housing units; however, these are competitive.

To undertake BE-5.13 and 5.14, a coordinated approach with multi-unit properties and property owners in the City will be needed. Before implementation, the City should consider an electrification readiness of multi-unit properties in the City through BE-5.2.²⁶ The City may use existing rate studies from Southern California Edison and SBCE to understand current rates and other associated electrical costs today. Funding and financing strategies will be based on these studies. Additional example funding and financing case studies follow below.

Cost-sharing Among Distributed Energy Resource Customers in Minnesota

Minnesota is the first state to adopt an approach to interconnection upgrades that spreads costs among certain distributed energy resource (DER) customers, rather than asking all utility ratepayers or individual DER customers to foot the bill. The local utility provider is [Xcel Energy](#), a major utility that serves approximately 3.7 million electricity customers across parts of the Midwest and Western states.

Under the [cost-sharing program](#), all Xcel Energy customers applying to interconnect a project up to 40 kilowatts will be asked to pay a cost-share fee of \$200, which will then make them eligible to have grid upgrade costs covered, up to a cap of \$15,000 per project.

The program also includes two key equity considerations. First, the program will exempt under-resourced or “low-income” customers qualifying for Xcel’s income qualified Solar Rewards program from paying the cost share fee. Additionally, Xcel is required to create a waitlist for customers participating in the program—ensuring that, even in the case of temporary insufficient funding, all customers who pay the cost share fee will be able to have up to \$15,000 of upgrades covered by the fund.

Bay Regional Energy Network (BayREN)²⁷ Bay Area Multifamily Building Enhancements (BAMBE)

Agency/Implementer: Regional Association | Program Type: Rebate | Beneficiary: Property Owners

BayREN assists eligible multifamily properties²⁸ and their owners seeking to replace old equipment and upgrade building’s energy and water efficiency. BayREN provides technical assistance and cash rebates for qualifying upgrades including gas-to-electric conversions. The rebate program includes a base rebate—\$500 per apartment unit—for the installation of two or more energy efficiency upgrades that save 10% or more of a property’s energy use.

Additional rebates for in-unit electrification upgrades, such as electric laundry dryers or electric cooking range from \$250 to \$1,500 per apartment unit. The rebates for system upgrades such as those for central systems, common areas, and electrical panels vary by equipment, by the number of apartments served or by property.

Properties located in high-priority zones—areas most affected by air pollution, extreme heat, and high housing costs—qualify for additional rebates. In these zones, upgrades that mitigate extreme heat and improve indoor air quality may earn \$500 per apartment served. Properties that are

²⁶ The completion of an existing building electrification feasibility analysis in collaboration with UC Santa Barbara and other research institutions by 2025.

²⁷ A regional organization managed by the Association of Bay Area Governments. BayREN is funded by California utility ratepayers under the California Public Utilities Commission (CPUC) and the public purpose surcharge, as well as through grants and funding from member agencies, other state and federal agencies, and foundations.

²⁸ Eligible properties must meet target criteria, see page 8 of the BayREN Annual Report 2022. Any other properties that do not meet at least one of the target criteria are put on a waitlist or admitted into the queue periodically given availability.

affordable (properties built before 2010 with less than 50 units or deed-restricted affordable properties) seeking any upgrades earn 1.5x to 2x more above all other program rebates.²⁹

California Energy Design Assistance Program (CEDA; run by Willdan)

Agency/Implementer: Third-party Program Administrator; Utility Provider | Program Type: Technical Services, Rebate | Beneficiary: Property Owners

SCE commissioned the California Energy Design Assistance (CEDA) program as part of the California Public Utilities Commission's Energy Efficiency program. The program provides complimentary custom energy modeling to analyze energy efficiency options and potential energy savings from common areas and in-unit upgrades or building controls and energy recovery systems in new construction and major alteration multifamily projects. A property's incentive is provided and based on estimated energy savings across the building's lifetime and paid after installation and savings are verified. Incentives are capped at \$1 million per project and lesser of 100% incremental measure cost or 50% full measure cost.³⁰

Bay Area Air Quality Management District (BAAQMD) Climate Tech Finance

Agency/Implementer: Local Air District; Bank | Program Type: Loans | Beneficiary: Local Governments; Small Businesses

Climate Tech Finance, through the California Infrastructure and Economic Development Bank (iBank), offers government-back loan guarantees to municipalities, universities, schools, hospitals, as well as small businesses and eligible nonprofits or public-private partnerships within the BAAQMD jurisdiction for climate tech financing. Direct loans are available to public-sector facilities. Loan guarantees of up to \$5 million are offered on loans of up to \$20 million, with up to a seven-year term. iBank provides loans for public entities ranging from \$500,000 to \$30 million, with up to 30-year terms. Interest rates vary and are based on public entities' ratings. Eligible projects include any that has direct greenhouse gas reductions, such as electrification, on-site or indirect reductions.

Southern California Edison (SCE) On-Bill Financing (OBF) Program for Non-Residential Customers

Agency/Implementer: Utility Provider | Program Type: OBF, No/Low Interest Loan | Beneficiary: Utility Customers

Eligible³¹ SCE non-residential customers may participate in on-bill financing (OBF) for qualifying energy efficiency projects. OBF through the SCE includes no interest, no fees or loan costs, and repayment through the SCE utility bill. Loans are at a minimum of \$5,000 and a maximum of \$250,000 for projects by multifamily customers with loan terms of up to 10 years. Loans may be bundled or consolidated but all loans are capped at a maximum of \$4,000,000 per service account, though exceptions apply on a case-by-case basis.

²⁹ More details on additional rebates by in-unit or system upgrades and geographic locations are found at [BayREN.org/multifamily-property-owners/building-improvements](https://www.bayren.org/multifamily-property-owners/building-improvements).

³⁰ CEDA Factsheet

³¹ Eligible SCE customers are those who participate in the capital projects under the Strategic Energy Management Program or those who participate in statewide Energy Efficiency program such as CEDA for multifamily and are in good credit standing.

US Department of Health and Human Services, Low Income Home Energy Assistance Program (LIHEAP)

Agency/Implementer: Federal; State Government | Program Type: Funding Assistance | Beneficiary: Local Governments; Residents

The State of California received \$179 million in LIHEAP funding in 2022 to assist households with low income, particularly those with the lowest incomes that pay a high proportion of household income for home energy. The resulting programs implemented by municipalities within the state can support the City in providing free energy efficiency upgrades to low-income households, including those in low-income multifamily housing, to lower their monthly utility bills while also improving the health and safety of the household's occupants. Eligibility is based on income requirements. Funds for the state in 2023 are not yet available at the time of this writing.

Retrofit Electrification Pilot in New York City

Building owners receiving Housing Preservation and Development (HPD) financing for rehabilitations of multifamily buildings up to seven stories that are interested in electrification of hot water heating and/or space heating and cooking may be eligible for funding and technical support through the [HPD-New York State Research and Development Authority \(NYSERDA\) Electrification Retrofit Pilot](#). Projects must meet the criteria to be considered. Funding will cover incremental costs for electrification and will be granted on a first-come, first-served basis. Funding may be capped on a per-project basis and will be limited to \$1 million per project.

Measure/Action 2: Time of Renovation/Sale Electrification Requirements

This measure and action involves two actions associated with time of renovation and time of sale electrification policies under the City's Measure BE-5: BE-5.5 and BE-5.6.

BE-5: Reduce Existing Residential Natural Gas Consumption by 10% Below 2019 Levels by 2030 and 17% by 2035

BE-5.5: Adopt a time of renovation energy efficiency and electrification requirement by 2025. This ordinance could require replacement of HVAC systems, hot water heaters, and other appliances to be all electric and low hydrofluorocarbons (HFC) gas emitters or provide a checklist of cost-effective efficiency and electrification options for renovations to complete based on the scope of the project.

BE-5.6: Provide a rebate at time of sale for qualifying building electrification upgrades including panels, wiring, and heat pump appliances. Implement the rebate program by 2025.

Benefits and Cost Considerations

Benefits

The adoption of a time of renovation and time of sale electrification requirements will benefit both the community and the City in several ways. Overall, building energy efficiency measures can benefit the broader society by reducing GHG emissions and help meet carbon reduction goals. Increasing energy efficiency helps lower utility bills for residents and can increase comfort levels during high summers and cold winter months. This can lead to a better quality of life for residents and higher resident retention rates.³² Utility programs are incentivized to encourage customers to upgrade their systems since electrification alternatives to on-site fossil-fueled heating can be as much as three times more energy efficient.³³

The addition of adopting these requirements at the time of renovation and time of sale will further accelerate electrification especially in the case of multifamily buildings. To support, the federal government has dedicated \$4.5 billion towards the Home Electrification and Appliances Rebates to advance a high-efficiency electric home rebate program.³⁴ These types of programs help households reduce energy bills and allows for easier access to residential energy improvements. Due to the demand, these programs also attract qualified workforces to serve both single and multifamily markets and increase market demand for residential efficiency and electrification.³⁵

Benefits to Community

Time of renovation and time of sale requirements will incentivize property owners to focus on electrification through a rebate. These energy efficiency adjustments can produce benefits for both building owners and occupants, such as lower energy costs and improved comfort, increase

32 Standard Rebates for Multifamily Properties | Austin Energy

33 Renovating Regulation to Electrify Buildings | Shipley, Hopkins, Takahashi, Farnsworth, 2021 <https://www.raonline.org/wp-content/uploads/2021/01/rap-shipley-hopkins-takahashi-farnsworth-renovating-regulation-electrify-buildings-2021-january.pdf>

34 Home Electrification and Appliance Rebates | Department of Energy

35 IRA Home Energy Rebate Program Informational Webinar

property values, reduce work orders, and decrease maintenance costs for properties.³⁶ For example a Rocky Mountain Institute 2018 Report ‘The Economics of Existing Buildings’ shows a lower 15-year net present cost for Oakland homes with a retrofit using a flexible heat pump in any electrical rate scenario (\$20.8-22.9) instead of a natural gas with new air conditioning scenario (\$24.2).³⁷

Benefits to City

As stated above, the major benefit to the City of electrification is meeting the aggressive GHG reduction goals adopted in the CAP. Across the City of Santa Barbara, single-family properties use a total of 8,105,606 therms of natural gas every year. Similar to the multifamily GHG and marginal cost description described above, the gas appliances that will ultimately need to be replaced with electric technologies to effectively electrify buildings will function anywhere from 10-22 years. When all single-family housing units in Santa Barbara are accounted for, the appliance units used for a single-family household are collectively expected to emit 871,756 MT CO₂e across their functional lifespan. At the single-family household level, each household can reduce 40 MT CO₂e GHG through whole home electrification by electrifying gas appliances as they fail.

As the appliances being replaced are the same as for multifamily properties, the total cost of whole-home appliance replacement is projected to be \$17,200 before incentives. This cost is the marginal cost (electric-gas replacement) without factoring any incentives for electrification, so can be considered a conservative cost estimate to electrify. When broken out by appliance type, this means that the building owner would be paying \$256-\$556 for each MT of CO₂e when they electrify before any incentives, as displayed below in Table 2.

Table 2: Single-family Building Electrification (GHG Savings & Marginal Cost)

Household Appliance Type	Water heating	Spacing heating/cooling	Cooking	Other	TOTAL (Whole-Home- as applicable)
Appliance Lifespan (Years)	13	22	12	10	
Total annual natural gas use (therms/ lifespan of appliance)	1,886	3,201	412	535	6,034
Appliance Lifespan GHG Emissions (MT/CO₂e/Source/Unit)	12	21	3	4	40
Electric Replacement Cost	\$ 6,000	\$ 17,900	\$ 2,400	\$ 2,000	\$ 28,300
Gas Replacement Cost	\$ 2,800	\$ 6,100	\$ 1,200	\$ 1,000	\$ 11,100
Marginal Cost	\$ 3,200	\$ 11,800	\$ 1,200	\$ 1,000	\$ 17,200
Marginal Cost/Lifespan MT CO₂e	\$ 256	\$ 557	\$ 440	\$ 283	\$ 431

³⁶ Renovating Regulation to Electrify Buildings | Shipley, Hopkins, Takahashi, Farnsworth, 2021

³⁷ Rocky Mountain Institute, the Economics of Electrifying Existing Buildings, 2018 [The Economics of Electrifying Buildings - RMI](#)

These electrification measures could also offer economic and workforce development opportunities. A UCLA Luskin Center for Innovation 2019 Report analysis revealed that electrification of building stock across the state would create over 100,000 full time equivalent jobs, even after accounting for job losses in the fossil fuel industry. This new demand for skilled workers is expected to grow in sectors including construction jobs for energy-efficient improvements, building upgrades and modifications, and electric equipment installation. Planning for this workforce transition will be critical to ensure a just transition, as an estimated 55% of gas workers are expected to reach retirement age over the next 25 years. This growth in electrification-related jobs could be a major opportunity for job growth in the City, as well as an opportunity to aid a just transition of fossil-fuel workers to clean-energy jobs³⁸

Costs

Time of renovation and time of sales requirements encourage the electrification of buildings. However, there are several challenges that the community and City could face in doing so. Upfront costs pose a challenge and can be a financial burden for building owners, especially for owners with limited budgets or resources. The time at which electrification takes place is very important for determining costs. As shown in Figure 4, the total upfront cost to electrify a single-family building is approximately \$32,000 and assumes a shift from natural gas to electric for the stove, HVAC, dryer, and water heater, as well as a panel upgrade and new wiring for 220v appliances. However, the marginal cost of upgrading (compared to replacing it with another natural gas appliance) is only \$13,400 before rebates. By stacking rebates, the marginal cost could potentially be lower to electrify than to replace with gas.

Costs to Community

Single family residential electrification costs are becoming more readily understood. Figure 4 summarizes average installation costs in San Mateo County. While these costs are likely similar in Santa Barbara, some cost variables can significantly change the costs for a particular building or region. The major cost variables include:

- Need for a panel upgrade (as shown in the figure panel upgrades can add nearly \$4,000)
- Existing or desired air conditioning (a single heat pump provides both heating and cooling, saving money compared to a separate furnace and AC unit installation)
- Labor costs in the region (higher labor costs increase installation costs)
- Existing electrical infrastructure (knob and tube is a safety hazard and difficult to work with)
- Space constraints (heat pumps are larger)

Consistent with the major cost variables described above, Figure 4 below includes specific rows for air conditioning because the installation of a heat pump HVAC functions as both an air conditioning and space heating unit, displacing the need for two separate appliances. This means that the entire cost of an air conditioner (\$7,500) is functionally displaced by one appliance: a heat pump HVAC, leading to cost savings equivalent to the cost of a new air conditioner. The City is expected to experience future effects of extreme heat, like the heat advisory experienced throughout the region in August of 2023. In response, more City of Santa Barbara residents are expected to install AC to adapt to these changing temperature conditions.³⁹

³⁸ California Building Decarbonization: Workforce Needs and Recommendations, Nov 2019, UCLA Luskin Center for Innovation
³⁹ County of Santa Barbara, Heat Expected in Santa Barbara County, August 2023

Similarly, the need for an electric panel upgrade, triggered by a greater electrical load through new electric appliances is a critical cost variable to consider, as it is estimated to cost \$3,700 upfront. The addition of an electric panel upgrade depends on the existing panel size of the house, which is closely correlated to building vintage (age). An analysis by Redwood Energy estimates that housing with a 100-amp panel can accommodate whole-home electrification, if there is incorporation of a “watt diet” strategy. Watt diets allow for maximization of the existing panel, avoiding the cost of a panel upgrade through selection of highly efficient appliances, and if necessary, prioritized circuit sharing devices.⁴⁰

Accordingly, the last four rows of Figure 4 describe different scenarios for electric, gas, and marginal cost replacement when factoring potential cost savings from avoided AC installation, or cost increases from electrical panel upgrades.

Figure 4 Residential Electric and Gas Replacement Upfront Appliance Installation Costs*

Residential Appliance	Electric Replacement Cost	Gas Replacement Cost	Marginal Cost
Gas HVAC to Heat Pump HVAC	\$17,900	\$6,100	\$11,800
Gas water heater to Heat Pump water heater	\$6,000	\$2,800	\$3,200
Air Conditioning (Gas case only)	Included with heat pump	\$7,500	(\$7,500)
Gas stove to electric stove	\$2,400	\$1,200	\$1,200
Gas dryer to electric dryer	\$2,000	\$1,000	\$1,000
Electric Panel Upgrade	\$3,700	N/A	\$3,700
Total with AC + Panel	\$32,000	\$18,600	\$13,400
Total Without AC + Panel	N/A	\$11,100	\$20,900
Total with AC no Panel	\$28,300	N/A	\$9,700
Total without AC no Panel	N/A	N/A	\$17,200

*Based on 2023 appliance costs and labor costs for the San Francisco Bay Area

A slow payback rate of lower energy bills may make it difficult for some households to justify a higher upfront cost for electrification, especially those without extra cash on hand.⁴¹ For multifamily residential homes, rebates to a building owner who does not pay the utility bill may

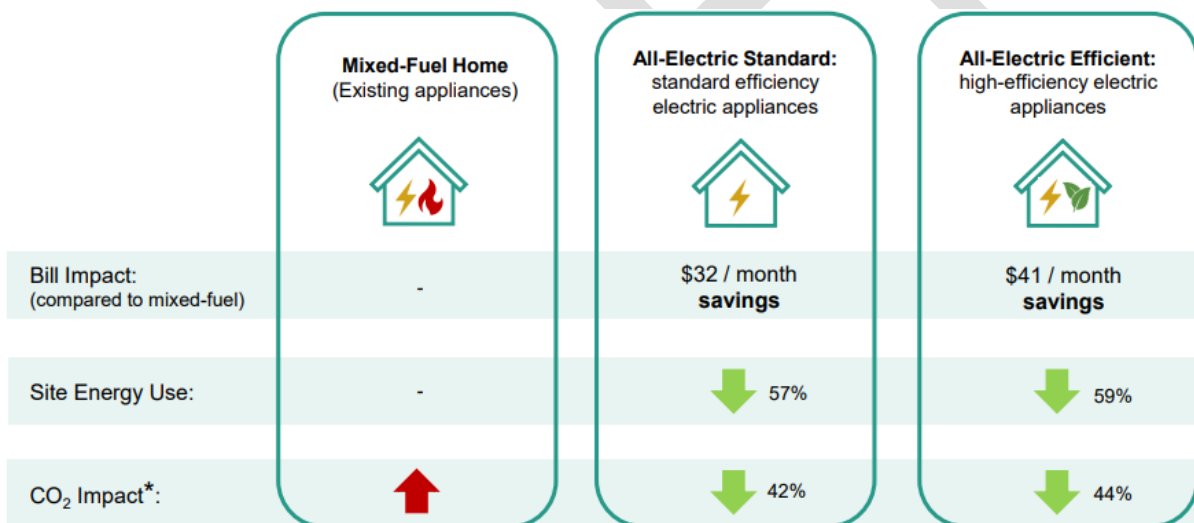
⁴⁰ Redwood Energy, Watt Diet Calculator.

⁴¹ To Decarbonize Households, America Needs Incentives for Electric Appliances | American Progress, 2021

not be a strong enough incentive. Similarly, a resident living in an older apartment building may not want to invest in a home they do not own. Actions BE-5.5 and BE-5.6 will need additional public outreach and education for both property owners and residents. Any incentive program that the City may develop should be coupled with extensive and targeted outreach efforts to reach property owners and residents that may not have the resources for a full-electrification transition.

While on-bill costs could not be calculated specifically for Santa Barbara in this report (due to the complexity of time of use rates, variability of gas rates over time, and other factors) studies in other locations have shown that electrification of single-family buildings can be cost effective within the correct rate structure. For example, a recent analysis conducted by Peninsula Clean Energy and Silicon Valley Clean Energy showed that after electrification an average single-family home which stayed on basic electricity rates saw an on-bill increase of approximately \$300 per year. However, if the all-electric rate was used (which has electrification friendly time of use rates) the same home would save about \$200 per year or \$32 per month as shown in Figure 5.⁴² These savings may or may not represent conditions in Santa Barbara due to differences in rate structure and climate zone. However, a significant departure from these results (a small increase or small decrease in energy bills) is not likely.

Figure 5 On-bill savings after electrification on the E-Elec Rate (PCE/SVCE Single Family On-Bill Impacts Results)



*Based on 0.720 lbs CO₂e/kWh per SVCE 2022 GreenStart Power Content Label and 13.446 lbs CO₂e/therm per PG&E.

Costs to City

The City may face similar high upfront cost issues as having to support the payment of incremental costs for electrification. Although some larger cities like New York City fund programs that will support residents and building owners in their transition, not many other cities have as ample services. The City would need to work with the local utility companies to determine upgrades that may be needed to support additional energy use. Collaboration would include planning, coordination, permitting approvals, infrastructure investment, and oversight with utility companies.⁴³

⁴² [SVCE-PCE-Single-Family-On-Bill-Impacts-Results-2023.pdf \(svcleanenergy.org\)](#)

⁴³ Building the Electricity Grid of the Future | Governor Gavin Newsom, 2023

Current Rebates and Incentives

Figure 6 provides some examples of single-family residential rebates available for heat pump hot water heaters (HPWH), heat pump HVAC, panel upgrades, and whole-home electrification credits. Rebates are currently available from 3C-REN, TECH Clean California, and the Inflation Reduction Act. Many of these incentives can “stack”, meaning a single project can take advantage of multiple incentive streams.

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Figure 6 Single-Family Electrification Rebates For Santa Barbara

Single-Family Electrification Rebates			
Appliance	Funder	Incentive Amount	Source
Heat Pump Water Heater (HPWH)	3C-REN: Low-range	\$2,420	https://www.3c-ren.org/for-residents#!directory:https://incentives.switchison.org/rebate-profile/3c-ren-500-750-heat-pump-water-heater-multifamily-building-project-s?view=residents&origin=directory
	3C-REN: High-Range	\$8,450	https://www.3c-ren.org/for-residents#!directory:https://incentives.switchison.org/rebate-profile/3c-ren-500-750-heat-pump-water-heater-multifamily-building-project-s?view=residents&origin=directory
	IRA*	\$2,000	CityofSanMateo_CostData_Clean_V2.xlsx; backed up by : https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
Total incentives for HPWH - Low; Range:		\$4,420	
Total Incentives for HPWH- High-Range:		\$10,450	
Heat Pump HVAC	TECH	\$1,000	CityofSanMateo_CostData_Clean_V2.xlsx; backed up by : https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
	3C-REN low-end	\$3,896	https://incentives.switchison.org/rebate-profile/3c-ren-single-family-hvac-heat-pump?view=residents&origin=directory
	3C-REN high-end	\$14,535	https://incentives.switchison.org/rebate-profile/3c-ren-single-family-hvac-heat-pump?view=residents&origin=directory
	IRA*	\$2,000	CityofSanMateo_CostData_Clean_V2.xlsx; backed up by : https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
Total incentives for HP HVAC -low-end		\$6,896	
Total incentives for HP HVAC -high-end		\$17,535	
Panel Rebates	IRA*	\$600	CityofSanMateo_CostData_Clean_V2.xlsx; backed up by : https://incentives.switchison.org/residents/incentives?field_zipcode=93101&field_zipcodes1=93101&field_functional_category=All&f%5B0%5D=incentive_type%3A2794
Total incentives for Panel		\$600	

Single-Family Electrification Rebates			
Appliance	Funder	Incentive Amount	Source
Whole-Home Electrification Credit (All-Systems)	CA Energy Smart Homes	\$5,500	https://incentives.switchison.org/rebate-profile/energy-smart-homes-whole-house-rebate-single-family?view=residents&origin=directory
<i>Total Available for Whole-Home Electrification (No Panel Electrification- Low Range)</i>		\$17,416	
<i>Total Available for Whole-Home Electrification (No Panel Electrification- High Range)</i>		\$34,085	
<i>Total Available for Whole-Home Electrification (+ Panel Upgrade); low-range</i>		\$16,816	
<i>Total Available for Whole-Home Electrification (+ Panel Upgrade); high-range</i>		\$33,485	

**Note that IRA; 3C-REN rebates may vary in timing and applicability of availability of funding. Costs displayed in this memo reflect incentives and rebates available in fall of 2023.*

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Additional Funding and Financing Strategies

In addition to the incentives listed above, some cities have begun developing additional incentives and programs to support adoption of electric appliances. Property-based pilot programs or incentives for individual appliances educate property owners on the benefits and drawbacks of electrification before major alterations or property sales occur.

Some of the residential electrification funding and financing strategies referenced in BE-5.13 and 5.14 may also apply to BE-5.5 and 5.6, and vice versa.

Rebates for Electrifying Gas Appliances in the City of Berkeley, CA

Agency/Implementer: Local Government | Program Type: Rebates | Beneficiary: Homeowners

The City of Berkeley adopted an ordinance in 2019 requiring new buildings and major renovations must be equipped with fully electric home appliances. The Berkeley legislation allowed residents with existing gas-powered appliances to keep them and helped connect those who wanted to make the switch of their own accord with rebates and resources to ease the process.⁴⁴ To reach lower-income residents, the City Council approved \$600,000 out of the City's general fund's discretionary budget in 2022 to establish a Climate Equity Fund Pilot Program, which consists of several sustainability programs.⁴⁵ Within that fund \$100,000 is to cover necessary City staff hours. Additionally, \$250,000 is set aside for three contracts not to exceed \$83,334 each with the Association for Energy Affordability, BlocPower, and Northern California Land Trust to run programs that identify and support low-income Berkeley residents in electrifying their homes and businesses.^{46,47}

Property-Assessed Clean Energy (PACE) Financing

Agency/Implementer: Local Governments | Program Type: Assessment Districts | Beneficiary: Property Owners; Taxpayers

Property Assessed Clean Energy (PACE) is a financing mechanism that enables low-cost, long-term funding for energy efficiency, renewable energy, and water conservation projects. PACE financing is repaid as an assessment on the property's regular tax bill and is processed the same way as other local public benefit assessments (sidewalks, sewers) have been for decades. Depending on local legislation, PACE can be used for commercial, non-profit, and residential properties. It is currently available for residents in the City of Santa Barbara.^{48,49}

Block-level Residential Retrofits in Oakland's EcoDistrict

Agency/Implementer: Local Governments | Program Type: Assessment Districts; Neighborhood Trusts | Beneficiary: Property owners; Taxpayers

⁴⁴ Berkeley first city in California to ban natural gas in new buildings

⁴⁵ City of Berkeley Adopted Budget FY 2023 & 2024

⁴⁶ City of Berkeley Council Report April 26, 2022

⁴⁷ Berkeley Climate Equity Action Fund

⁴⁸ PACE FAQ

⁴⁹ Strategic Energy Plan for the County of Santa Barbara

Lowering GHG emissions at the community wide level is often left in the hands of individuals, which has been a major contributing factor to the relatively slow pace of the adoption of climate-friendly measures. EcoBlock aims to develop a framework under which the process of retrofitting residential blocks to be more sustainable and resilient is more cost effective, equitable, and efficient. In partnership with the City of Oakland, EcoBlock is developing a prototype of an energy efficient and resilient city block in lower-income neighborhoods in the city where residents are historically less empowered to make energy and water efficient upgrades to their homes. This pilot program combines sustainability actions like solar panels and energy efficient appliances with infrastructure like electric vehicle (EV) chargers, bike sharing systems, and street trees and aims to have six fully complete eco-districts by 2030.⁵⁰

Approaches like EcoBlock are a great example of what can be accomplished when sustainability measures are leveraged with economies of scale, which can be accomplished and funded through established mechanisms like assessment districts and neighborhood level trusts. Assessment Districts are funded by a charge paid by property owners within the district to fund projects or services that provide direct benefits to properties in that district. A neighborhood trust is a nonprofit community-based fund that manages capital, operations, and maintenance related to energy efficiency projects. Funds for the trust are raised by the same community members that receive the benefits. Both approaches function in a similar way and are an effective way to leverage unique community priorities, expand access to potential grants, and save on implementation costs that are spread across an entire neighborhood rather than individuals.

As of October 2023, the initial goal of capping the neighborhood's gas line was delayed by the opposition of ten of the 25-neighbors residing on the Fruitvale EcoBlock project site. However, voluntary home electrification, community EV car-sharing and curbside charging, and fast-tracked rooftop solar plus battery storage for the neighborhood has been a success, with construction being six months away from implementation by PG&E. There have also been a couple of pandemic-related supply chain shortages that slowed construction, and the initial vision for a microgrid was scaled back due to inflation. However, residents note that a major success of the program is relatively wide-spread support among the neighborhood for the program, which has been integral to the success so far.^{51, 52}

Golden State Rebates

Agency/Implementer: CleaResult under contract by Investor Owned Utilities (SCE, PG&E SDG&E, SoCalGAS) | Program Type: Rebates | Beneficiary: Homeowners, Renters within Utility Service Territories

Funded by ratepayers, the program offers instant rebates through coupons for measures that increase the energy efficiency of single-family homes including replacement of gas heating or cooling pumps into electric. Coupons are provided to eligible buyers (SCE customers) who can then apply the coupons to their purchases at participating retailers.⁵³

⁵⁰ EcoBlock, University of California Berkeley

⁵¹ Electric Avenue: One Oakland Block's Improbably Journey to Ditch Gas; Oct 30| KQED

⁵² Oakland Fund for Innovation, Ecoblock

⁵³ Golden State Rebates

State of California GoGreen Home Energy Financing

Agency/Implementer: State Agencies | Program Type: Loans | Beneficiary: Homeowners; Renters within Utility Service Territories

The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) partners with California Public Utilities Commission (CPUC) and California Hub for Energy Efficiency Financing (CHEEF) provide financing for eligible residential electrification and efficiency renovations. Eligible properties are those that receive service from SCE and include both single-family and multifamily housing (making this loan applicable for BE-5.13 and 5.14). Eligible projects include upgrades to ENERGY STAR accredited electric appliances.⁵⁴ Interest rates are reduced in exchange to energy efficiency benefits and is capped using 10-year Treasury bonds plus 750 basis points. Maximum loan terms per unit is \$50,000 for up to four units with a minimum of \$2,500 (though this varies). GoGreen Home Energy Financing is available for affordable⁵⁵ multifamily properties with five or more properties and businesses.

U.S. Department of Energy Clean Energy Tax Credits for Consumers

Agency/Implementer: Federal Government | Program Type: Tax Credits | Beneficiary: Taxpayers

The federal Inflation Reduction Act allocated \$4.5 billion to tax credit programs for appliance electrification and other energy savings. The program is available to taxpayers—both homeowners and renters—from 2023 to 2032. Credit amounts are typically 30% of equipment costs with a cap depending on equipment type or energy efficiency upgrades including credits for home energy audits.⁵⁶

U.S. Department of Energy Home Energy Rebate Program

Agency/Implementer: Federal and State Governments | Program Type: Rebates | Beneficiary: Homeowners; Renters

As part of the Inflation Reduction Act, the US DOE allocated \$582 million to the state of California to develop programs and accelerate deployment of clean energy technology. Half of the allocation is dedicated to help states develop home energy performance-based, whole-house rebates, called the Homeowner Managing Energy Savings (HOMES) rebate program. This grants rebates for retrofits ranging \$2,000 (reduces energy use by 20% or more) to \$4,000 (reduces energy use by 35% or more) per individual households and up to \$400,000 per multifamily buildings in the states. Rebates are increased if applied at retrofits for low- and moderate-income homes.

The other half of the allocated funds to the state is dedicated to high efficiency electric home rebates. This includes point-of-sale rebates administered by states (see coupon referenced above). Total amount of rebate is adjusted based on the consumer's area median income. Caps for certain equipment apply.^{57,58}

⁵⁴ Detailed list of eligible energy efficiency measures for GoGreen are found here.

⁵⁵ At least 50% of the unites are income-restricted.

⁵⁶ Clean Energy Tax Credits for Consumers | Department of Energy

⁵⁷ HOME and High Efficiency Electric Home Rebate

⁵⁸ Inflation Reduction Act Residential Energy Rebate Programs in California | California Energy Commission

Measure/Action 3: Benchmarking and Incentives for Building Performance Standards

This measure and associated actions involve the creation of building performance standards (BPS) for commercial buildings over 20,000 square feet with residential components of mixed-use development exempted beyond state building energy code requirements for commercial construction:⁵⁹

BE-6: Reduce Commercial Natural Gas Consumption 10% Below 2019 Levels by 2030 and 18% by 2035

BE-6.2: Develop and implement a commercial and mixed-use building benchmarking program for commercial buildings over 20,000 square feet in advance of state building performance standards. The program would include reporting electricity and natural gas usage data through the ENERGY STAR portfolio manager. Establish monetary penalties for non-compliance. Residential portions of buildings that are part of a mixed-use development would be exempt. Create incentives for buildings not covered to encourage voluntary compliance.

This action is largely based on the California Energy Commission which created a statewide benchmarking program mandated by Assembly Bill 802 (AB 802), which establishes a statewide program for benchmarking and publicly disclosing building energy use for commercial, multifamily, and mixed-use buildings 50,000 square feet or larger.⁶⁰

Typically, local governments develop building performance standards (BPS) to require energy and water efficiency, electrification, and GHG emission reduction compliance amongst larger buildings including commercial developments. While BPS hold contractors and developers up to high standards, enforcement is currently difficult given the variability of commercial buildings and the complexity of commercial building systems. A building benchmarking program will allow the City and

Implementing a Building Efficiency Program at Brisbane, California

The [Brisbane Building Efficiency Program \(BBEP\)](#) addresses energy and water use in existing buildings, making them more efficient, thereby saving owners money, improving the safety and comfort of building stock, and reducing emissions that are driving climate change. The City of Brisbane created a [map-based, interactive dashboard](#) that shows compliance status and results. At a later stage of the program, buildings at the City of Brisbane will need to show that they are high-performing or take steps to improve. Requirements advance state goals and will include buildings that are (1) privately owned and is 10,000 square feet or more OR (2) owned by a local agency of the State that is required to comply with the City's building ordinances pursuant to California State Government Code Section 53090, et seq., or successor legislation, and is 10,000 square feet or more OR (3) Owned by the City of Brisbane and is 2,000 square feet or more.

property owners to gather more data on commercial buildings over time, perform cost saving retro-

⁵⁹ Among other requirements, the 2022 California Building Energy Code requires new commercial construction over 5,000 square feet to install PV and storage to meet 60% of the building's energy load and reduce exports to 10%.

⁶⁰ State Assembly Bill 802

commissioning, and ultimately plan for the most cost effective decarbonization strategy and its enforcement.

Benefits and Cost Considerations

Benefits

When energy benchmarking is done correctly and is followed up with action (e.g. energy efficiency and subsequent electrification retrofits), a building will end up with lower energy costs, lower maintenance costs, and better lighting and comfort. In a case study of 11 deep energy retrofits by the New Buildings Institute, buildings were estimated to see annual cost savings ranging from \$8,000 to an annual payback period of 4-6 years.

The Aventine, a medium-sized office building located in La Jolla was profiled in a case study analyzing existing building benchmarking and retrofits. The building is LEED-EB Platinum, with a 75% better than baseline rating, and an Energy Star Score of 100. As part of the retrofit, the design team upgraded the building's HVAC to a high-efficiency all-variable-speed chiller plant, added controls for HVAC, and

Creating Partnerships for Comprehensive Building Performance Standards

As BPS is still a relatively new strategy, knowledge sharing is critical to achieve success. This is the motivation behind the [White House's Building Performance Standards Coalition](#), a partnership of state and local governments with an interest in developing comprehensive nationwide energy efficient building standards alongside the US Department of Energy. Together, the member organizations have nearly 20% of the nation's building square footage in their jurisdictions, so the group has the potential to influence the pursuit of more sustainable building codes.

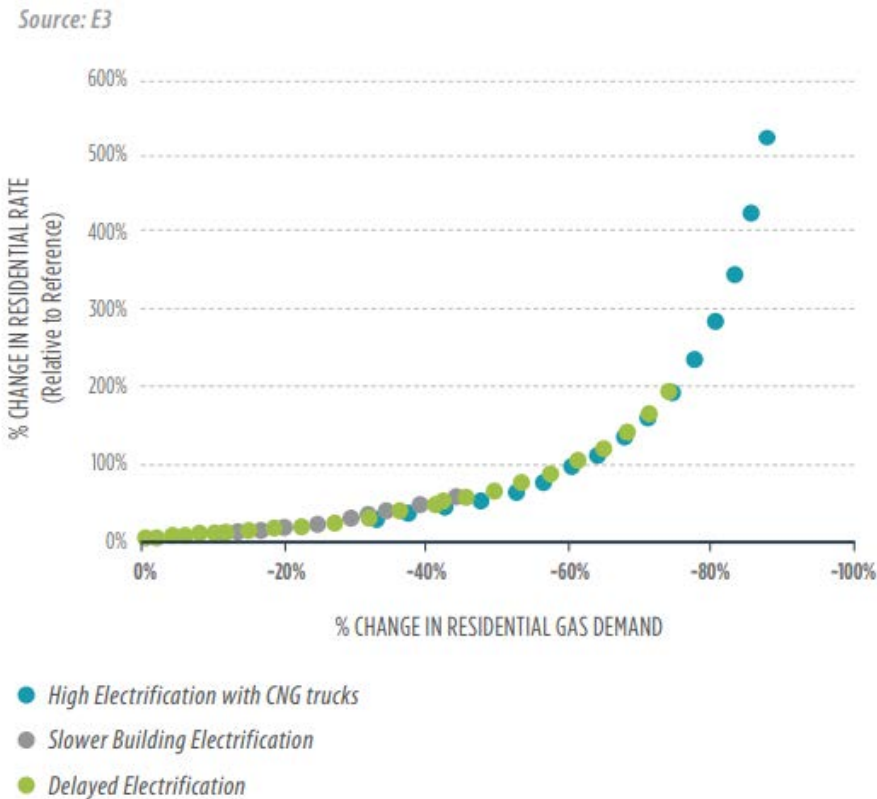
lighting retrofits to CFLs with sensors. Following this retrofit, energy use dropped by 63%. In total, the cost of the retrofits at the Aventine retrofits was \$801,540 before rebates (approx. \$3.02/sf). The project received \$175,000 in utility incentives for central plant upgrades and lighting retrofits resulting in a projected payback period of 2-4 years. The project reduced electricity use by over 2 million kWhs of in year one. First-year energy and operating expenses fell by \$116,000 and the building saw a 600,000 MT CO₂e reduction in carbon emissions.⁶¹

Though the initial switch from gas to all-electric technologies may cost more today due to comparatively low costs for gas, analysis of long-term gas rate costs project that there will be multi-fold increase in gas rates by 2045. As more households and governments make the switch from gas to carbon-free electricity to achieve carbon neutrality goals, the prices to maintain the same network of natural gas pipelines is projected to increase as a lower amount of natural gas flows through the same infrastructure to a shrinking customer base. The remaining natural gas customer base will then bear the burden of rising natural gas costs. In fact, the analysis states that if the transition from the natural gas system is not managed, remaining customers on natural gas could experience costs of \$19/therm of gas by 2050 (in comparison to \$3/ therm in 2018). This future trend is shown below in Figure 6.⁶²

61 A Case for Deep Savings: 11 Case Studies of Deep Energy Retrofits, September 2011 | New Buildings Institute

62 California's Gas System in Transition: Equitable, Affordable, Decarbonized, and Smaller, 2019 | Gridworks

Figure 7: Impacts of Decline in Gas Demand on Future Gas Rates



Source: Gridworks, *California's Gas System in Transition* (2019)

From many perspectives—the state and local government as well as property owners, facility operators, manager, and designers—benchmarking facilitates energy accounting, comparing a facility’s energy use to similar facilities to assess opportunities for improvement, and quantifying/verifying energy savings. Commercial building energy performance benchmarking is a foundational element of a property owner’s or organization’s energy management strategy—management of energy requires measurements.⁶³

According to the US EPA, the public disclosure of energy efficiency ratings has influence over people’s behavior in their energy consumption. A benchmarking tool—like the free Portfolio Manager by ENERGY STAR⁶⁴—is a way to evaluate these efficiencies.

Benefits to Community

Energy assessments and benchmarking can help building managers or owners in several ways including:

- 1) receiving expert advice on energy performance and energy-saving recommendations,
- 2) understanding energy performance over time compared to other buildings,
- 3) uncovering hidden problems that may be making the building less efficient,

⁶³ Building Energy Use Benchmarking | Department of Energy

⁶⁴ Benchmark Your Building Using ENERGY STAR® Portfolio Manager® | ENERGY STAR

- 4) identifying potential health and safety concerns,
- 5) futureproofing the building ahead of municipal or statewide benchmarking and disclosure requirements.⁶⁵

By reducing a building's energy use the owners can lower their energy bill, reduce greenhouse gas emissions, improve air quality, and gain recognition for being energy efficient.⁶⁶ Resilient and efficient buildings are essential to grappling with inconsistent and increasingly expensive energy supplies in the region. Building benchmarking and performance standards allow for a greater level of flexibility for building owners compared to a more prescriptive approach. This allow building owners to identify the most cost effective and beneficial actions for their individual buildings.

Benefits to City

Energy assessments and benchmarking can help futureproof the building ahead of municipal or statewide benchmarking and disclosure requirements.⁶⁷ Benefits of benchmarking of building energy include actionable information to market actors, identification of investment opportunities, a proven strategy for energy savings, enhanced real estate values, and stimulation of the local economy through the creation of building construction and energy service jobs.⁶⁸

Chula Vista's Benchmarking Map Tool

In 2021, as part of its CAP, the City of Chula Vista adopted their Building Energy Saving Ordinance. It stipulates that multifamily, commercial, and industrial buildings must benchmark and report their energy use through a web platform managed by the Energy Star Portfolio Manager. That data is then visualized on a public-facing map platform where citizens can see the emissions and energy efficiency of large buildings. The data gathered by Energy Star is also used by the City to [perform audits](#) that ensure compliance.

Costs

While there are several benefits to assessing and benchmarking energy efficiency in large buildings, this process comes with additional difficulties. Property owners may benefit in ways to reduce energy efficiency but concerns with privacy and competitiveness in the market may need to be addressed before benefits are realized. For example, since the ENERGY STAR score is based on a building's energy consumption compared to similar buildings, building owners may not want the public or their tenants to know the inefficiencies of an owner's building as compared to another.

Another issue is the up-front cost and labor. Energy use data must be collected and uploaded into the ENERGY STAR Portfolio Manager database, as an example, before certain deadlines. This would be an additional task that would need to be handled by the property owner and eventually relayed to the tenants as part of an initiative to reduce energy use in the property. There would be potential need for outreach, and in areas with disadvantaged communities or communities where the primary language

⁶⁵ NYSERDA, 2023

⁶⁶ Ruff, 2016

⁶⁷ NYSERDA, 2023

⁶⁸ NEEP, 2023

is not spoken in English, translators may be needed. The upfront cost of integrating benchmarking and assessment is not without added time, labor, and finances.

Additional costs would be incurred if the performance standard required infrastructure changes to meet thresholds over time. In this case, costs would be dependent on the type of upgrades employed and the specific building characteristics.

Costs to Community

Compiling energy data into energy star portfolio manager could be done by existing staff/building owners.. If the benchmarking program ultimately included GHG or energy consumption thresholds for buildings to meet, additional costs may be incurred. These costs would depend on the thresholds set, the equipment in the building, and the age of the building. The City should utilize the benchmarking data to complete a more detailed analysis of building costs when setting potential future GHG reduction thresholds for commercial buildings.

Costs to City

Building benchmarking programs require upfront costs to develop the program and ordinance language and long term staffing by the City. The upfront costs to develop the standard would include the development of an ordinance, research into setting thresholds for reductions, and outreach and engagement. Recent costs for consultant support for building benchmarking programs are estimated to be between \$100,000 and \$200,000 depending on the detail of the work. The City could expect to save some money by combining this with the existing building electrification study which would include much of the same research and information. The number of staff required to run the program will be based on the requirements of the standard itself as well as the number of buildings covered by the program. Figure 6 provides examples for the number of FTEs from several building performance standards from programs covering between 900 and 1,850 units. The City’s actual operating costs would depend on staff salaries.⁶⁹

Figure 6 Staffing Examples from Several Cities with Building Performance Standards

Jurisdiction	Number of Covered Properties	BPS Staff	Budget (including non-personnel costs)
Montgomery County MD	1,850	7 FTEs	\$1.1 million annually
St. Louis MO	~900	4 FTEs	\$299,600
Washington DC	1,662 in 1 st compliance cycle; increasing to 5,000 by 3 rd cycle	7 FTEs	\$1.1-1.2 million annually

Other Examples of Funding and Financing Strategies

Support for the City’s mission of increasing building performance is not limited to utility providers. The federal and state governments offer a broad range of grant and loan programs accessible to property owners to modify and upgrade their properties to standards. As an example, federal funding was specifically allocated to the County through the state Department of Energy (DOE) in 2013. The

⁶⁹ Putting Policy in Action: Building Performance Standard Implementation Guide (imt.org)

Elective Municipal Programs to Optimize Water, Energy and Renewables (emPower) program was supported by \$2.4 million in federal seed money funded through the United States' DOE's Better Buildings Neighborhood Program which encouraged energy efficient home upgrades through a combination of financing, rebates, and technical advising and training.^{70,71}

A sampling of funding and financing strategies for these actions follow below. Previously referenced funding or financing programs for Measure BE-5 including those currently provided by SCE as part of the utility's energy efficiency partnerships and program may be applicable to BE-6.2.

City of Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO) Enforcement Fund

Agency/Implementer: Local Governments | Program Type: Enforcement Fund | Beneficiary: Property Owners including Members of Environmental Justice Communities

The City of Boston updated its BPS, called BERDO, in 2021 to meet the City's significant decarbonization goals.⁷² While stringent, Boston's BPS allows for flexibility. For example, emission standards for mixed-use buildings will be calculated as a weighted average based on the square footage of each use. With approval from the City, owners of multiple properties can comply based on its portfolio-wide emissions, but every portfolio will need to reach carbon neutrality by 2050. Property owners can also opt in a Hardship Compliance Plan.

Property owners who do not meet emissions targets can pay an "Alternative Compliance Payment" of \$234 per metric ton of CO₂e in excess of each building's target. The resulting revenue will be used for an "Equitable Emissions Investment Fund". This fund will be assigned to environmental justice communities that need help in upgrading energy performance to relevant buildings.⁷³ A "Review Board"—consisting of members of environmental justice communities (defined by the State of Massachusetts) and community-based organizations—ensures benefits of the fund are realized by these communities. The "Review Board" will administer the fund.⁷⁴

Washington DC's Green Bank Commercial Loan for Energy Efficiency and Renewables (CLEER)

Agency/Implementer: Investment Banks | Program Type: Loans | Beneficiary: Advisory Neighborhood Commissions (ANCs); Business and Property Owners; and Developers

The District of Columbia set a Green Bank alongside its building energy performance standards. In partnership with the Montgomery County Green Bank, the DC Green Bank runs the Commercial Loan for Energy Efficiency and Renewables (CLEER) program for multifamily, commercial, and industrial buildings—targeting retrofits, renovations, and additions. The loans are complementary with other financing including DC's PACE program and rebates from DC Sustainable Energy Utility. Initial funding is granted by the DC Government in 2018. CLEER provides 100% financing for projects that provide energy savings of at least 15% of a building's current consumption over a 12-month baseline.⁷⁵

⁷⁰ Empowering Santa Barbara to Invest in Upgrades | Department of Energy

⁷¹ SB County emPower | Final Program Report

⁷² Boston's BPS require buildings containing 20,000 or more square feet of gross floor area meet a series of emissions intensity targets starting in 2025 and ending at carbon neutrality in 2050.

⁷³ BERDO Review Board, November 2023 | City of Boston

⁷⁴ More information on the City of Boston's BERDO from the Institute for Market Transformation.

⁷⁵ Related enhancements that are not energy improvements may account for up to 30% of the total project cost financed. CLEER – DC Green Bank

Energy Services Agreements (ESA) or Energy Savings Performance Contracting (ESPC)

Agency/Implementer: Utility Provider or Energy Service Company | Program Type: Performance Savings Agreements | Beneficiary: Property Owners

An ESA or ESPC may allow a facility owner—typically large buildings or group of buildings such as city, county, and state buildings; schools; hospitals; commercial office buildings; and multifamily buildings—to implement agreed upon building energy efficiency upgrades upfront at no cost by contracting with a third-party to pay for the building upgrades who then benefit from the building energy savings. Private, commercial facilities often do not employ ESAs since they require a strict payback threshold; however, this “pay today-earn tomorrow” approach applies to government facilities more directly given their long-term ownership of their facilities and their longer financing terms. The City may employ ESAs to evaluate building performance standards and energy conservation measures at municipally owned facilities—namely, municipal offices—prior to enacting the BPS citywide.⁷⁶

California Energy Commission’s 1% Interest Loan Energy Conservation Assistance Act (ECAA)

Agency/Implementer: State Agencies | Program Type: Loan | Beneficiary: Local Governments; Other Public Entities

ECAA is a revolving loan fund—loan repayments fund the program—for public schools and public entities seeking to finance energy efficiency, electric vehicle infrastructure, and energy generation or storage projects. Cities are eligible for a 1% interest loan program with a maximum loan amount of \$3 million. Eligible projects vary but must have net energy savings and wholly owned by the applicant. While this loan assistance program does not fund the creation or implementation of building performance standards in the private, commercial sector, the City could use funds to pilot energy efficiency project that tests building performance standards set as part of BE-5.5 at City-owned facilities such as municipal offices.⁷⁷

California Energy Commission’s Energy Partnership Program

Agency/Implementer: State Agencies | Program Type: Assistance Program | Beneficiary: Local Governments; Special Districts; Other Public Entities

The CEC provides technical assistance services (up to \$20,000 of a consultant’s costs) to help local governments and public entities in the state to identify energy savings opportunities for existing properties and new construction including development of equipment performance specifications, design review consultations, selection of contractors or energy efficiency expertise.⁷⁸ The program is competitive and requires participants who are seeking assistance to commit to energy efficiency recommendations and to provide plans to fund energy efficiency project recommendations. Like the ECAA and ESA, the City can incorporate lessons learned from the technical assistance as it adopts BPS for large commercial buildings.

⁷⁶ Energy Savings Performance Contracting | Department of Energy

⁷⁷ CEC ECAA

⁷⁸ Applicants with studies beyond \$20,000 may opt in to share in the cost or reduce the scope.

Measure/Action 4: Off-road Equipment Decarbonization

This measure and associated actions involve the decarbonization of off-road equipment:

T-8: Electrify or otherwise decarbonize 6% of off-road equipment by 2030 and 20% by 2035

T-8 includes the alignment or expansion of AB 1346 which California Governor Gavin Newsom signed a law in 2021 ordering state regulators to ban the sale of new gas-powered equipment using small off-road engines, which includes generators, lawn equipment, and pressure washers, to help curb emissions from a category of small engines on pace to produce more pollution each year than passenger vehicles. This law orders regulators to offer rebates for people to replace their equipment and aims to electrify the landscaping business. These regulations are set to apply to engines produced on or after January 1, 2024.⁷⁹ Other actions associated to the measure include education and outreach to local employers and City staff regarding the transition to zero-emission off-road equipment.

Benefits and Cost Considerations

Benefits

Off-road emissions make up 7% of the City of Santa Barbara's overall GHG emissions profile (~44,000 MT CO₂e). In addition, according to the California Air Resources Board, off-road equipment makes up the single largest source of mobile air pollution emissions in the state of California.⁸⁰ Electrification of these end uses will reduce both GHG emissions and air pollution providing substantial health benefits for the community.

There is a wide range in the size and function of off-road equipment, ranging from large construction equipment to small lawn equipment. While adoption, operations, and maintenance of smaller off-road equipment like electric lawnmowers can be easily adopted at near cost-parity with existing gas alternatives, others like large construction equipment will likely require additional incentives to ease the cost burden of decarbonization.⁸¹ The State of California has already started making moves to increase incentives for large off-road equipment decarbonization through programs like the California Air Resources Board (CARB) Clean Off-Road Equipment Vouchers, which has allocated \$273 million to incentivize California fleets to purchase or lease cleaner offroad equipment.⁸²

Benefits to Community

Communities will benefit from reducing air pollution when converting to electric off-road equipment through vouchers and incentive programs. The diesel off-road equipment adds to the vehicle exhaust and poor air quality that is a precursor to lung and heart diseases, and an issue to tackle for both residents and the larger community. Construction with smaller electric construction vehicles could be applicable in settings where diesel vehicles were impractical, such

⁷⁹ Air Pollution: small off-road engines, 2021 | Legiscan

⁸⁰ <https://ww2.arb.ca.gov/resources/documents/off-road-equipment-research#:~:text=Under%20current%20regulations%2C%20off%2Droad,of%20mobile%20emissions%20in%20California.>

⁸¹ Gas vs. Electric Lawn Mower: Which Is Better? May 2023 | Consumer Reports

⁸² Funding for Fiscal Year 2022-2023. Project Background for Clean Off-Road Equipment Vouchers | California Air Resources Board

as indoor settings, orchards, and fish hatcheries.⁸³ The operation of electric alternatives can also be substantially lower.⁸⁴

Benefits to City

Providing cleaner air to the community is beneficial to the City and County following the County's Regional Transportation Plan and agenda towards emissions reduction. Recently, some municipalities have passed propositions to alleviate property owners from the responsibility of maintaining sidewalks and street trees, shifting the responsibilities to cities and their operating engineers. Studies have shown that operating engineers (those that operate and maintain heavy construction equipment) have higher potential for exposure to numerous hazards includes whole-body vibration, dust, diesel exhaust, and noise.⁸⁵ Electric off-road equipment would help to prevent many of the complications operating engineers would face if diesel equipment were replaced.

Costs

Although there are several benefits to off-road equipment, there are also several barriers and drawbacks to electrifying off-road vehicles. Benchmarking costs and performance of vehicles would be vital to improving product development and system operations. The federal government must continue to play a central role in convening diverse stakeholders, conducting foundational pre-competitive research, development, and deployment, and coordinating case studies and technology validations to advance the industry.⁸⁶ Due to the numerous types of vehicles, the off-road sector has few one-size-fits-all solutions which does not allow for streamlined production of electrified vehicles, but rather would need high levels of customization.⁸⁷

A challenge to transitioning into electric equipment is ensuring capacity and availability of charging infrastructure.⁸⁸ Additionally, grid support and stability will be necessary to evaluate, and municipalities and utilities would need to continuously find solutions and assess grid infrastructure. Charging infrastructure varies between offroad equipment types. For example, large frequently used equipment may require similar chargers to electric on-road vehicles. However, the regulation referenced in this measure covers small motors which would use 110v electrical outlets common in every building. In the example of a commercial-electric lawn mower, initially higher costs are ultimately offset by the reduced maintenance costs (e.g. electric mowers don't have belts, oil changes, etc.) and lower operation costs, meaning that the payback period for making the switch from gas to electric lawnmowers can be as short as two years.⁸⁹

Costs to Community

In California, current off-road engines are focused on smaller, but highly polluting engine tools such as leaf blowers and lawn mowers. In the City of Santa Barbara, those tools are used primarily

⁸³ Volvo Construction Equipment, 2021

⁸⁴ <https://www.fleetequipmentmag.com/electric-yard-trucks-cost/>

⁸⁵ Whole-Body Vibration and Postural Stress among Operators of Construction Equipment: A Literature Review (cdc.gov)

⁸⁶ Solutions Emerge for Decarbonizing Historically Difficult Off-Road Vehicle Sector | NREL, 2022

⁸⁷ Off-Road Vehicle Decarbonization and Energy Systems Integration | NREL, 2022

⁸⁸ Volvo Construction Equipment

⁸⁹ Benefits of Electric Riding Lawn Mowers, Gravely

for single-family household lawns and in the hotel industry, one of Santa Barbara County and City’s top employing industries.⁹⁰ Figure 7 provides example costs of electric small off-road engines (SORE) rated at or below 25 horsepower. Costs vary by equipment with most being cost comparable (and much less cost to operate). Some equipment like larger mowers can incur more substantial marginal costs and is a good place to identify rebates or incentives. Long term cost savings should be seen for most if not all equipment similar to electric vehicles.⁹¹ It has been shown that operating an electric lawn mower would cost 32 times less than a gas lawn mower, according to some estimates leading to a payback period of around two years.⁹² Electric equipment needs no oil, no fuel mixing, minimal to no maintenance, and is cheaper to fuel than gas equipment.

Figure 7 Small Combustion Engine Electrification Upfront Cost Examples

Equipment	Gas Costs	Cost source	Electric Cost	Cost Source	Marginal Cost
Soft wash/Power washer	\$350	https://shorturl.at/fwIR0	\$400	https://shorturl.at/tDJR7	\$50
Zero turn lawn mowers	\$3,800	https://shorturl.at/inJ69	\$6,000	https://shorturl.at/oxJNT	\$2,200
Residential lawn mowers*	\$550	https://shorturl.at/uwSZ5	\$500	https://tinyurl.com/yfmpu32a	-\$50
Leaf blowers	\$274	https://tinyurl.com/c57ksc8w	\$250	https://tinyurl.com/yzshseyr	-\$24

**Note that electric lawn mowers up to commercial size, likely have a payback period of up to two years [see reference above], depending on use case.*

90 Major Employers in Santa Barbara County | State of California, 2023

91 <https://thehill.com/changing-america/sustainability/energy/559971-finally-heres-the-exact-cost-of-owning-an-electric-car/>

92 <https://smartenergy.illinois.edu/electric-lawn-mowers/>

Costs to City

The largest cost to the City is likely to be enforcement. Successfully implementing an off-road vehicle electrification requirement would require some level of enforcement for those who continue to operate fossil fuel equipment. This could be one or multiple FTEs, or potentially covered by existing code enforcement staff. As these types of municipal programs are largely in

Heavy Duty Equipment and Infrastructure Enhancements in Los Angeles, California

The [Electric Crane Project](#) for cargo handling equipment at the Port of Los Angeles has reduced crane emissions by 100%. A 1987 diesel ship-loading crane was replaced with a Liebherr 550 electric crane which has helped eliminate air pollutants such as nitrogen oxides, particulate matter, hydrocarbons, carbon monoxide, and GHG. The new electric crane is the Port of Los Angeles' first electric mobile ship-loading crane for non-container cargo, an important step in the port's goal of becoming a zero-emission green port. Just the particulate matter emission eliminated from this replacement is equivalent to taking 3,400 heavy duty trucks off the road for a year. The funding for this project came from the EPA which granted a total of \$1.3 million of Diesel Emission Reduction Act (DERA) funding.

their exploratory stage across the State, the City should continue to monitor statewide and existing examples staffing and enforcement models for these types of enforcement and programming strategies.

Possible Funding and Financing Strategies

Transition into zero-emissions off-road equipment will require coordination and outreach efforts on behalf of the City to connect the users of machinery and equipment with applicable funding opportunities. The City itself will require additional funds to replace its existing fossil-fuel powered equipment alongside local enterprises. Some of the costs of vehicle replacement and the charging infrastructure can be recouped through specifically earmarked grant programs from state and federal governments. Existing partnerships with the Santa Barbara Air Pollution Control District can be leveraged for the creation of rebate and incentive programs. Examples below show possible funding and financing strategies for the City and independent, private operators.

County of Santa Barbara and Santa Barbara Air Pollution Control District (the District) Vehicle Replacement Grants and Local Charger Infrastructure

Agency/Implementer: Local Government; Local Air Districts | Program Type: Grants | Beneficiary: Local Businesses; Local Governments; Other Public/Private Entities

The District offers grants for replacing vehicles for lower-emissions options including off-road vehicles and agriculture equipment ranging in amount from \$10,000 to \$250,000. While the 2022 application window has closed, the 2023 grant categories should be announced in the coming months and will likely include similar project eligibility requirements.⁹³ Though not dedicated to off-road equipment, the District pledged close to \$150,000 for the expansion of local charger infrastructure in the County of Santa Barbara, which the County matched with about \$60,000 in

93 Clean Air Grants for Off-Road Equipment | Santa Barbara County Air Pollution Control District (ourair.org)

funding for the goal.⁹⁴ This charging infrastructure will be pivotal for the success of T-8 and similar zero-emissions vehicle measures.

California Air Resources Board (CARB) Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program

Agency/Implementer: State Agencies; Local Air Districts | Program Type: Formula Grant | Beneficiary: Farmers; Agricultural Businesses

The California Air Resource Board (CARB) FARMER Program funds the replacement of agricultural equipment with zero emissions replacements. Applications are evaluated on a case-by-case basis by CARB staff and grant funds are allocated to regional air districts before they are awarded to applicants. Eligible applicants must work entirely within the boundaries of the air district and project equipment can include off-road vehicles, tractors, irrigation pump engines, and other equipment used entirely for agricultural purposes.⁹⁵

Agricultural Equipment Penetration Rates in California

A [CalStart Technology and Market Assessment](#) has shown that smaller and lightweight agricultural equipment are feasible to electrify for off-road equipment. While the number of electric tractors in the field to-date is small, penetration of zero- or low-emission agricultural equipment is expected to grow. In California, it is estimated that 12% of annual tractor sales will be battery-electric by 2029 with another 8% being hybrid electric.

California Air Resources Board (CARB) Clean Off-Road Equipment (CORE) Voucher

Agency/Implementer: State Agencies; Local Air Districts | Program Type: Formula Grant | Beneficiary: Farmers; Agricultural Businesses

The State through CARB implemented the Clean Off-Road Equipment Voucher Incentive Project (CORE), which is a part of the California Climate Investments, a statewide initiative allocating billions of cap-and-trade dollars. The program provides funds for the replacement of heavy-duty and off-road equipment with zero-emissions models for California businesses. Specific funds are set aside to support micro and small businesses and can be used to purchase equipment from lawnmowers to construction equipment. CORE voucher amounts are tailored by the cost premium of new zero-emission alternatives over traditional equipment.⁹⁶ The program provides additional funding is available for charging infrastructure and equipment deployed in pollution-overburdened and low-income communities.⁹⁷

California Air Resources Board (CARB) Carl Moyer Program Lawn and Garden Equipment Replacement

Agency/Implementer: State Agencies; Local Air Districts | Program Type: Formula Grant | Beneficiary: Individuals; Business Owners

94 County launches move to electric vehicle fleet; first 56 EVs to hit road by summer | Government and Politics | syvnews.com

95 Funding sources for the FARMER program varies including the state's Air Pollution Fund, the Greenhouse Gas Reduction Fund, among others. More information at California Air Resource Board (CARB) FARMER Program.

96 California Off-Road - Advanced Clean Equipment | California Air Resources Board

97 Low-income communities as defined by AB1550

In partnership with local air districts, CARB runs the Carl Moyer Program through which it funds fleet upgrades and replacement incentives for eligible equipment like heavy-duty trucks, emergency vehicles, solid waste collection vehicles, and charging infrastructure. The program has a Lawn and Garden Equipment (LG&E) Replacement program which provides California residents who own and operate existing combustion LG&E funds to replace or acquire batteries for electric LG&E. The program allows for bulk purchasing. Maximum funding amounts are set by equipment type and differ between residential and commercial users with a maximum amount of \$15,000 for commercial ride-on or stand/site mowers.⁹⁸

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⁹⁸ CARB Carl Moyer Program