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EXISTING BUILDING ELECTRIFICATION AND MULTIFAMILY ELECTRIC VEHICLE CHARGING

POLICY AND FINANCING LITERATURE REVIEW AND ANALYSIS

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1 Executive Summary

This study is intended to aid Menlo Park, Peninsula Clean Energy, and other agencies to understand the policy and financing landscape for existing building electrification and multifamily EV charging infrastructure retrofits. TRC has compiled research on relevant state and local building codes and financing approaches that could support achieving carbon neutrality goals. TRC has preliminarily identified gaps and developed recommendations for future programs.

TRC recommends that municipalities address all areas of the market by invoking as many effective policy and financing options as resources allow. The highest ranking in this study include:

- ◆ **Policy:** The jurisdiction has the ability to serve as the lead agency in all of these policy options, which is beneficial to enforce customized policies but may also lead to higher administrative investment.
 - Triggered Appliance Conversion (e.g., time of transfer, burnout permit, major alteration) – Highly scalable and readily enforceable if permits are pulled regularly. An example of successful policy implementation includes City of Davis’s Resale Program (triggered at point of transfer). A notable gap is the limited implementation period of local policies requiring significant energy upgrades at the time of major alterations.
 - Building Performance Standards (e.g., emissions criteria achieved by a deadline) – Highly scalable and readily enforceable. The City of Boulder’s SmartRegs Program is an example that has achieved high compliance in existing building energy efficiency compliance.
 - Municipal Buildings Lead with Electrification – An important policy to raise the profile of community goals, increase government familiarity with the challenges and opportunities of electrification, and establish notable precedents. Jurisdictions should also explore electrification policies as part of Capital Improvement Projects.
 - Achieving Equitable Outcomes – Early and regular communications with marginalized community members can avoid inadvertently harmful policies, and ensure electrification works to reverse compounding historical injustices. A key policy approach includes rental property energy performance standards.
- ◆ **Financing:** Local jurisdictions can serve in the lead role in providing the following financing pathways:
 - Municipal Financing (e.g., Green Bonds and Local Taxes and Fees) – Voter-approved fund generation mechanisms can affirm a community’s willingness to invest in decarbonization measures. Bonds can be used for public infrastructure projects, and increased revenues from utility taxes can serve potentially provide consumer financing.
 - Incentive Programs – A jurisdiction may lead the development of incentive programs, likely with funding from a partner organization, such as San Jose and Marin County partnering with BAAQMD.

Local jurisdictions may also serve educational and advocacy roles for the following mechanisms:

- Electrification as a Service – A local jurisdiction can play a key role in reducing market entry barriers for providers such as BlocPower, or advocate for establishing local programs like

NYSERDA's that creates a market for contractors and installers by paying them for projects that deliver metered bill savings.

- Tax Credits, Deductions, and Rebates – Federal tax incentives can be attained for eligible electrofits and stacked with incentive programs, though they are fairly low amounts.
- Ratepayer-Funded Tariffed On-Bill Investment – Tariffed on-bill programs serve a wide market, including the harder to reach markets such as renters with modest credit history.
- Loan Programs – A suite of loans are available for credit-worthy residential and nonresidential building owners through the state financing authority. These programs may fill in gaps where building owners may have insufficient access to incentive programs or tax deductions. Loans are expected to be one of the last options to financing a project, as they carry more risk for the applicant than many of the preceding options listed.

TRC noted the following financing mechanism gaps

- ◆ High investment costs and limited incentives for heat pump space heating as a replacement for a methane gas furnace in a building that doesn't already have air-conditioning.
- ◆ Limited precedence for existing building EV financing. A jurisdiction may supplement PCE's EV incentive program with additional incentives, or additional loan programs targeted toward EV investment in a similar manner that Boulder partnered with a local credit union.
- ◆ Nonresidential buildings are eligible for fewer incentive programs than residential. This may be due to the higher financing needs and access of the nonresidential market.

Alongside exploring these policy and financing options, TRC recommends local jurisdictions:

- ◆ Thoroughly assess the people and buildings that must be reached to achieve the carbon neutrality goals (e.g., square footage of buildings by type, number of multifamily buildings with parking, major property owners in the City, energy burden for low-income residents, etc ...).
- ◆ Understand the scale of the challenge to estimate the corresponding scale of the solutions necessary (e.g., dollars of investment, outreach strategies, retrofit rates, consumer protections, etc...).
- ◆ Support a range of market transformation strategies (e.g., workforce development, permit streamlining, etc...).

2 Codes and Policies

This chapter provides examples of policies, implementation tools, and strategies that were deployed to support existing building electrification and existing multifamily EV readiness topic areas. Each policy example contains descriptions of mechanisms, applicability to topic areas, instances of policy implementation, and results if available. An example is presented in the following format:

{Name of Policy Mechanism}
{Role of Municipality} | {Policy Action}

TRC has listed policy examples in perceived order of maturity and prevalence.

2.1 Existing Building Electrification

All of the established precedents identified in this literature review are intended to be directly applicable to building electrification policies; however, only a limited set of planned policy approaches currently consider building electrification specifically. All policy approaches are provided for full context and consideration.

2.1.1 Municipal Buildings Lead with Electrification

Local Government Authority | Municipal Resolution

To raise the profile and encourage acceptance of new policies, government agencies often start with mandating and implementing new policies on their own assets and business practices.

- ◆ **California** established a requirement for 100 percent of new state buildings, major renovations, and build-to-suit leases beginning design after October 2017 to be verified zero net energy (ZNE), and 50 percent of existing square footage to include measures achieving ZNE by 2025.¹ The Department of General Services definition of ZNE allows offsetting natural gas with renewable electricity production on a kBtu basis.
- ◆ **San Mateo County's** climate action plan establishes a goal for carbon neutrality by 2035 across government operations, including the electrification of 100 percent of existing County-owned building stock.² The other areas covered in the plan include water, transportation, solid waste, materials management, and carbon sequestration.

Local government could set an example, learn from experience, and chart a pathway for existing building electrification by mandating electrification on its own existing building portfolio.

¹ <https://www.dgs.ca.gov/OS/Resources/Page-Content/Office-of-Sustainability-Resources-List-Folder/Zero-Net-Energy>

² <https://www.smcsustainability.org/wp-content/uploads/Attachment-A-Government-Operations-Climate-Action-Plan-Pathway-to-Carbon-Neutrality.pdf>

2.1.2 Triggered Appliance Conversion

Local Government Authority | Local Ordinance or Resolution

Local governments have some leverage in requiring electric equipment or preparation for electric equipment through amendments to the building code, ordinance(s), or time of sale requirements. Electrification could be prompted for certain types of building permits, such as installation of space- and water-heating equipment, additions, or alterations.³ Policy levers can range from providing pre-wiring for future electrical equipment, to replacement of fossil fuel equipment when an event is triggered (e.g. building permit or sale of property).

City of Berkeley's Equitable Electrification Strategy includes many of the trigger mechanisms and strategies described in this study, including time of sale and replacement and renovation.⁴ The proposed timeline goal for Berkeley is to decarbonize by 2045. Prior to implementing a electrification requirement, it will be imperative for local governments to consider related market preparedness and developments that encourage electric replacement prior to the fossil fuel equipment's end of life. The market must have a robust supply chain, a well-stocked equipment distribution network, and promote a well-trained contractor workforce for installations.

Triggered at Point of Building Sale or Transfer

A jurisdiction may encourage or require electrification upgrades at time of real estate sales. Existing examples require some energy assessment and/or label and disclosure policies, with no explicit link to electrification. Notable instances include:

Within California

- ◆ Since 2015, **City of Berkeley** Building Emissions Savings Ordinance (BESO) has required an energy efficiency assessment for all single family, commercial, and multifamily buildings at time of listing, and/or annual benchmarking, using either the Department of Energy Home Energy Score or ENERGY STAR Portfolio Manager.^{5,6} Exemptions are allowed for new construction, extensive renovations, or financial hardship (such as participation in income-qualified or tax-postponement programs). A 2020 evaluation of the program states that while the program helped the City attain energy consumption information that is useful for shaping policy, it has also been challenging for the city to track conversion rates from assessment to energy upgrade, due to privacy protections of utility program data and a lack of granular building permit data.⁷
- ◆ **City of Davis'** Resale Program, implemented in 1976, requires a building inspection to certify that the building meets local ordinance requirements as part of a residential property transaction. The inspected items include various health and safety measures including air

³ http://www.buildingdecarb.org/uploads/3/0/7/3/30734489/building_decarbonization_legal_opportunities.pdf

⁴ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Draft_Berkeley_Existing_Bldg_Electrification_Strategy_20210415.pdf

⁵ <https://www.cityofberkeley.info/beso/>

⁶ https://www.cityofberkeley.info/benchmarking_buildings/

⁷ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/BESO%20Evaluation%20Final%20Report.pdf

conditioner disconnect, furnace combustion air, laundry outlet voltage, energy standards compliance with retrofit, and pipe insulation.⁸ As of 2018, the cost for the inspection was \$426. The City inspects approximately three to four percent of its housing stock annually, and since 2014, only five percent of resale inspections have found unpermitted heating, ventilation, and air conditioning (HVAC) installations.⁹

- ◆ **City of Piedmont** requires that at point of listing for sale of a property, a report from a Home Energy Audit or Home Energy Score (homeowner’s choice) must be provided to potential buyers and submitted to the City—unless the residential building was constructed in the past 10 years.¹⁰ This requirement was implemented in early 2021, and there is limited compliance and implementation data at this time.
- ◆ Since 1982, the **City of San Francisco** has required energy and water conservation measures for all residential dwellings that undergo a property transfer or major improvements (e.g., \$20,000 of estimated improvements for a single-family home).¹¹ Measures include a minimum of R-11 attic insulation, water heater insulation, weatherization, and duct insulation, and must be inspected for compliance. Costs are capped at \$1,300 per single-family dwelling, and for multifamily buildings:
 - 1% of the assessed value of the building if improvements are performed prior to property transfer
 - 1% of the purchase price as stated in the real estate sales contract

Outside of California

- ◆ **City of Minneapolis’** Truth in Sale of Housing (TISH) requires home inspections prior to sale. Inspected items include water heater and space heater venting and improper gas lines.¹² Home energy data is also collected in an energy disclosure, but no energy improvements are required. All of the data is published and available to the public.
- ◆ **City of Chicago** requires the seller of a residential property to provide a *heating cost disclosure form* to the prospective purchaser during the sale of a property, based on historical information. Landlords are required to provide the same report to prospective renters.¹³ No retrofits are required.
- ◆ **City of Austin’s** Energy Conservation Audit and Disclosure (ECAD) Ordinance requires energy audits and disclosures for all buildings to promote energy efficiency. Audits are required at time of sale for residential buildings (costing \$200-\$300), annually for commercial buildings larger than 10,000 ft², and every ten years for multifamily buildings.¹⁴ The ECAD Ordinance requires multifamily buildings that are high-energy users (exceeds 150 percent of average energy use for

⁸ <https://www.cityofdavis.org/city-hall/community-development-and-sustainability/building/resale-program>

⁹ https://www.bayrencodes.org/wp-content/uploads/2020/12/EE-and-Electrification-White-Paper_FINAL_12.28.2020.pdf

¹⁰ <https://piedmont.ca.gov/common/pages/DisplayFile.aspx?itemId=17376920>

¹¹ <https://sfenvironment.org/residential-energy-conservation-ordinance>

¹² <https://www.minneapolismn.gov/resident-services/property-housing/buying-selling/tish/>

¹³ <https://www.chicago.gov/content/dam/city/depts/dol/rulesandregs/HeatingCostDisclosureRules.pdf>

¹⁴ <https://austinenergy.com/ae/energy-efficiency/ecad-ordinance/energy-conservation-audit-and-disclosure-ordinance>

multifamily properties) to make energy efficiency improvements to reduce energy use by at least 20 percent.

Each of these ordinances carry penalties ranging from a few hundred to a few thousand dollars for non-compliance.

Triggered by Major Alteration

California's Title 24, Part 6 Building Energy Efficiency Standards contain various efficiency upgrade requirements that additions and alterations must comply with if the trigger conditions are met. For example, the standards dictate that space-conditioning system replacements (the trigger event) are limited to methane gas, liquefied petroleum gas, or the existing fuel type, except in the case of going from gas or liquefied petroleum gas to heat pumps (the requirement).

Local governments may use the same triggering events, such as the replacement of a mechanical and/or domestic water heating system, and further require electrification measures. In this case, a local code amendment could further require that replacement equipment be heat pump systems, as opposed to the like-for-like replacement currently allowed in Title 24, Part 6.

Encouraging or requiring electrification conversions make most economic sense when coupled with major renovations, because it can be more cost effective and less disruptive to the building owner. Solar photovoltaic (PV) installations have an added benefit of improved operational cost effectiveness.

Notable instances include:

Within California

- ◆ **City of Piedmont** recently passed an existing building ordinance requiring:¹⁵
 - Projects proposing an entire new upper level on a low-rise residential building or increasing a low-rise residential building's total roof area by 30 percent or more, install solar panels on the roof.
 - A renovation project on a low-rise residential building that costs \$25,000 or more will require the applicant to choose one item from a list of energy efficiency or heating system electrification improvements to include in the renovation.¹⁶ A renovation project on a low-rise residential building that costs \$100,000 or more will require the applicant to choose two items.
 - An application for an electrical panel upgrade must include capacity in the panel to accommodate future electrification of all appliances in the residence. The building official has the authority to approve of a panel physical size that can accommodate an amperage larger than the service connection, ostensibly with a main breaker that sized no larger than the building service.
 - An application for a kitchen or laundry area renovation must include electrical outlets for future appliance installation.
- ◆ **City of Portola Valley** requires that nearly all residential additions or remodels, including accessory dwelling units, achieve a certain number of GreenPoint Rating Points, depending on the exact scope. The project documents must include the proposed measures to achieve the

¹⁵ <https://piedmont.ca.gov/cms/one.aspx?portalId=13659823&pageId=17415806>

¹⁶ <https://piedmont.ca.gov/common/pages/DisplayFile.aspx?itemId=17426428>

required number of points, and prior to building permit issuance, documentation must be provided by a certified GreenPoint Rater.¹⁷

- ◆ **City of Chula Vista** Existing Home Energy Sustainability Ordinance (EHSO) requires two-to-four efficiency measures to be installed for existing homes performing major alterations that were built in Chula Vista before 2006, such as adding square footage, moving interior walls, or moving windows and doors.¹⁸
- ◆ **City of Berkeley** is planning for a *time of replacement and renovation plan* that requires equipment changeout at the end of life or during a renovation. Their current timeline would require electric HVAC and hot water as early as 2025 if accessible financing and funding is available.¹⁹
- ◆ **City of Emeryville** is considering adopting model code language developed by East Bay Community Energy that requires replacement HVAC equipment be heat pumps in low-rise and high-rise residential, office, and retail buildings, and that panel upgrades be electric-ready to the extent that the service connection capacity allows.²⁰

Outside of California

- ◆ **City of Seattle** adopted an energy code that requires heat pump installation in commercial alterations (and new construction) effective on building permits applied after January 1, 2022. There are exemptions that would allow methane gas in limited instances, but exemptions are specific to occupancy types (e.g., less than five percent of the conditioned floor area) and technologies (e.g., existing district energy or emergency generators).²¹
- ◆ **City of Boulder**'s Green Building and Green Points Program required that renovations that add over 500 square feet to pre-existing housing also have to meet an energy efficiency requirement that may trigger mandatory upgrades.²²

2.1.3 Building Performance Standards

Local Government Authority | Local Ordinance

Setting performance standards and enforcing compliance via a timeline can allow for long-term planning by building owners.

¹⁷ <https://www.portolavalley.net/building-planning/green-building-and-your-project>

¹⁸ <https://www.chulavistaca.gov/departments/clean/retrofit>

¹⁹ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electfication%20Strategies.pdf

²⁰ <https://ebce.org/reach-codes/>

²¹ <http://seattle.legistar.com/View.ashx?M=F&ID=9085266&GUID=545EA5F5-8C47-4A56-80FF-7846BA07EFCF>

²² <https://www.aceee.org/toolkit/2020/02/residential-energy-use-disclosure-guide-policymakers>

Disclosure Programs

Energy use disclosures can educate building owners and provide customized, discrete next steps toward compliance with specific thresholds.²³ In some cases, cities require that upgrades be performed within certain time windows or face a penalty.

Within California

- ◆ **City of Brisbane** requires most owners of buildings larger than 10,000 ft² to report energy benchmarking results using ENERGY STAR Portfolio Manager to the city annually on May 15th starting in 2021. Starting in the 2023 reporting cycle, buildings will be required to demonstrate building efficiency performance metrics or conduct an audit to identify and implement savings opportunities.²⁴
- ◆ Some cities may leverage existing structure from rental policies and business license programs to enforce disclosure programs and require additional upgrades.²⁵ The **City of El Cerrito** is a California example of a residential rental inspection program, operating since 1997. El Cerrito requires all residential rental units to be registered, obtain a business license, pay an annual license tax, and be inspected every two years. The inspection costs approximately \$129 per multifamily unit. The inspector checks for a variety of measures including appliance installation and operation as well as electrical wiring.^{26, 27} The cities of Richmond, San Pablo, and San Rafael also include rental inspection programs, though triggers can vary by regular time periods, time of sale, and/or complaints. These programs achieve an average of 80 percent compliance rates.
- ◆ **City of Berkeley** may expand their BESO program to include greenhouse gas emissions per square foot estimates and require building owners to limit emissions according to gradually decreasing threshold through 2045.²⁸ This may be administratively challenging—even under the

Relevant Resources

1. While existing building electrification will ultimately require mandatory approaches, disclosures may provide an important foundational dataset and administrative framework. The American Council for an Energy Efficient Economy has published a [Guide for Policymakers](#) to establish energy disclosure programs, as has the [Federal Office of Energy Efficiency and Renewable Energy](#).
 2. StopWaste developed key considerations and estimates of carbon impacts to support jurisdictions exploring the idea of a [Rental Housing Inspection Programs](#) with energy efficiency requirements.
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²³ <https://www.aceee.org/toolkit/2020/02/residential-energy-use-disclosure-guide-policymakers>

²⁴ <https://www.brisbaneca.org/bbep#:~:text=The%20first%20step%20was%20development,May%2015th%20startin g%20in%202021.>

²⁵ <https://rmi.org/rental-efficiency-standards-a-win-for-equity-and-climate/>

²⁶ <http://www.el-cerrito.org/563/Residential-Rental-Inspection-Program>

²⁷ https://library.municode.com/ca/el_cerrito/ordinances/code_of_ordinances?nodeId=958375

²⁸ [https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-](https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electrification%20S trategies.pdf)

[27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electrification%20S trategies.pdf](https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electrification%20S trategies.pdf)

current BESO program design, a recent evaluation found that the “BESO administrative process [and ensuring compliance] is staff-intensive and time consuming.”²⁹

Outside of California

- ◆ **City of Boulder** adopted the SmartRegs program in 2010, which required that rental properties meet energy efficiency requirements by 2018 or before a rental license application approval. In 2017, 100 percent of the rentals were inspected, and 86 percent were compliant.³⁰ Similarly, Boulder also requires that commercial and industrial building owners complete one-time lighting upgrades and implement cost-effective retro-commissioning measures by set dates, depending on the size of the building.³¹ Failure to perform upgrades can result in fines of \$0.0025 per square foot up to \$1,000 *per day* of non-compliance. To support property owners, the City provides a set of resources including a cost estimation tool and a list of service providers.
- ◆ Since 2013, the **City of Chicago** has required multifamily and commercial buildings of at least 50,000 ft² to report whole-building energy use annually according to a custom energy rating system that went into effect in 2019. The rating is required to be posted in a prominent location on the property, and either the energy rating or ENERGY STAR® score must be listed in any advertisements for sale or lease at the time of listing.³²
- ◆ In May 2021, the **City of Burlington** adopted an ordinance requiring rental units that consume over 90 kBtu/ft² for space heating purposes to implement energy efficiency measures up to a cost cap of \$2,500/unit to complete the initial work, not including incentives. After the initial work is completed, property owners are given a three-year extension to finish the required efficiency improvements with no cost cap.³³
- ◆ **Gainesville, Florida** has a rental unit permit and inspection program that requires rental units apply for permits annually, and demonstrate that they meet a set of energy efficiency requirements.³⁴
- ◆ **City of Boston** has proposed updates to the Building Emissions Reduction and Disclosure Ordinance (BERDO) intended to meet carbon neutrality by 2050 (Figure 1).³⁵ Every building over 20,000 ft² will need to achieve zero emissions per square foot by the year 2050. The policy has flexible compliance options, such as alternate timing or carbon payments, as well as the purchase of off-site renewable energy combined with on-site electrification. The policy does not currently account for time-of-use of electricity but may in the near future.

²⁹ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/BESO%20Evaluation%20Final%20Report.pdf

³⁰ http://rmi.org/wp-content/uploads/2018/05/Better-Rentals-Better-City_Final3.pdf

³¹ <https://boulder.colorado.gov/sustainability/boulder-building-performance-efficiency-requirements>

³³

[https://go.boarddocs.com/vt/burlingtonvt/Board.nsf/files/C2RKKP51C01A/\\$file/BCO%20Chapter%202018.%20Housing%20Change%20re%20Energy%20Efficiency%20and%20Weatherization%20in%20Rental%20Housing_Revised%20-%20%20City%20Council%205.10.2021.pdf](https://go.boarddocs.com/vt/burlingtonvt/Board.nsf/files/C2RKKP51C01A/$file/BCO%20Chapter%202018.%20Housing%20Change%20re%20Energy%20Efficiency%20and%20Weatherization%20in%20Rental%20Housing_Revised%20-%20%20City%20Council%205.10.2021.pdf)

³⁴ <https://gainesville.legistar.com/View.ashx?M=F&ID=8805396&GUID=444F88CC-EDFB-4498-AA98-04C0110A3AD0>

³⁵ <https://www.imt.org/boston-introduces-building-performance-standard/>

Figure 1. Boston's Emissions Performance Standards Extending to 2050.

Building use	Emissions standard (kgCO ₂ e/SF/yr.)					
	2025 - 2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-
Assembly	7.8	4.6	3.3	2.1	1.1	0
College/ University	10.2	5.3	3.8	2.5	1.2	0
Education	3.9	2.4	1.8	1.2	0.6	0
Food Sales & Service	17.4	10.9	8.0	5.4	2.7	0
Healthcare	15.4	10.0	7.4	4.9	2.4	0
Lodging	5.8	3.7	2.7	1.8	0.9	0
Manufacturing/ Industrial	23.9	15.3	10.9	6.7	3.2	0
Multifamily housing	4.1	2.4	1.8	1.1	0.6	0
Office	5.3	3.2	2.4	1.6	0.8	0
Retail	7.1	3.4	2.4	1.5	0.7	0
Services	7.5	4.5	3.3	2.2	1.1	0
Storage	5.4	2.8	1.8	1.0	0.4	0
Technology/Science	19.2	11.1	7.8	5.1	2.5	0

- ◆ The **State of Colorado** recently signed into law HB21-1286, which requires buildings to track progress toward meeting a 90 percent reduction in emissions by 2050 from 2005 levels. The implementation of the law will be developed through a stakeholder process starting in late 2021.³⁶

Appliance NO_x Emission Limit

Another approach to effectively disallow gas appliances upon burnout or by a deadline is to set the equipment outdoor emission limits low enough based on health and safety reasons. Many dwellings use gas wall furnaces for heating, which can contribute to poor indoor air quality because of over spillage of furnace combustion products.³⁷ Few or no gas equipment would meet the low combustion emission thresholds, and this helps pave the path for electrification.

The State's health and safety code permits local governments to exceed the State's indoor air quality (IAQ) standards. However, potential limitations to the approach include Clean Air Act (CAA) preemption and complications from interactions with building ventilation requirements.³⁸

There are no known instances of this policy implementation, but TRC did find examples of air-quality related policies:

- ◆ **Portola Valley's** fireplace policy prohibits wood burning fireplaces unless they are an EPA-qualified or EPA-certified fireplace for air quality reasons. The policy is also enforced at the time-of-sale, requiring Certificate of Compliance for the wood burning heater, or removal of the appliance.³⁹

³⁶ <https://www.imt.org/colorados-new-building-performance-standards/>

³⁷ <https://www.osti.gov/servlets/purl/1375004>

³⁸ http://www.buildingdecarb.org/uploads/3/0/7/3/30734489/matrix_of_decarbonization_options.pdf

³⁹ https://www.ci.portola.ca.us/uploads/4/3/3/5/43350423/ord_354-wood_stove_ordinance_amendment_2019_and_open_burn_ban.pdf

- ◆ The Express Terms proposed 2022 Standards by the **California Energy Commission** (draft policy, not final) includes a provision in Table 150.0-G requiring a greater airflow rate over natural gas ranges than electric ranges, reflecting the increased NO₂ emissions resulting from natural gas combustion.⁴⁰

A more feasible, though indirect, approach for a local jurisdiction may be to support the regional Air Quality Management District via advocacy to establish this requirement, rather than local ordinance adoption. The Bay Area Air Quality Management District is considering such a program, though the timeline is uncertain.⁴¹

2.1.4 Elimination of Fossil Fuel Infrastructure

Support Utility | Resolution, Advocacy, and Support

Local governments may adopt a *no reconnection* methane gas policy to eliminate gas utility obligation to serve gas, and over time, develop strategies for gas infrastructure pruning, while prioritizing low-income neighborhoods. The main barrier and area needing clarity remains how this interferes with the utility's obligation to serve gas and coordination with utilities. Identifying suitable locations that meet technical, financial, equity, and community considerations to implement gradual reduction and elimination of gas infrastructure requires high and sustained commitment and resources from municipalities.

Initial market penetration may be targeted in sites and neighborhoods where high-cost propane is used for heating to capture improved economics while the local market develops.⁴²

- ◆ **City of Berkeley** is in the process of drafting a plan containing phased actions. Pilot programs are projected to begin prior to 2025, and the strategy may begin wider implementation in 2030, pending appropriate funding and financing strategies.⁴³

2.1.5 Achieving Equitable Outcomes

Local Government Authority | Resolution, Advocacy, and Support

Electrification policy must make financial sense for all populations, including lower-to-moderate income (LMI) residents. Ensuring that benefits of electrification, such as health, safety, and affordability, are targeted toward marginalized communities reverses compounding historical injustices, many of which have been created and perpetuated by government action.

- ◆ **The Zero Cities Project**, led by the Urban Sustainability Director's Network, supported the development of workplans for several cities that center equity and community decision-making in the development of local building decarbonization policy.⁴⁴ Takeaways from projects implemented at Portland, San Francisco, Washington, DC, Boston, and several others include:

⁴⁰ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=236876&DocumentContentId=70030>

⁴¹ See slides 23-34: [https://www.baaqmd.gov/~media/files/board-of-directors/2021/sscic_presentations_04192021_v2-pdf.pdf?la=en](https://www.baaqmd.gov/~/media/files/board-of-directors/2021/sscic_presentations_04192021_v2-pdf.pdf?la=en)

⁴² https://www.colorado.edu/rasei/sites/default/files/attached-files/accelerating_the_us_clean_energy_transformation_final.2.pdf

⁴³ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Draft_Berkeley_Existing_Bldg_Electrification_Strategy_20210415.pdf

⁴⁴ https://www.usdn.org/uploads/cms/documents/rm_zero_cities_project_report_portland.pdf

- Without equitable policy development, local building regulations run the risk of doing more harm than good. For example, landlords may evict tenants when making building upgrades, a harmful practice known as “renovictions.”
 - Partnering directly with Community Based Organizations (CBOs) can expand city efforts and deepen engagements in the creation of building decarbonization policies. CBOs and community members may initially be skeptical of governmental interventions, but early and regular engagement can lead to honest discussions around climate policy, establish a strong commitment, demonstrate accountability, repair trust, and lead to better overall policy.
 - Rental property energy performance standards, coupled with rental housing policies, could reduce the energy cost burden on tenants, eliminate the split incentive, and support cities in meeting climate goals (See Section 2.1.3 for related policies).
 - CBOs and community members should be compensated for attending workshops or meetings to cover childcare, food, travel, or other expenses.
- ◆ **City of Berkeley** Existing Buildings Electrification Strategy defines the multiple forms of equity, establishes the intention to design policy around the goal of Targeted Universalism, and will leverage the Greenlining Institute’s Equitable Building Electrification Framework.^{45,46}
 - ◆ **The Executive Branch of the U.S. Government** has established an Environmental Justice Interagency Council, as part of a broad executive order on climate action, that will ensure that achieving environmental justice is including in their mission when developing programs, policies, and activities designed to combat climate change.⁴⁷

Using the LEAD tool (see sidebar), the American Community Survey indicates that there are approximately 1,500 housing units in Menlo Park that are below the 30 percent Area Median Income (AMI). The occupants of these housing units are mostly renters and pay seven to eleven percent of their income on energy (also known as ‘Energy Burden’). As one example, an equitable policy would strive to ensure that the energy burden of LMI communities matches that of more affluent populations (see section 3.1.4)

Relevant Resource

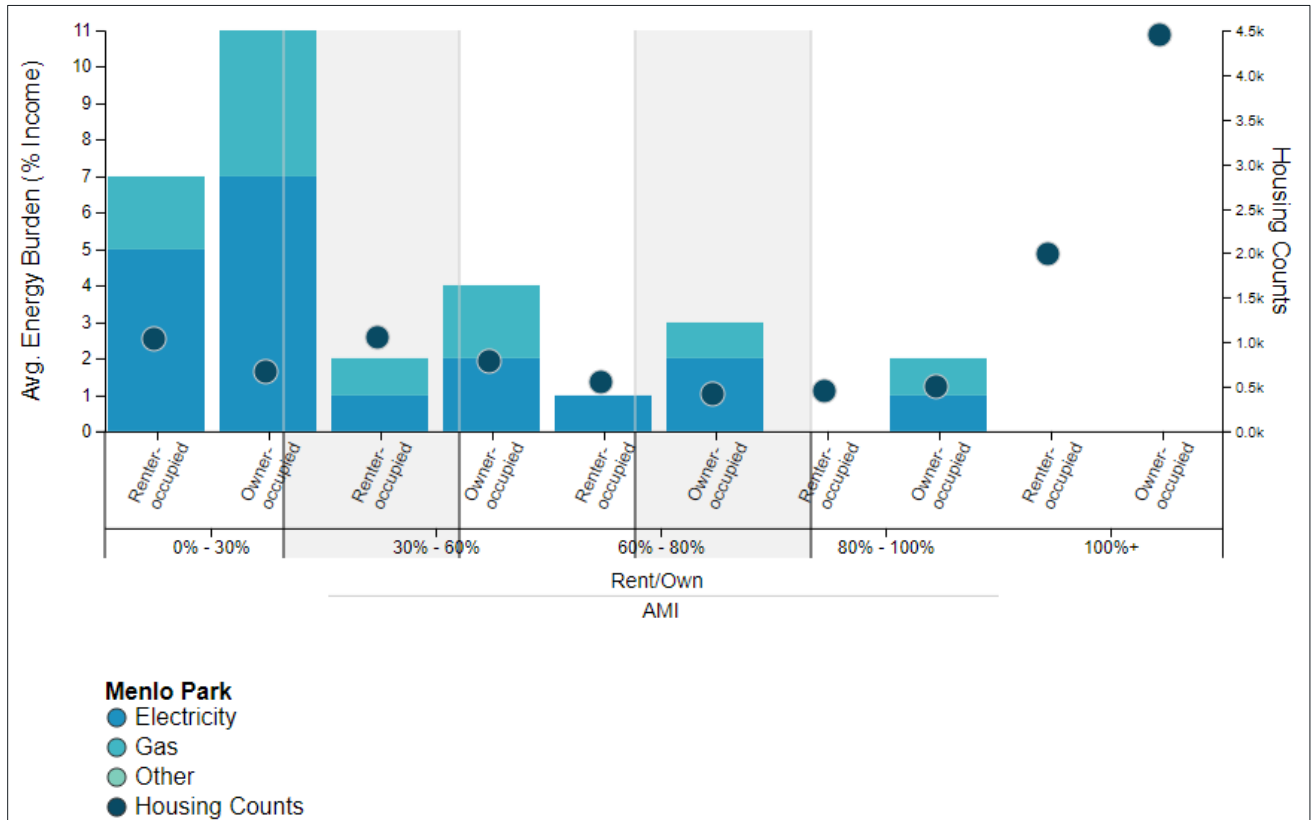
The U.S. Department of Energy’s [Low-Income Energy Affordability Data \(LEAD\) Tool](#) extracts data from the U.S. Census Bureau’s 2018 American Community Survey 2018 to help communities create better energy strategies and programs by improving their understanding of low-income housing and energy characteristics.

⁴⁵ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Draft_Berkeley_Existing_Bldg_Electrification_Strategy_20210415.pdf

⁴⁶ <https://greenlining.org/publications/reports/2019/equitable-building-electrification-a-framework-for-powering-resilient-communities/>

⁴⁷ <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>

Figure 2. Average Energy Burden (percent of income) for Menlo Park



2.2 Existing Multifamily EV Charging

2.2.1 Establish Alteration Threshold

Local Government Authority | Local Reach Code

Examples of existing policy governing clear definitions and threshold for EV infrastructure requirements in multifamily building alterations are limited.

- ◆ **City and County of San Francisco** requires that 100 percent of the total number of parking spaces on a building site be EV charging spaces (EV spaces) capable of supporting future electric vehicle supply equipment (EVSE) for major multifamily alterations. In major alterations where existing electrical service will not be upgraded, this requirement applies to the maximum extent that does not require an upgrade to existing electrical service.⁴⁸ Major alterations appear to be defined as 25,000 ft² of floor area or more where interior finishes are removed and significant upgrades to structural and mechanical, electrical, and/or plumbing systems are proposed.
- ◆ **City of Carlsbad** requires multifamily projects install EV infrastructure when performing major alterations (i.e., interior finishes are removed, upgrades to structural and mechanical, electrical and/or plumbing systems, and a grading permit to rehabilitate or install 2,500 square feet or more of landscaping; or repave, replace or add 2,500 square feet or more of vehicle parking and drive area). These buildings must have 5 percent of parking by EV capable and 5 percent EVCS.⁴⁹
- ◆ **California's** green building standards, Title 24 Part 11, requires 10 percent EV capable spaces for additions and alterations of existing residential buildings as new construction. The requirements apply where the addition or alteration increases the building's conditioned area, volume, or size, and only to and/or within the specific area of the addition or alteration.⁵⁰
- ◆ **City of Menlo Park** requires that nonresidential additions or alterations affecting over 10,000 ft² of building area provide a Level 2 raceway for 5 to 10 percent of the associated total parking

Relevant Resources

1. The [Alternative Fuels Data Center](#) maintained by the Department of Energy, contains a variety of laws and incentives related to clean transportation. TRC explored the database but it's possible more relevant findings existing than those presented.
 2. The [Charge4All](#) tool, developed by Arup, will help prioritize EV charging suitability based on density, ground conditions, electrical infrastructure, road types, and equity factors to support development at multi-family dwelling sites. The tool is currently in beta testing, and timeline and cost for commercial service have yet to be determined.
 3. East Bay Community Energy commissioned [a report](#) indicating that direct install Level 1 charging programs can enable large scale deployment at multifamily unit dwellings due to low costs and strong market acceptance from both property tenants and owners.
-

⁴⁸ https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-87834

⁴⁹ <https://www.carlsbadca.gov/services/depts/pw/environment/cap/evres.asp>

⁵⁰ <https://codes.iccsafe.org/content/CAGBSC2019>

spaces, and Electric Vehicle Supply Equipment for one plus 1 percent of total required parking spaces. There are currently only voluntary requirements for residential buildings.⁵¹

- ◆ **The City of Los Angeles** Department of Public Works initiated a pilot program to provide Level 2 EV charging stations on streetlights in the right-of-way, and has installed 431 stations over the last few years.⁵² While this program is not directly related to multifamily alterations, it may support broader access to EV charging for tenants that do not reside in multifamily buildings triggered by other city policies to install EV charging stations.

⁵¹ <https://www.menlopark.org/1480/Electric-vehicle-EV-chargers>

⁵² <https://bsl.lacity.org/smartcity-ev-charging.html>

3 Incentives and Funding Mechanisms

This chapter starts by presenting existing incentives and resources for existing building electrification and for existing multifamily EV charging. The chapter then identifies various funding and dispersion mechanisms that municipal governments can either lead or play a critical role in catalyzing to leverage stable financial resources to support electrification initiatives.

The **City of Berkeley** estimated that they require \$700M to \$1.4B in investment to electrify 90 percent of all Berkeley buildings by 2045, including envelope efficiency and solar PV measures to ensure equitable outcomes.⁵³ To put these numbers into context, here are some characteristics for Berkeley:

- ◆ Population of 122,000
- ◆ 20.7M square feet of nonresidential space and 65.1M square feet of residential space
- ◆ 35,432 total buildings, 92 percent of which are residential
- ◆ Residential comprises 48 percent of greenhouse gas emissions from buildings, while nonresidential comprises 52 percent

For further context, E3 estimates that approximately \$10B per year is necessary, every year from now through 2050, to electrify all of the 8.7M single-family buildings and 3.3M low-rise multifamily units in the state of California.⁵⁴ The scale and speed of the building-industry investments that are necessary to avoid the worst impacts of climate change are unprecedented.

3.1 Consumer Financing

3.1.1 Incentive Programs

Co-Lead with Other Agencies | Municipal Resources

Building Electrofit

The following entities provide program incentives or for heat pump water heaters (HPWH), heat pump space heating, induction cooking, and/or heat pump clothes drying often including income-qualified options. This is not an exhaustive list but includes some of the most relevant programs for San Mateo County and the neighboring region:

Community Choice Aggregators: Peninsula Clean Energy, Silicon Valley Clean Energy, Clean Power SF, East Bay Community Energy, Marin Clean Energy, San Jose Clean Energy, and Sonoma Clean Power.

Peninsula Clean Energy provides up to \$1,500 to replace a methane gas water heater, with bonus incentives of \$1,000 for California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance (FERA) customers, and up to \$1,500 for panel upgrades.⁵⁵

⁵³ https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electfication%20S trategies.pdf

⁵⁴ <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442467615>. Does not include high-rise multifamily or nonresidential.

⁵⁵ <https://www.peninsulacleanenergy.com/heat-pump-water-heater/>

Regional Agencies: Bay Area Regional Energy Network (BayREN), StopWaste, California Department of Community Services and Development (CSD), Bay Area Air Quality Management District (BAAQMD), and South Coast Air Quality Management District (SCAQMD).

- ◆ **BayREN** currently administers the Home+ program, which provides \$1,000 rebates each for HPWHs and heat pump space heaters, and \$300 each for induction cooktops and clothes dryers in single family residences. Their Bay Area Multifamily Building Enhancements program provides significant incentives via the Clean Heating Pathway (e.g., \$1,000 for each in-unit heat pump, or \$15,000 for a central heat pump water heater serving at least 19 units).⁵⁶
- ◆ The CSD's **Low-Income Weatherization Program**, funded by the State's cap-and-trade proceeds, focuses on low-income multifamily buildings located in disadvantaged communities as defined by the CalEPA, and it funds electrification upgrades within its portfolio.⁵⁷

Local Governments:

- ◆ **County of Marin** administers the Electrify Marin program with funding from BAAQMD, providing rebates for water heaters, space heaters, and cooktops replacing of gas equipment for existing single-family properties.⁵⁸ Appliance specific rebates range from \$250 for an induction cooktop to \$1000 for a heat pump water heater, and a \$500 rebate is available for updates to the main electric service panel. Income-qualified owners qualify for 2x-4x higher rebates.
- ◆ **City of San Jose** had an Electrify San Jose program with funding from the BAAQMD, which provided rebates for switching from methane gas water heater to an electric heat pump water heater. The maximum rebate per single- and multifamily dwelling was \$4,500 with an electric service panel upgrade, or \$2,000 without.⁵⁹ CARE and FERA customers qualified for additional rebate amounts.
- ◆ **City of Santa Monica** administers the Electrify Santa Monica pilot program which provides up to \$1,000 in rebates for replacement of gas equipment in existing residential properties, (\$1,800 for income-qualified applicants), and service panel upgrades.⁶⁰ Appliance specific rebate amounts range from \$100 for a HPWH to \$300 for induction cooking.
- ◆ **Redwood City** has started a rebate program for homeowners offering \$500 for heat pumps, \$500 for electrical panel upgrades if necessary, \$500 for income-qualified residents, \$500 for level 2 chargers, and \$250 for electric lawn care equipment.⁶¹

Investor Owned Utilities (IOUs): IOUs, including Pacific Gas and Electric Company (PG&E) and Southern California Edison, provide incentives for new construction and retrofit projects that include multiple electrification technologies. Fifteen of the sixteen separate building electrification programs that the IOUs implement fund HPWHs.⁶²

⁵⁶ <https://www.bayrenresidential.org/get-rebates>; <https://bayareamultifamily.org/>; <https://www.bayren.org/clean-heating>

⁵⁷ <https://www.csd.ca.gov/Pages/Low-Income-Weatherization-Program.aspx>

⁵⁸ <https://www.marincounty.org/depts/cd/divisions/sustainability/energy-programs/electrify>

⁵⁹ <https://www.sanjoseca.gov/your-government/departments-offices/environmental-services/climate-smart-san-jos/electrify-san-jos>

⁶⁰ <https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Energy/Electrify%20Santa%20Monica%20Rebate%203%20pg%20PDF.pdf>

⁶¹ <https://www.redwoodcity.org/home/showpublisheddocument/23493/637566742860930000>,

⁶² <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442465700>

- ◆ **PG&E** provides equipment rebates for retrofitting with ENERGY STAR high efficiency electric heat pump storage water heaters replacing electric water heaters (such as resistance electric). Qualifying products listed in their rebate catalog qualify for a rebate of \$300 per unit.⁶³
- ◆ **Southern California Edison** provides \$1,000 in rebates for HPWHs, \$300 per ton for central HVAC heat pumps, and \$600 per ton for minisplit HVAC heat pumps.⁶⁴

State Agencies: The **California Public Utilities Commission** (CPUC) is administering and/or implementing several relevant programs listed below. These programs are primarily intended to improve market conditions for heat pump water heaters statewide rather than achieve deep penetration of electrofits in any locale.

- ◆ The Technology and Equipment for Clean Heating (TECH) Initiative will provide incentives to heat pump space and water heating to encourage sales and adoption, up to \$120M program budget statewide.
- ◆ The Self-Generation Incentive Program (SGIP) was updated to include incentives for HPWHs as energy storage devices (anticipated to be a \$1500 rebate) up to a program budget of \$45M statewide.⁶⁵ The proposed incentive would pay a bonus for models with controls that enable HPWHs to be grid responsive. This typically requires additional hot-water storage and capability to perform pre-determined load-shift modes.⁶⁶

TECH and SGIP combined are anticipated to fund approximately 75,000 heat pump water heater installations across California, made available by the third quarter of 2021.

Municipal Utilities: City of Palo Alto, Alameda Municipal Power, and Sacramento Municipal Utility District provide rebates in the range of thousands of dollars to electrify a wide range of residential appliances.⁶⁷

Each program has specific funding rules, and some rebates can be layered while others may not. For example, a PG&E rebate cannot be layered with a BayREN rebate as they come from the same pool of public funding, while the PCE rebate can. Figure 2 below depicts how the layered funding sources can cover conversions of existing methane gas equipment in Menlo Park residential buildings. The investment costs are estimated from the Energy & Environmental Economics retrofit study, and do not include panel upgrades.⁶⁸

As an example, a multifamily building (up to four dwelling units) in Menlo Park can receive a \$1,500 incentive from Peninsula Clean Energy and a \$1,000 incentive from BayREN to replace an in-unit existing methane gas water heater with a HPHW. This would cover about half of the estimated investment cost

⁶³ https://www.pge.com/pge_global/common/pdfs/save-energy-money/savings-solutions-and-rebates/rebates-by-product/ee_residential_rebate_catalog.pdf

⁶⁴ <https://www.sce.com/residential/rebates-savings/rebates>

⁶⁵ *Self-Generation Incentive Program*. Retrieved from <https://www.cpuc.ca.gov/sgip/>

⁶⁶ Retrieved from Heat Pump Water Heater Workshop - Part 2:

https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/SGIP.HPWH.Workshop.Part2.pdf

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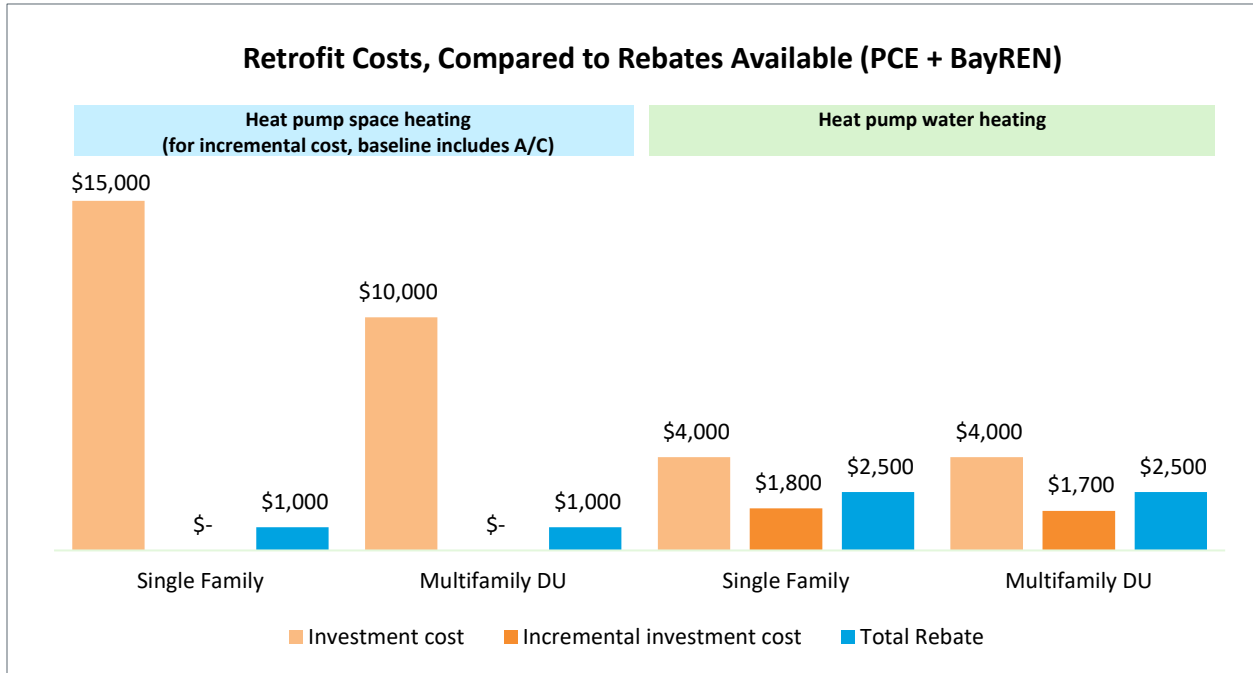
https://www.cityofpaloalto.org/gov/depts/utl/residents/save_energy_n_water/rebates/heat_pump_water_heater/program_details.asp; <https://www.smud.org/en/Rebates-and-Savings-Tips/Go-Electric/Residential-Go-Electric>

⁶⁸ <https://www.ethree.com/e3-quantifies-the-consumer-and-emissions-impacts-of-electrifying-california-homes/>

of \$3,349-4,388 to install a heat pump water heater, and it would more than cover the incremental cost (\$1,435-1,927) compared to replacing a like-for-like methane gas water heater.⁶⁹

For heat pump space heating, the incremental cost is assumed to be \$0 if the existing installation or planned retrofit includes air-conditioning. If air-conditioning is not included, costs associated with siting the exterior unit, electrical wiring, and refrigerant piping can be substantial.

Figure 3. Retrofit Costs Compared to Rebates Available



Existing Multifamily EV Charging Rebate Programs

The following programs reduce cost barriers for EV charging in major alterations:

- ◆ **The Peninsula-Silicon Valley Incentive Project**, funded by the California Energy Commission as part of the California Electric Vehicle Infrastructure Project (CALeVIP), offers rebates in for installations at new, replacement, or make-ready sites.⁷⁰ The incentives for direct current fast EVSE greater than 100 kW covers 75 percent of total project costs, up to \$70,000; projects located in disadvantages communities (DACs) has a higher cap at \$80,000. For Level 2 EVSE for multi-unit dwelling projects, the maximum incentive amount is \$5,500 outside of DACs, and \$6,000 for DACs.
- ◆ **Peninsula Clean Energy’s EV Ready Program** is providing \$28M to install 3,500 charging ports in San Mateo County over the next four years. Incentives range from \$2,000 to \$5,500 per port for existing multi-unit dwellings. There is no limit on the cap for installing L1 chargers, and a cap of \$44,000 for L2 EVSE ports. An additional \$4,000 is available for main panel upgrades.⁷¹

⁶⁹ https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

⁷⁰ <https://calevip.org/incentive-project/peninsula-silicon-valley>

⁷¹ <https://www.peninsulacleanenergy.com/ev-ready-incentives/>

- ◆ **Santa Monica's** EV Charging Station Rebate Program for multifamily unit dwellings (MUDs) and small businesses provides up to \$1,000 (\$1,800 for income-qualified applicants) to offset the cost of purchasing and installing residential Level 1 or Level 2 charging infrastructure.⁷² The program offering can be layered with SCAQMD EV residential EV charging pilot, which provides an additional \$250.⁷³

3.1.2 Tax Credits, Deductions, and Rebates

Co-Lead with Other Agencies | Municipal Resources

Beyond equipment rebates and building retrofit program incentives, there are number of federal tax deduction and tax credits, equipment tax credits, and examples of local tax refund/rebates applicable to electrification retrofits.

- ◆ The **Energy-Efficient Commercial Buildings Federal Tax Deduction** offers \$1.80/ft² tax deduction to buildings that install qualifying building systems that reduce the building's total energy and power cost by 50 percent in comparison to the most recent ASHRAE 90.1 standards, for the year when the system installation was completed.⁷⁴
- ◆ The **Residential Energy Efficiency Federal Tax Credit** was retroactively extended from 2017 through the end 2021. Residential property owners are eligible for tax credits of \$300 for qualifying HPHW and qualifying heat pump air conditioning equipment, with the maximum tax credit for all improvements of \$500 in 2005-2021.⁷⁵

On a municipal level the city can provide tax rebate to encourage electrification measures.

- ◆ **City of Berkeley's** Real Property Transfer Tax is imposed on all property transfers, and ranges from 1.5 percent - 2.5 percent of the property value. Up to 1/3 of the base 1.5 percent transfer tax rate is eligible for a Seismic Transfer Tax Refund, if the property owner performs voluntary seismic upgrades within one year of the transfer.⁷⁶ Historically, an average of 13 percent of eligible homeowners have received the refund between 2014 and 2019.⁷⁷ The City is considering updates to expand the Seismic Tax Refund Program include resilience, energy efficiency, electrification measures for commercial and mixed-used buildings.⁷⁸

⁷²https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Transportation/Phase3_EV_RebatePacket.pdf

⁷³<http://www.aqmd.gov/home/programs/community/community-detail?title=ev-charging-incentive>

⁷⁴<https://programs.dsireusa.org/system/program/detail/1271/energy-efficient-commercial-buildings-tax-deduction>

⁷⁵https://www.energystar.gov/about/federal_tax_credits

⁷⁶https://www.cityofberkeley.info/Finance/Home/Real_Property_Transfer_Tax_Seismic_Refunds.aspx

⁷⁷[July 21, 2020 staff report to Council](#)

⁷⁸[https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-](https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/Commission_for_Energy/2021-01-27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electfication%20Strategies.pdf)

[27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electfication%20Strategies.pdf](#)

[27_EC_Item%209_Late%20Communication_Item%204_Proposed%20Existing%20Building%20Electfication%20Strategies.pdf](#)

3.1.3 Grant Programs

Co-Lead with Other Agencies | Municipal Resources

Federal grants are targeted to specific demographics and types of projects, creating a patchwork of funding that is generally not available to all residents. Generally, the Biden Administration has signaled an emphasis in delivering grants (and loans) to energy projects that create new, high-paying jobs.⁷⁹

- ◆ **Community Development Block Grants (CDBGs)** is a program administered by the Department of Housing and Urban Development and provide communities with energy improvements by giving state and local governments the ability to transform a portion of their CDBG funds into federally guaranteed loans.⁸⁰ The grant is only available for projects in cities with populations of less than 50,000, except principal cities in metropolitan areas.
- ◆ The **Weatherization Assistance Program** is a grant program administered by the Department of Energy for residential energy efficiency retrofits (including electrofit measures) and solar additions. This program focuses on residences with elderly individuals, individuals with disabilities, and families with children. Recipients must be a resident of California and have an annual income that is below 60 percent of the state median Income.⁸¹
- ◆ The **U.S. Department of Transportation** has highlighted several EV infrastructure programs with substantial funding, though they are primarily for Highway installations and other public areas.⁸² Nevertheless, President Biden’s American Jobs Plan includes \$15 billion to fund a national network of 500,000 charging stations, including grant and incentive programs for local governments to accelerate deployment in apartment buildings.⁸³

3.1.4 Loan Programs

Co-Lead with Other Agencies | Municipal Resources

A municipality can use borrowing capacity or loan loss reserve to develop a partnership with a local lender and create a loan program to finance electrification enhancements. A dedicated loan program brings a streamlined funding opportunity and rate certainty to property owners who are considering the prospect of electrification and would benefit from the extra financial line of sight.

Within California

- ◆ The California Hub for Energy Efficiency Financing has several financing options available for energy related upgrades, excluding solar PV but including several electrification measures. The program is administered by CPUC and paid for with IOU program funds.⁸⁴ Eligible properties

⁷⁹ <https://www.politico.com/news/2021/03/04/graholm-clean-energy-spending-473668>

⁸⁰ <https://www.hudexchange.info/programs/cdbg-state/>

⁸¹ <https://www.benefits.gov/benefit/1844>

⁸²

https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/resources/ev_funding_report_2021.pdf

⁸³ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-biden-administration-advances-electric-vehicle-charging-infrastructure/>

⁸⁴ <https://gogreenfinancing.com/>

must receive either electric or gas service from an IOU, and up to 30 percent of financing can be used for non-eligible improvements.

- **Residential Energy Efficiency Lending (REEL)** and program provides financing for energy related upgrades for owners of any residential property up to four units. Borrowers can access up to \$50,000 for payback terms between 5 to 15 years. Interest rates are between 3.99 – 5.99 percent depending on credit scores, and the average interest rate is 5.02 percent across all terms. Only 28 percent of loans were made to customers with credit scores less than 700, and 18 percent of loans were made to upgrade properties in disadvantaged communities. In early 2021, approximately 1,059 loans have been administered on a total of \$2.6M. For every dollar lent, \$6.60 in private lending has been leveraged.⁸⁵
- The **Affordable Multifamily Financing (AMF)** program is available for properties of five or more units, where at least 50 percent of the units are restricted to income-eligible households. The property must be subject to deed restrictions that require the owner to keep rents affordable for a minimum of five years. Repayment can be either direct to the finance company or on-bill for master-metered multifamily properties.
- The **Small Business Financing (SBF)** program is for business and nonprofit building owners or tenants with fewer than 100 employees and limitations on annual revenue.
- ◆ **Sonoma Clean Power** provides an on-bill financing program.
- ◆ **Peninsula Clean Energy** is launching an on-bill financing program in early 2022.
- ◆ **BayREN** has recently launched the Small Business Microloan program provides no-interest financing on ENERGY STAR certified products. The program is still in a pilot phase. Pre-existing monthly debt payments must be less than half of the business's monthly income.⁸⁶
- ◆ **Property-Assessed Clean Energy (PACE)** is a financing mechanism available to private ownership models that enables low-cost, long-term funding for energy efficiency, renewable energy, and water conservation projects. PACE allows property owners to borrow money to pay for energy improvements and repay via a special contractual assessment on the property over a length of the agreement terms (up to 20 years). California state law enabled municipalities to offer PACE financing programs since 2008. The California State Treasurer says that PACE may be used to finance electrification conversions, though specific examples have not been identified.

PACE has had consumer protection issues such as abusive contractor practices and unsustainable loans.⁸⁷ In 2010, the Federal Housing Finance Agency (FHFA) directive prevented Fannie Mae and Freddie Mac from purchasing home mortgages with a PACE lien, and the residential PACE activity had since subsided, except for PACE programs that operate with loan reserve funds or other measures that address concerns raised in FHFA's directive.⁸⁸ Nonetheless, the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) has established a PACE Loss Reserve program to mitigate risk to mortgage lenders associated with residential PACE financing.⁸⁹

⁸⁵ <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442467615>

⁸⁶ <https://www.missionassetfund.org/bayren/>

⁸⁷

⁸⁸ <https://programs.dsireusa.org/system/program/detail/3527/local-option-municipal-energy-districts>

⁸⁹ <https://www.treasurer.ca.gov/caeatfa/pace/index.asp>

- ◆ **Fannie Mae** provides HomeStyle Energy Mortgage works with lenders to offer loan products to their consumers specifically for energy or water improvements. Borrowers can finance energy or water efficiency improvements or resiliency upgrades when purchasing or refinancing a home. HomeStyle Energy may be a more affordable financing solution than a subordinate lien, home equity line of credit, PACE loan, or unsecured loan.⁹⁰

Outside of California

- ◆ **City of Fort Collins** instituted a Home Efficiency Loan Program with local banks to identify inefficient homes occupied by low-to-moderate income families. The program also connected the building owners with local contractors and suppliers who do the renovations. The City's borrowing capacity helped deliver up to \$3.25M over 15 years and provide on-bill financing of efficiency projects, including HVAC upgrades, envelope upgrades, and solar PV.⁹¹
- ◆ **City of Boulder** leveraged a local credit union, Elevations Credit Union, and created an energy loan for homeowners that Boulder County supports with a loan loss reserve. Loan rates range from an APR of 2.75 percent for a 3-year loan up to 8.125 percent for a 15-year loan.⁹² Similar offerings are available to homeowners in Colorado with various local municipal program partners.
- ◆ **Connecticut Green Bank** provides a sub-ordinated debt vehicle, technical assistance, and outreach strategy for their Solar for All program. The program is available to all homeowners (not renters), not dependent on credit score, and focuses on enrolling low-to-moderate income (LMI) applicants. The program aimed to reduce the energy burden for LMI customers down to where it would be if the applicant was affluent and was able to reach 7.5 percent of LMI multifamily housing in the state since FY2014.

3.1.5 Electrification as a Service

Co-Lead, or Support IOUs and Community Choice Aggregations (CCAs) | Pilot, or Support and Advocacy

Building owners can *host* the electrification or EVSE infrastructure and receive lease payment from vendors for allowing them to develop, install, own, and operate the equipment. This is similar to a power purchase agreement for solar installations. In these arrangements, a third-party company would finance and own the asset and be responsible for system design, install, and operation and maintenance, while the host building receives reoccurring payments for providing the property for the system, or they agree to purchase the energy at an agreed upon rate.

- ◆ **BlocPower** provides heat pump leasing models aimed at affordable multifamily buildings and small/medium commercial buildings. Since 2012, the company has completed energy projects in 1,000 buildings, and implements leasing structures, project management, and monitoring while delivering energy bill reductions.⁹³

⁹⁰ <https://singlefamily.fanniemae.com/originating-underwriting/mortgage-products/homestyle-energy-mortgage>

⁹¹ <https://www.fcgov.com/utilities/epicloan>

⁹² <https://www.elevationscu.com/loans/energy-loans>

⁹³ <https://www.blocpower.io/>

- ◆ **SparkFund** provides a subscription-based approach to energy systems for commercial and industrial customers, with monthly payments for energy upgrades and operation that deliver outsized utility bill savings.⁹⁴
- ◆ **NYSERDA** and **National Grid** are in the process of launching the Home Energy Savings Program pilot, which utilizes ratepayer funding for a pay-for-performance approach that funds whole-house efficiency measures. The program solicits bids from service providers and installing contractors who will develop a project pipeline to receive payments from the program. Development of financing for upfront measure costs is encouraged in a variety of ways, as preferred by the service provider, including upfront payments from customers, debt financing, and equity financing. Service providers and installing contractors are compensated by the program over a period of three years via metered reductions in energy and bill savings.⁹⁵

A fundamental challenge to the *as-a-service* model is to identify buildings with predictable energy consumption that provide steady revenue streams and motivates vendors. This is an area where local governments can provide a critical matchmaking function between technology providers and high potential host sites, such as defining provider criterion and a portfolio of qualifying host sites, to lower development and customer acquisition costs. Local governments can further assist with the development of template agreements that lower the transactional costs of electrification-as-a-service projects.

3.1.6 Ratepayer-Funded Tariffed On-Bill Investment

Support to CPUC, IOUs, and CCAs | Support and Advocacy

There are multiple types of on-bill financing and investment. According to a recent white paper on accessible financing:⁹⁶

“A tariffed on-bill program allows a utility to pay for cost-effective energy improvements at a specific residence, such as home heating and cooling units, and to recover its costs for those improvements over time through a dedicated charge on the utility bill that is immediately less than the estimated savings from the improvements. The tariffed on-bill model differs from on-bill loans and repayment models in that tariffs are not a loan, but rather a utility investment for which cost recovery is tied to the utility meter according to terms set forth in a utility tariff.”

Tariffed on-bill models, also known as *pay as you save*, are particularly well suited for LMI homeowners and renters of all incomes, because they do not provide cost or credit barriers while enabling behind-the-meter investment.

Municipalities must rely on CPUC regulation to authorize, and the IOUs and perhaps CCAs to administer on-bill financing in the coming years. Local governments would ensure that renters have access to on-bill savings associated with decarbonization investments and enforce affordable housing provisions.

⁹⁴ <https://www.sparkfund.com/case-studies/>

⁹⁵ <https://www.nyserda.ny.gov/All-Programs/Programs/Home-Energy-Savings-Program/Portfolio-Managers>

⁹⁶ https://www.buildingdecarb.org/uploads/3/0/7/3/30734489/bdc_whitepaper_final_small.pdf

- ◆ The **Town of Windsor** and the **City of Hayward** received permission from their oversight bodies and implemented tariffed on-bill water efficiency programs, known as Windsor Efficiency PAYS and Green Hayward PAYS, respectively. **BayREN** now administers the Water Upgrades \$ave program, which has enrolled 584 multifamily units and 247 single family units across the nine Bay Area counties. 87 percent of program participants would recommend the program.⁹⁷
- ◆ The **Southeast Energy Efficiency Alliance** has invested in a variety of loan and on-bill financing programs and found that tariff on-bill investments have outperformed loans in multiple metrics.⁹⁸

3.2 Municipal Mechanisms

3.2.1 Green Bonds

Local Government Authority | Resolution, Ballot Measure

Green bonds issued by municipal entities help finance projects with a positive climate impact, such as renewable energy and energy efficiency. Funds can likely only be used for public buildings. Governments issue bonds, and investors receive principle and fixed interest payments in return. CAEATFA has provided Energy Conservation Bond financing to 26 projects amounting to \$212M.⁹⁹

Green bonds have higher transactional costs than conventional loans and have standards and certification for use of funds to qualify attaching the green label. Notable issuances of green bonds include:¹⁰⁰

- ◆ **Hayward Unified School District** issued \$20M in bonds for renewable energy and sustainability projects.
- ◆ **Imperial Irrigation District** issued \$65M in bonds for renewable energy projects.
- ◆ **Sacramento Municipal Utility District** issued \$75M in bonds for green building projects.

In 2019, the cumulative issuance of municipal bonds exceeded \$8 billion, and the California Green Bond Market Development Committee was launched.¹⁰¹

3.2.2 Local Taxes and Fees

Local Government Authority | Ballot Measure

Local governments may tax building projects for greenhouse gas emissions and use the funding to incentivize future decarbonization offsets throughout the jurisdiction. A utility users' tax (UUT) may be levied by municipalities to provide general fund revenue. The tax may be increased to generate funds for projects and programs that reduce greenhouse gas emissions.

⁹⁷

⁹⁸ <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442467615>

⁹⁹ <https://www.treasurer.ca.gov/caeatfa/incentives.asp>

¹⁰⁰ <https://www.treasurer.ca.gov/cdiac/webinars/2019/greenbonds/green-bonds-session.pdf>

¹⁰¹ <https://gspp.berkeley.edu/centers/cepp/projects/green-bonds-market-development-committee/ca-green-bond-market-development-committee>

- ◆ **City of Berkeley** proposed Measure HH in 2020 to increase the UUT from 7.5 percent to 10 percent for electricity and 12.5 percent for methane gas.¹⁰² Despite strong community support from a survey, the ballot measure was ultimately defeated.
- ◆ **City of Albany** proposed Measure DD to increase the UUT from 7 percent to 9.5 percent for electricity and gas and apply a tax to water service at 7.5 percent. The measure passed. The measure is estimated to generate an additional \$675,600 in new revenues annually for the City.¹⁰³
- ◆ **City of Watsonville** adopted a Carbon Fund Ordinance in 2015 that charges a fee to all development projects including new construction, additions, and alterations, with the exception of single-family alterations. The additional carbon impact fee is between 30 and 50 percent of the building permit fee. Projects may be refunded the fee if they install on-site renewable generation to offset the average annual electricity load.¹⁰⁴
- ◆ In late 2019, the **City of San Luis Obispo** tentatively proposed a greenhouse gas *in-lieu fee* for new construction projects that installed fossil fuel consuming appliances, ranging from \$6,013 for a typical single-family residence up to \$89,000 for a 54,000 ft² office.¹⁰⁵ This measure has been delayed for adoption due to political pressure.

¹⁰² [https://www.cityofberkeley.info/Clerk/City_Council/2020/07_Jul/Documents/2020-07-21 \(4pm\) Special Item 05 Placing a Tax Measure on the November pdf.aspx](https://www.cityofberkeley.info/Clerk/City_Council/2020/07_Jul/Documents/2020-07-21%20(4pm)%20Special%20Item%2005%20Placing%20a%20Tax%20Measure%20on%20the%20November%20pdf.aspx)

¹⁰³ <https://cdn.kqed.org/wp-content/uploads/2020/10/09-Measure-DD-City-of-Albany-UUT.pdf>

¹⁰⁵ <https://www.sanluisobispo.com/news/local/environment/article234680472.html>

4 Recommendations and Gaps

Given the pace and scale of efforts necessary to achieve carbon neutrality, municipalities must address all areas of the market by invoking as many effective policy and financing options as resources allow. To assess the policy and financing options that may be most effective, TRC developed a scoring system by which to rate each option described in this report. Each option was assessed on a red (“low”) to green (“high”) scale according to each of the following characteristics:

- ◆ Availability – How widely available is the policy or financing option currently, particularly in California? An option with several examples would indicate a high degree of readiness for replication.
- ◆ Ease of Implementation – How easily would this policy or financing option be administered from the perspective of the agency, and/or participate in from the perspective of the applicant? Reduced administrative burden suggest quicker processing, a high application rate, and stretching resources for a longer program period.
- ◆ Scalability – If given enough resources, can the policy or financing option be scaled to capture all of targeted population?

TRC also characterized each policy and financing option by target market (residential buildings, nonresidential buildings, or EV infrastructure), target population (building owners, renters), target income level (i.e., low-income), and potential role for the municipality (lead or advocate). These characterizations allowed for a standardized format to develop recommendations and point to significant gaps.

Results are sorted by those scoring highest in Figure 3, and are accompanied by a narrative providing further detail.

Figure 4. Policy and Financing Characteristics Summary

	Sub-Category	Mechanism			Ease of			Recommended	Muni Role
			Bldg	EV	Availability	Implementation	Scalability		
Policy	Triggered	2.1.2 Point of Transfer	●		●	●	●	●	Lead
	Gov't Buildings	2.1.1 CIP	●		●	●	●	●	Lead
	Performance	2.1.3 Disclosure	●		●	●	●	●	Lead
	Triggered	2.1.2 Major Alteration	●	●	●	●	●	●	Lead
	Achieving Equitable Outcomes	2.1.5	●		●	●	●	●	Lead, Advocacy
	Performance	2.1.2 Emissions Limits	●		●	●	●		Advocacy, Lead
	Eliminate Gas Inf.	2.1.4	●		●	●	●		Advocacy
Consumer Financing	Incentive Programs	3.1.1 CCA (PCE) - EV		●	●	●	●	●	Advocacy
	Incentive Programs	3.1.1 Regn'l Agency (BayREN)	●		●	●	●	●	Advocacy
	Incentive Programs	3.1.1 Local Gov't - Bldg	●		●	●	●	●	Lead
	Tax Credit/Deduction	3.1.2 Federal	●		●	●	●	●	Advocacy
	Electrification as a Service	3.1.5	●	●	●	●	●	●	Advocacy
	Incentive Program	3.1.1 CCA (PCE) - Bldg	●		●	●	●	●	Advocacy
	Incentive Programs	3.1.1 IOUs (PG&E)	●		●	●	●	●	Advocacy
	Tariffed On-Bill	3.1.6	●		●	●	●	●	Advocacy
	Incentive Programs	3.1.1 Regn'l Agency (CSD)	●		●	●	●	●	Advocacy
	Loan Programs	3.1.4 AMF	●		●	●	●	●	Advocacy
	Loan Programs	3.1.4 Municipal Support	●		●	●	●		Lead
	Loan Programs	3.1.4 REEL	●		●	●	●	●	Advocacy
	Loan Programs	3.1.4 SBF	●		●	●	●	●	Advocacy
	Grants	3.1.3 WAP	●		●	●	●		Lead
	Incentive Programs	3.1.1 Local Gov't - EV		●	●	●	●		Lead
	Loan Programs	3.1.4 PACE	●	●	●	●	●		Lead, Advocacy
	Tax Credit/Deduction	3.1.2 RPTT	●		●	●	●		Lead
Incentive Programs	3.1.1 State Agencies	●		●	●	●		Advocacy	
Grants	3.1.3 CDBGs	●	●	●	●	●		Lead	
Muni	Local Taxes and Fees	3.2.2 UUT, Carbon Tax	●		●	●	●	●	Lead
	Green Bond	3.2.1	●	●	●	●	●	●	Lead

4.1 Policy Findings

4.1.1 Recommendations

TRC recommends that Menlo Park and other jurisdictions with similar goals explore the following policy options in the near term for building electrification:

- ◆ 2.1.1 Municipal Buildings Lead with Electrification – An important policy to raise the profile of community goals, increase government familiarity with the challenges and opportunities of electrification, and establish notable precedents. Jurisdictions should also explore electrification policies as part of Capital Improvement Projects though this policy cannot scale beyond municipal projects.
- ◆ 2.1.2 Triggered Appliance Conversion – Highly scalable and readily enforceable if permits are pulled regularly. An example of successful policy implementation includes City of Davis’s Resale Program (triggered at point of transfer).
- ◆ 2.1.3 Building Performance Standards – Highly scalable and readily enforceable. The City of Boulder’s SmartRegs Program has achieved high compliance in existing building energy efficiency compliance.
- ◆ 2.1.5 Achieving Equitable Outcomes– Critical to reversing the lasting impacts of discriminatory policies and ensuring

The jurisdiction has the ability to serve as the lead agency in all of these policy options, which is beneficial to enforce customized policies but may also lead to higher administrative investment.

4.1.2 Gaps

TRC noted the following policy mechanism gaps:

1. Though there are several examples of policies triggering additional requirements at the time of major alterations (2.1.2), they have not been implemented for a significant time period and have unknown potential for success. Applicants may attempt to dodge electrification requirements through creative permit applications or avoiding the process entirely.
2. There are very limited examples of existing building policies applying to electric vehicle infrastructure.

4.2 Financing Findings

4.2.1 Recommendations

TRC recommends that jurisdictions explore the following financing pathways for building electrification, largely serving in advocacy and educational outreach roles:

Consumer Financing

- ◆ 3.1.1 Incentive Programs – A local jurisdiction may share eligible incentives with project applicants. Several entities, notably PCE and BayREN, have incentive programs in place that are broadly applicable, including carveouts for low-income populations. PCE in particular has two

programs specifically for adding EV charging infrastructure in existing multifamily buildings, although is slightly limited in scalability as applicants must be PCE customers to be eligible.

A local jurisdiction may also lead the development of incentive programs, likely with funding from a partner organization. San Jose and Marin County funded electrofit incentives by partnering with BAAQMD.

- ◆ 3.1.2 Tax Credits, Deductions, and Rebates – Federal tax incentives can be attained for eligible electrofits and stacked with incentive programs, though they are fairly low amounts.
- ◆ 3.1.5 Electrification as a Service – A local jurisdiction can play a key role in fostering an Electrification as a Service market by reducing market entry barriers for providers such as BlocPower. Or, a jurisdiction can advocate for establishing a local program like NYSEERDA's, which creates a market for contractors and installers by paying them for projects that deliver metered bill savings.
- ◆ 3.1.6 Ratepayer-Funded Tariffed On-Bill Investment – Tariffed on-bill programs serve a wide market, including the harder to reach markets such as renters with modest credit history. Local jurisdictions can advocate with the CPUC to ensure this policy option becomes available.
- ◆ 3.1.4 Loan Programs – A suite of loans are available for credit-worthy residential and nonresidential building owners through the state financing authority. These programs may fill in gaps where building owners may have insufficient access to incentive programs or tax deductions. Loans are expected to be one of the last options to financing a project, as they carry more risk for the applicant than many of the preceding options listed.

Municipal Financing

- ◆ 3.2.1 Green Bonds and 3.2.2 Local Taxes and Fees – Voter-approved fund generation mechanisms can affirm a community's willingness to invest in decarbonization measures. Bonds can be used for public infrastructure projects, and increased revenues from utility taxes can serve potentially provide consumer financing.

4.2.2 Gaps

TRC noted the following financing mechanism gaps:

1. The investment for heat pump space heating as a replacement for a methane gas furnace can be very high in a building that doesn't already have air-conditioning, which is prevalent in the Bay Area according to the Residential Appliance Saturation Survey. TRC did not identify incentives large enough to support this market to transition away from methane gas.
2. As with policy options, there is limited precedence for existing building EV financing. A jurisdiction may supplement PCE's EV incentive program with additional incentives, or additional loan programs targeted toward EV investment in a similar manner that Boulder partnered with a local credit union.
3. Nonresidential buildings are eligible for fewer incentive programs than residential. This may be due to the higher turnover rate of nonresidential spaces and equipment, the higher financing needs and access of the nonresidential market.

4.3 Further Considerations

TRC recommends that local jurisdictions thoroughly assess the people and buildings needing that must be reached to achieve the carbon neutrality goals. Understanding the scale of the challenge (e.g., square footage of buildings by type, number of multifamily buildings with parking, major property owners in the City, energy burden for low-income residents) will allow the jurisdiction to estimate the corresponding scale of the solutions necessary (e.g., dollars of investment, outreach strategies, retrofit rates, consumer protections).

Several related issues emerged throughout the course of TRC's research that did not explicitly fit within the scope of this report. These additional considerations, listed briefly below, suggest that the policy and financing options in this report would be implemented more effectively if the jurisdiction a range of market transformation strategies:

1. Protecting consumers must be a priority to prevent the abusive practices that emerged in the PACE program. For example, financing energy upgrades with home-secured debt is inappropriate for homeowners with lower incomes.
2. Simplifying permitting processes will reduce administrative burden. Coordinating the processes across jurisdictions will familiarize the building industry with requirements.
3. Measure packaging, such as combining electrofits, EV charging, efficiency, demand response compensation, and/or on-site solar may drive down operating costs and improve cost effectiveness. Adding vehicle-to-building charging or battery storage may improve resiliency and project appeal.
4. Inspecting, auditing, and/or evaluation provides an accurate understanding of program impacts and informed position by which to make future investments.
5. Targeting outreach and programs to portfolio property owners may generate economies of scale.
6. Achieving 'early wins' can demonstrate feasibility, drive down market barriers, and improve public perception.
7. Ensuring that the workforce is well-trained and incentivized to perform high-quality installations will require dialogue with local trade associations, unions, training programs, and certifying bodies. These efforts can achieve equitable outcomes, as demonstrated by the RichmondBUILD and Rising Sun Center for Opportunity's Climate Careers programs.^{106,107}
8. Providing technical assistance with engineering and financing approaches can simplify compliance and mitigate negative experiences.

¹⁰⁶ <http://www.ci.richmond.ca.us/1243/RichmondBUILD>

¹⁰⁷ <https://risingsunopp.org/>