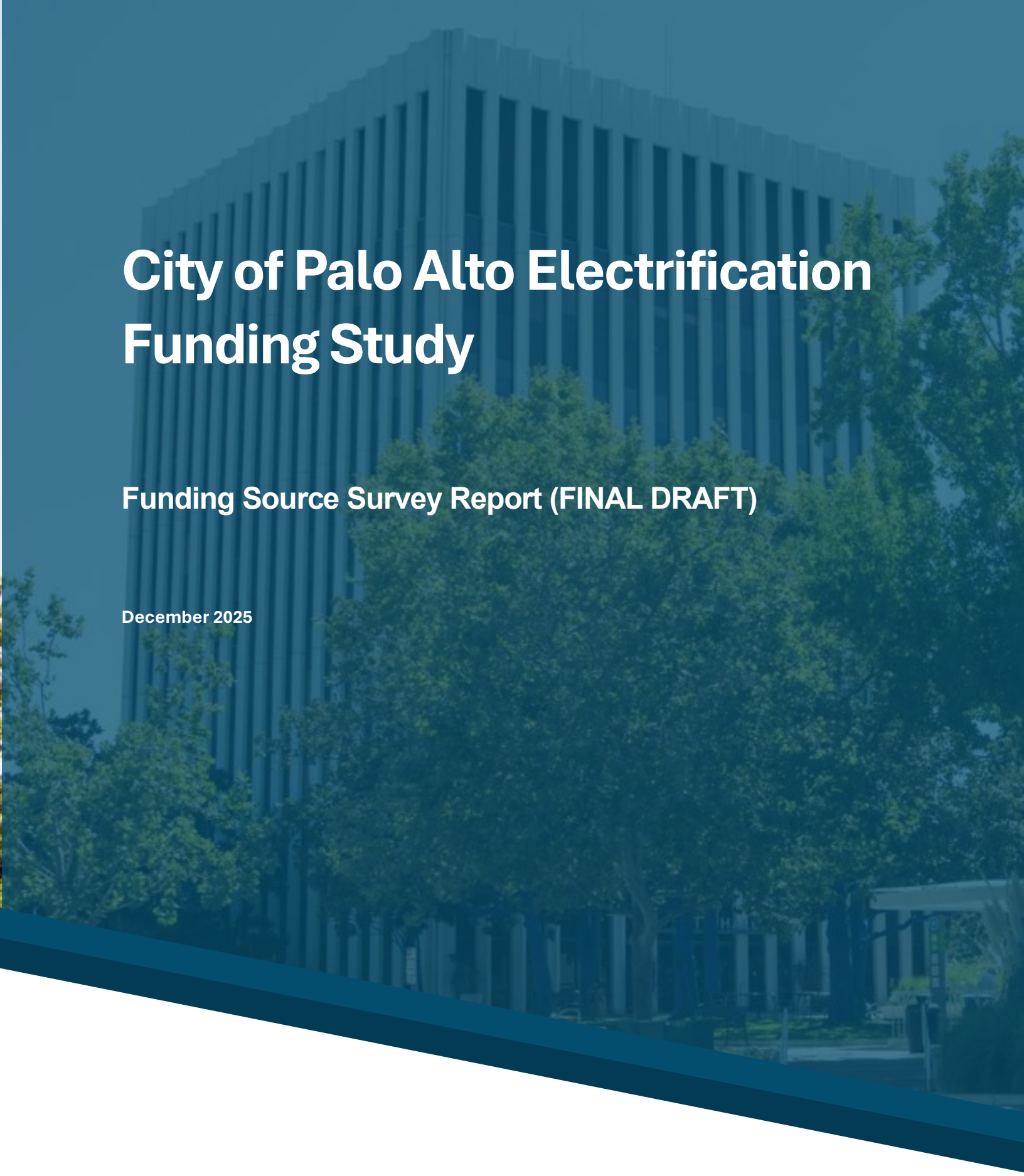

City of Palo Alto Electrification Funding Study

Funding Source Survey Report (FINAL DRAFT)

December 2025

Energy+Environmental Economics

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Acronym Definitions

Acronym	Definition
AB	Assembly Bill
ASHP	Air Source Heat Pump
BAAQMD	Bay Area Air Quality Management District
BEV	Battery Electric Vehicle
CaaS	Charging-as-a-Service
CARB	California Air Resources Board
CEC	California Energy Commission
CES	Clean Energy Surcharge
CFBP	Consumer Financial Protection Bureau
CFD	Community Facilities District
CFI	Charging and Fueling Infrastructure
CMAQ	Congestion Mitigation and Air Quality
CPAU	City of Palo Alto Utilities
CPUC	California Public Utilities Commission
DAC	Disadvantaged Community
EIFD	Enhanced Infrastructure Financing District
EPSC	Energy Performance Savings Contract
ESCO	Energy Service Company
EV	Electric Vehicle
EV-PIR	EV Phase-In Rate
FAST	Fixing America's Surface Transportation
FY	Fiscal Year
GO	General Obligation
GSHP	Ground Source Heat Pump
HEAR	Home Electrification and Appliance Rebates
HEET	Heating Efficiently with Electric Technology
HER	Home Efficiency Rebates
HFCV	Hydrogen Fuel Cell Vehicle
HOMES	Home Owner Managing Energy Savings
HOT	High-Occupancy Toll
HPWH	Heat Pump Water Heater
HVAC	Heating, Ventilation and Air Conditioning
ICE	Internal Combustion Engine
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act
LCFS	Low Carbon Fuel Standard
LEZ	Low Emission Zone

LMI	Low- and Moderate-Income
MTA	Metropolitan Transportation Authority
NCIF	National Clean Investment Fund
NOx	Nitrous Oxide
NYSERDA	New York State Energy Research and Development Authority
PACE	Property Assessed Clean Energy
PASS	Preservation and Seismic Safety
PBD	Parking Benefit District
PFA	Public Financing Authority
PHEV	Plug-in Hybrid Electric Vehicle
PPP	Public-Private Partnership
S/CAP	Sustainability and Climate Action Plan
SacRT	Sacramento Regional Transit District
SB	Senate Bill
SFMTA	San Francisco Municipal Transportation Agency
SMUD	Sacramento Municipal Utility District
STO	State Treasurer's Office
TECH	Technology and Equipment for Clean Heating
TIO	Technology Implementation Office
TOB	Tariffed On-Bill
ULEZ	Ultra Low Emission Zone
ZEV	Zero Emission Vehicle

Executive Summary

Within California, a state known for ambitious climate goals, Palo Alto is a leading actor in the fight against climate change. In 2016, City Council adopted an aggressive community-wide emissions reduction goal of 80% below 1990 levels by 2030 ("80x30") and created an initial Sustainability and Climate Action Plan (S/CAP) to outline the steps Palo Alto would need to take to meet these ambitious targets. As the S/CAP has evolved, a major focus of the plan is accelerating building and transportation electrification. However, a major barrier to electrification is cost; electric vehicles are currently more expensive than their internal combustion engine counterparts, heat pumps are more expensive than traditional furnaces that run on natural gas or fuel oil, and the costs associated with electric vehicle charging infrastructure are significant.

This report will focus on the various sources of capital available to different entities within Palo Alto for the purpose of funding communitywide transportation and building electrification. These sources include both funding and financing sources available to the City as a Municipality, the City as a Utility, third-party entities involved in electrification, and community members looking to electrify their vehicles, homes, and businesses.

The report is divided into three sections. The first section covers External and Existing Funding Opportunities; this encompasses any funding or financing source made available from the State, the Federal Government, or any other program that is already available to the Palo Alto community. Note that this survey was completed in 2024, and there have been significant changes in Federal policy that are not reflected in this report. The second section will focus on Prospective Strategies. Prospective Strategies encompass the funding and financing sources that will be necessary to close the financial gap remaining after existing sources have been utilized to the highest extent realistically possible. Prospective strategies include new taxes, utility-related revenue sources, and private capital made available for electrification by third-party entities. The final section of the report will cover Implementation Strategies; this section covers any strategies that can be implemented by the City, the Utility, or third-party entities in order to use the collected capital to promote and accelerate electrification.

Given the magnitude of the cost of electrification, it is expected that each stream of capital be allocated to some type of program, incentive, or public investment that would promote building and transportation electrification within Palo Alto. It is also expected that Palo Alto's funding and financing strategies will likely evolve over time. However, this report serves to identify these potential funding and financing strategies to be considered in the S/CAP Funding Study; the Funding Study itself will identify combinations of these funding and financing sources that could be used in tandem for the City Council to consider.

This report offers a high-level review of a wide variety of national and international programs and funding sources that have been used for climate-related projects. It is not a legal memo; rather this report is intended to generate a variety of potential funding starting points for further exploration. California is unique in that its constitution restricts the use of tax revenues for specific purposes and mandates voter approval for taxes and charges that exceed constitutional cost-of-service

requirements. California law also provides public agencies with a variety of ways to raise revenue by issuing bonds, along with specific requirements on legally valid uses of bond proceeds. The legality of programs and funding mechanisms implemented in Palo Alto will be very fact-dependent, and in-depth legal analysis will be necessary before proceeding with individual measures.

Introduction

In 2015, Governor Brown signed Executive Order B-30-15, which set the goal for California to reduce emissions by 40% below 1990 levels by 2030. California Senate Bill 32 (SB 32) turned this Executive Order into state law. The City of Palo Alto ("the City") is a leading actor in the fight against climate change within the world's 5th largest economy; in 2016, City Council adopted an aggressive community-wide emissions reduction goal of 80% below 1990 levels by 2030 ("80x30") and created an initial 2016 Sustainability and Climate Action Plan (S/CAP) to outline the steps Palo Alto would need to take to meet these ambitious targets. The 2022 S/CAP is a revised, and more comprehensive, roadmap to reaching Palo Alto's aggressive 2030 climate targets and ensuring a resilient community for all community members in the years to come.

A focus of Palo Alto's S/CAP climate goals is accelerating building and transportation electrification. This means increasing the speed with which consumers, businesses, and governments expand their use of alternative transportation, purchase electric vehicles to minimize their remaining transportation emissions, and adopt heat pumps and other electric appliances and equipment to decrease their building emissions.

Meeting the S/CAP targets will require nearly 100% electrification of all buildings and vehicles in Palo Alto by 2040.[1] However, cost is currently a major barrier to the goal of electrification. Electric vehicles are currently more expensive than their internal combustion engine counterparts and transportation electrification requires investment in charging infrastructure. Similarly, heat pumps are more expensive than the space heating alternative – a traditional furnace or boiler running on natural gas or distillate – and may require building electrical upgrades depending on the age of the building. Although these cost differences may decrease in the future, it is currently a major obstacle to communitywide electrification.

The total cost to electrify all buildings and vehicles ("Total Community Cost to Electrify") is yet to be determined, but it is predicted that it will be substantial and not an effort that will be fully funded or financed from existing revenue sources.[2] As published in the Fiscal Year (FY) 2024 Palo Alto Budget in Brief, the City's current FY 2024 budget (July 1, 2023 – June 30, 2024) is $1.0B. Currently, the primary categories of revenue are:

- **Net Sales:** Includes revenues generated from Palo Alto utilities, accounting for 42.2% of total revenue sources (FY 2024).[3]

[1] The specific pace of transportation and building electrification depends on the assumed scenario for rate of electrification, but most scenarios reach 100% electrification by 2040.

[2] Total Community Cost to Electrify is being calculated by Energy and Environmental Economics (E3) through the S/CAP Funding Model.

[3] Additional prospective funding from this revenue stream is discussed in the section titled "Prospective Strategies" under "City as a Utility Perspective".

- **Tax Revenue.** Includes revenues generated from taxes, accounting for 15% of total revenue sources and nearly 60% of General Fund revenue.[4]
- **Other Revenue:** Includes revenue generated from charging for services, like permits, programs, or class registration.[5]
- **Use of Reserves/Fund Balance:** Includes the use of reserves as a funding stream, accounting for 19% of all revenue streams.[6]

This report will focus on various sources of capital available to different entities within Palo Alto. Sources of capital include both funding and financing sources; for the purpose of this report, "funding sources" are considered sources of capital that do not require the recipient to pay back the money over time; "financing sources" do require payback to the lending entity. These sources can complement each other, with a long-term stable funding source allowing access to greater up-front financing for large capital investments. Some of these sources are currently available via the State or Federal government (see "External and Existing Funding Opportunities"), whereas some of these sources are considered prospective (see "Prospective Strategies") and would require some type of implementation on Palo Alto's part to utilize.

Fortunately, the Palo Alto community has access to multiple sources of funding that will decrease the communitywide cost of electrification in the form of State and Federal grants. Various grants are being made available to the City of Palo Alto, the City of Palo Alto Utilities (CPAU), and community members looking to invest in electrification (see "External and Existing Funding Opportunities"). However, electrification costs not covered by Federal or State funding sources must be covered by prospective funding or financing sources (see "Prospective Strategies"); utilizing these sources would require some type of implementation on Palo Alto's part to utilize. The portion of electrification costs not covered by existing funding opportunities will largely be borne by community members, whether it is via personal expenditures, or via increased taxes and utility rates necessary to increase the City's ability to invest in electrification.

This report will cover these funding and financing sources that are currently or prospectively available to the community. Prospective sources are labeled based on the primary entity involved with utilizing the source of capital. The perspectives highlighted in this report include:

- **City as a Municipality**: The City of Palo Alto acting as a municipality to raise capital through strategies such as taxes, pricing structures, or issuing municipal bonds
- **City as a Utility:** The CPAU raising capital through strategies such as increased revenue from electricity sales, or issuing utility bonds

[4] Additional prospective funding from this revenue stream is discussed in the section titled "Prospective Strategies" under "City as a Municipality Perspective".

[5] Additional prospective funding from this revenue stream is discussed in the section titled "Prospective Strategies" under "City as a Municipality Perspective."

[6] Existing reserves funding is discussed in the "External and Existing Funding Opportunities" section, under "Funding opportunities available to the City as a Municipality". Additional prospective funding from reserves is discussed in the section titled "Prospective Strategies" under "City as a Municipality Perspective."

- **Third-party:** Third parties, such as non-profits or private businesses,[7] raising capital to be used for electrification programs that will benefit the public. This may include grants from the federal government or issuing corporate bonds. Philanthropy, although not in the scope of this report, would fall under this category as well.
- **Community Members:** Community members (residents and businesses) participating in electrification can provide or raise their own capital to cover the cost of electrification. This includes out-of-pocket payments for all-electric technology, or a community member taking out a loan from a bank or other private financing provider.

Regardless of the funding or financing source, in the context of electrification, each stream of capital is expected to be allocated to some type of program, incentive, or public investment ("implementation strategies") that would promote building and transportation electrification within the City. These implementation strategies primarily move funds from the City, Utility, or third-party to the customer to enable the adoption of all-electric technologies in an equitable and just way. The City of Palo Alto has the opportunity to provide both funding and financing sources to residents in order to aid communitywide electrification in the coming years in an equitable manner.

Incentives can be useful in closing the funding gap for the cost of electrification as much as possible. However, in the longer-term, when customers could be required to comply with State and regional regulations that influence electrification, providing financing options for customers could be a viable policy option. For example, the Bay Area Air Quality Management District (BAAQMD) established appliance standards that require zero nitrous oxide ("zero-NOx") emissions from natural gas fired furnaces and water heaters; the California Air Resources Board (CARB) has implemented similar rules in their 2022 State Strategy for the State Implementation Plan. This type of regulation, though not technically a natural gas ban, will require building owners to electrify in order to achieve the zero-NOx target.

This report is intended to identify these potential funding and financing strategies to be considered in the S/CAP Funding Study; the Funding Study itself will identify combinations of these funding and financing sources that could be used in tandem for the City Council to consider.

External and Existing Funding Opportunities

The following external (i.e., originating outside of Palo Alto) and existing opportunities are available regardless of the pathway taken to pay for building and transportation electrification. These sources are made available either by the Federal or State government and should be considered as the first step towards CPAU's funding goal. Funding sources in this category represent dollars that come from sources outside of Palo Alto (i.e., there is no direct cost to the City of Palo Alto or its residents) to help the City close the gap for covering the costs of electrification. The use of these funding sources should be maximized no matter what; to not do so would be the equivalent of leaving money

[7] An example might be a private EV charger provider who obtains capital to install and own chargers on site which are then paid back over time through EV charging fees.

on the table. The funding opportunities in this section have been broken down as sources available to community members, the municipality, or the Utility. In this context, community members are homeowners, vehicle owners, or businesses looking to invest in electrification. Detailed explanations of each funding and financing source are available below. From a modeling perspective, it is assumed that the external and existing funding sources are utilized to the highest extent realistically possible by community members, the municipality, and the Utility before exploring other options.

Funding opportunities available to community members

This is the perspective of the community members, the residents or commercial entities who will be electrifying. This means residents looking to purchase EVs or heat pumps for their homes, or commercial businesses looking to electrify fleets or commercial buildings.

Funding opportunities available to community members consist of tax credits and rebates made available by Federal, Regional, and State programs. Federal tax credits and rebates are those provided by the Inflation Reduction Act (IRA) or the Infrastructure Investment and Jobs Act (IIJA); these incentives cover both transportation and building improvements meant to decrease energy use and greenhouse gas emissions. Californians are expected to be able to apply for IRA funding in 2024.[8]

State and regional incentives include those made available through Technology and Equipment for Clean Heating (TECH) Clean California and the BAAQMD. These programs also provide certain incentives for improvements within transportation and electrification. Given the availability of these programs, eligible businesses and residents should take advantage of these funding sources whenever possible to decrease the overall cost of electrification in Palo Alto.

Overall, incentive types and amounts vary by:

- **Recipient**. There are different incentives available depending on whether they are going to a contractor or a participating customer.
- **Participant type**. Incentives vary in eligibility and amount depending on if they are for a residential or a commercial customer.
- **Income level**. Some incentives are higher if the recipient is income-qualifying.
- **Technology type**. Incentives vary by technology type, such as electric vehicles (EVs) and heat pump water heaters (HPWHs). They may also vary by the performance of a particular type of heat pump, such as higher incentives for heat pumps using low global warming potential refrigerants

Beyond incentives, the main funding source available to community members is their own capital in the form of the community members' willingness to pay for electrification. Each funding source is described below and in Table 1.

[8] California Energy Commission

Funding sources

IRA funding opportunities

[Note: The funding opportunities in this section should be checked carefully in light of 2025 Federal policy changes. Some or all of these opportunities may no longer be available]

Personal Clean Vehicle Credit

As part of the IRA, tax credits are available to individuals who purchase an EV. Up to $4,000 is available in tax credits with the purchase of a previously owned clean vehicle, if the vehicle is purchased at a dealership for under $25,000, and up to $7,500 is available with the purchase of a new vehicle. Partial credits are also available; the extent to which an individual receives the full credit depends on the EV's battery components and critical minerals.[9] In addition, there is a tax credit for a home electric vehicle charger purpose of 30% (up to $1,000) for individuals located in an eligible low-income or non-urban census tract.[10]

Commercial Clean Vehicle Credit

A tax credit is also available with the purchase of a commercial EV. Plug-in hybrid electric vehicles (PHEVs) are eligible for a credit of 15% of costs, and battery electric vehicles (BEVs) are eligible for a credit of 30% of costs. Tax credits are capped at $7,500 for vehicles under 14,000 lbs., and $40,000 for vehicles above 14,000 lbs.[11]

Enhancement of Energy Efficiency Home Improvement Credit (25C)

This tax credit is available to homeowners who invest in technology to electrify their homes. Eligible technologies are cold climate air source heat pumps (ASHP), heat pump water heaters (HPWH), biomass stoves, ground source heat pumps (GSHP), solar water heaters, and other efficient Heating, Ventilation and Air Conditioning (HVAC) equipment. The tax credit is worth 30% of the purchase price, with a cap at $2,000 per year for ASHPs, HPWHs, and biomass stoves. Additional credits are available for building envelope upgrades to improve the overall energy efficiency of homes.[12]

Home Electrification and Appliance Rebates (HEAR)

The HEAR program provides rebates to support low- and moderate-income customers electrify their homes. For low-income customers, HEAR covers 100% of electrification project costs (up to $14,000) and for moderate-income customers the program covers 50% of electrification project costs (up to $14,000). Specific rebates vary by technology:

- Heat pump HVAC: $8,000/unit
- HPWH: $1,750/unit
- Electric stove: $840/unit

[9] US DOE
[10] NYSERDA
[11] NYSERDA
[12] NYSERDA

- Heat pump clothes dryer: $840/unit
- Breaker box: $4,000/unit
- Electric wiring: $2,500/unit[13]

Home Owner Managing Energy Savings (HOMES) or Home Efficiency Rebates (HER) Rebate Program

The HOMES, or HER, program will provide grants to State energy offices to provide performance-based rebates for energy improvement projects in multifamily and single family homes. The timing and structure of the rebates will vary by state, and it is predicted that most of the programs will not be launched until 2025.[14]

BAAQMD funding opportunities

California has 35 air districts responsible for administering grant programs focusing on improving air quality. Palo Alto falls under the BAAQMD, which manages multiple programs that are focused on funding building and transportation electrification.[15]

Clean Cars for All

The Clean Cars for All program provides funding to income-qualified individuals as incentive to retire old, inefficient cars and replace them with hybrids, PHEVs, BEVs, or hydrogen fuel cell vehicles (HFCVs). Rebate amounts range from $7,000-10,000 depending on the vehicle type; an extra $2,000 is available if the participant is in a Disadvantaged Community (DAC), as defined in Senate Bill (SB) 535.[16] Additionally, $2,000 is available for participants who also install a home EV charger.[17]

Clean HEET Program

The Clean Heating Efficiently with Electric Technology (HEET) program has not officially been implemented and is still under development. The aim of the program is to replace wood-burning stoves and fireplaces with electric heat pumps to improve indoor air quality and reduce emissions.[18]

TECH Clean CA funding opportunities

TECH Clean CA is a statewide initiative aimed at accelerating the adoption of clean space and water heating in California buildings. The program includes both market incentives and workforce development aspects, with an emphasis on working in DACs.[19]

Single family incentives

[13] Rewiring America
[14] Rewiring America
[15] BAAQMD
[16] OEHHA
[17] BAAQMD
[18] BAAQMD
[19] TECH Clean CA

TECH Clean CA incentives available to single family homeowners vary depending on where the family is located. In Palo Alto, $1,000 is available for the installation of a heat pump; households can purchase two devices and receive the incentive for both, meaning they can receive up to $2,000. For a limited time, non-income qualifying homeowners could also receive an additional $3,100 from the TECH Clean CA program to go toward a HPWH, layering on top of the existing CPAU HPWH rebate for a total of $7,100.[20] Income-qualifying homeowners can receive $4,185-10,385 for a HPWH through the TECH Clean CA program.[21]

Multifamily incentives

TECH Clean CA also offers incentives specifically for multifamily building owners. For a limited time, non-income qualifying homeowners could receive an additional $3,100 from the TECH Clean CA program to go toward a HPWH, layering on top of the existing CPAU HPWH rebate for a total of $7,100.[22] Income-qualifying homeowners can receive $4,185-10,385 for a HPWH through the TECH Clean CA program.[23] Income-qualifying owners can also have pre-electrification costs such as venting, additional plumbing, or replacements of floors, ceilings, and walls covered.

Community member willingness to pay out-of-pocket (i.e., "customer contribution to capex")

The primary funding source for community members is their own willingness to pay. Community members may be willing to put in some of their own funding for transportation or building electrification; the amount varies by customer income, awareness, and tendency to prioritize sustainability. It is assumed that moderate- to high-income residents and businesses would be willing to pay at least as much for an EV or all-electric heat pump as they would a traditional internal combustion engine (ICE) vehicle or gas/oil space heating device, while low-income residents may have trouble paying much (or anything) out-of-pocket. Community members may see co-benefits from electrification, such as better indoor air quality and higher performance equipment that consumes less energy. But relying entirely on community member willingness to pay out-of-pocket could have negative implications for equitable distribution of electrification benefits and could slow the overall process of community-wide adoption.

Customer willingness to pay will change as time goes on. In the near-term, it is assumed that some eco-conscious early adopters will be willing to pay a premium for an EV or heat pump in order to reduce personal emissions, but many other community members will not. However, in the coming years as mandates around NOx emissions standards come into effect, more customers will be forced to buy all-electric technologies, thus increasing the general community member's willingness to pay. This may lead the City of Palo Alto to focus on implementation strategies that

[20] This program is set to end in mid-April with updated HPWH rebate amounts to be determined. Program expires and is renewed periodically, check State-provided resources for most up to date information.
[21] The Switch is On
[22] This program is set to end in mid-April with updated HPWH rebate amounts to be determined. Program expires and is renewed periodically, check State-provided resources for most up to date information.
[23] The Switch is On

revolve around providing funding to community members in the near term, but shift to strategies that provide financing in the medium- and long-term.

Table 1: External and existing funding sources available to participants (as of 2024)

Name of Funding Source	Provider	Recipient	Approx. Amount Available	Income Qualifying?	Program Budget Cap	End Date
Inflation Reduction Act (IRA)						
IRA - Personal Vehicle Credit	Federal Government	Community member	$3,750-$7,500/vehicle; additional $1,000/home EV charger for income-qualifying participants	Yes – for the additional $1,000	None	Dec. 31, 2032
IRA – Commercial Clean Vehicle Credit	Federal Government	Community member	15% PHEV cost, 30% of EV cost. Max. $7,500 for vehicles under 14,000 pounds, $40,000 for all other vehicles	No	None	Dec. 31, 2032
IRA – Energy Efficiency (EE) Home Improvement Credit – 25C (enhancement)	Federal Government	Community member	30% of cost; up to $2,000/heat pump, $2,00/HPWH, $600/electrical panel	No	None	Dec. 31, 2032
IRA – Home Electrification and Appliance (HEEHRA) Rebates	Federal Government	Community member	100% of costs for low-income customers; 50% of costs for moderate-income customers. Max rebate: $14,000 ($8,000/heat pump, $1,750/HPWH, $840/electric stove, etc.)	Yes	$290M for all of California; approximately $500k population weighted share for Palo Alto	Sept. 30, 2031 (or state-dependent)
IRA – Home Owner Managing Energy Savings (HOMES) Rebate Program	Federal Government	Community member	Home energy rebates are not currently available for households, states apply for the funds to create rebate programs.	Yes	$292M for all of California; approximately $500k population weighted share for Palo Alto	Sept.30, 2031 (or state-dependent)

Bay Area Air Quality Management District (BAAQMD)						
BAAQMD – Clean Cars for All Grant	Regional Organization	Community member	$7,000-$12,000/vehicle; $2,000/charger; additional $2,000 for income qualified participants. Average total incentive is $8,300.	Yes - for additional $2,000	Total budget was $73M from 2019-2023. As of end of 2023, available remaining budget was $2.89M	Open until all funds are exhausted
BAAQMD – Clean HEET Program	Regional Organization	Community member	$3,000-$10,500/one stove/insert; will prioritize communities most impacted by air pollution	Yes – additional $4,000	$2M	Applications accepted until May 15, 2024
TECH Clean CA						
TECH Clean CA – Single Family Rebates	State Government	Community member	$1,000/heat pump for HVAC; up to $10,385/ HPWH[24] for income qualified participants. Additional $4,000 available for electric panel and pre-electrification upgrades	Yes – larger incentives available for income-qualified customers (e.g., HPWH rebate)	Statewide incentive budget $22M total, $7.86M remaining. Approximately $13k population weighted share of remaining for Palo Alto.	Open until all funds are exhausted
TECH Clean CA – Multifamily Rebates[25]	State Government	Contractor	Up to $10,385/HPWH for income qualified participants	Yes – larger incentives available for income-qualified customers (e.g., HPWH rebate)	Statewide incentive budget $7M total, $0 remaining	Open until all funds are exhausted
Willingness to Pay						
Community Member	Community Member	N/A	Varies by customer income level and	Low income individuals expected to	N/A	N/A

[24] Income-qualified HPWH incentives only in Palo Alto. Market rate HPWH incentives are reserved for electric investor-owned utility (IOU) customers.

[25] It is not clear if Palo Alto contractors are eligible for TECH Clean CA market rate multifamily incentives.

Willingness-to-pay			technology incremental cost	have lower willingness to pay		

Financing strategies

Participants can utilize third-party sources to receive financing for electrification. Green banks lend to individuals and offer Property Assessed Clean Energy (PACE) financing for building electrification. Both of these mechanisms are already available to Palo Alto community members (though GoGreen is only available to residents, not businesses). Building owners with available equity can also borrow against that through various borrowing mechanisms.

PACE financing

PACE financing is a financing mechanism specifically aimed at the installation of energy efficiency improvements, distributed generation renewable energy sources and electric vehicle charging infrastructure on private property. PACE allows a property owner to finance up-front project costs and pay the costs back over time through a voluntary assessment; however, the assessment is attached to the property as opposed to the individual. Costs are repaid over a set period, usually between 10 and 30 years (depending on the useful life of the financed improvements), and the assessments are added to the owner's property tax bills. If the property owner sells the property, the repayment obligation may transfer to the new property owner, although a new residential lender may require the assessment to be prepaid. The structure is meant to mitigate the disincentive of investing in energy efficiency that many property owners face if they believe that they will not stay in the property long enough to recover their upfront cost via energy savings.

PACE is available for commercial buildings (C-PACE) and residential buildings (R-PACE).[26] Commercial PACE is more politically feasible in California because, to date, there has been a history of consumer protection concerns with R-PACE. These concerns are mostly focused on predatory practices driven by a high reliance on for-profit PACE program administrators and solar installers and exploitative lending terms that put homeowners at risk of mortgage delinquency or foreclosure.[27] The Consumer Financial Protection Bureau (CFPB) reports that the average interest for rate for R-PACE loans was 7.6%, significantly higher than average home equity loan rates.[28]

Green banks

Green banks are financial institutions that bridge the gap between private capital and sustainability projects. Green banks also link private lenders and residents or businesses to make private capital available to community members in citywide building and transportation electrification. For example, the Connecticut Green Bank offers the Smart-E loan that provides financing to homeowners looking to implement energy efficiency projects. Loan terms go up to 20 years, with

[26] DOE
[27] Berkeley Law
[28] CFPB

interest rates between 5.99-7.49%.[29] Smart-E loans can specifically be used for heat pump installations.[30] Participating utilities are also able to buy down their interest rates as low as 0% by contributing additional incentive funding that is applied to loans until the incentive funding is exhausted. For California residents, the State Treasurer's Office (STO) informally serves as a green bank to provide financing to community members. The STO offers financing programs for both residential and commercial community members through the GoGreen program.[31] The GoGreen program is currently only available for single-family residential homeowners in Palo Alto, not multifamily or commercial property owners. This program was created by the STO in partnership with investor-owned utilities and credit unions, and only serves Californians in locations served by an investor-owned gas or electric utility. Palo Alto is not served by an investor-owned utility but entered into an agreement with the STO to offer the GoGreen program to homeowners only as a pilot partnership. The partnership would need to be expanded to enable Green Bank access for a wider variety of community members.

Private loans

Third parties can make private financing available to commercial or residential community members looking to electrify. Private loans range widely in terms of interest rates available. Loans available to community members looking to finance an HVAC upgrade, which could include the installation of a heat pump or HPWH, have interest rates ranging from 7.49-35.99%, the higher end of which would result in extremely high financing costs for borrowers.[32] However, these private loans can help commercial and residential community members electrify without the barrier of a high upfront cost.

Funding opportunities available to the City as a municipality

There are additional funding opportunities created under the IIJA that apply specifically to municipalities. Multiple programs provide funding for municipalities looking to decarbonize public transportation or increase the availability of public EV charging infrastructure. Certain BAAQMD programs that are available to participants are also available to local governments. Like funding opportunities available to participants, the local government of Palo Alto should maximize these funding sources and pursue them regardless of other actions being taken to minimize the cost of citywide electrification. Table 2 includes detailed information about each funding source.

Funding sources

IIJA funding opportunities (as of 2024)

Low and Zero Emissions Public Transportation Funding

[29] Connecticut Green Bank
[30] Connecticut Green Bank
[31] STO
[32] Forbes

This funding source is meant to support state and local efforts to buy or modernize buses, support workforce development, and improve bus facilities. As of February 2024, it was announced that $1.5 billion would be made available within this fund for the 2024 fiscal year. This program existed prior to but was amended by the IIJA in 2021. This funding source could be used for the municipality of Palo Alto to buy or lease low- or no-emissions transit buses, and could aid the effort to electrify the City's transportation.[33] As per the Federal Transit Administration, the largest grant given to a single entity in 2023 was $104 million; it was awarded to the Washington Metropolitan Area Transit Authority to transition their bus fleet to BEV buses and develop a workplace training program. There was, however, a wide range of grant size given in 2023, with some grants being below $1 million.[34]

Charging and Fueling Infrastructure (CFI) Discretionary Grant Program

This is a competitive grant program that allocates funding to projects focused on electric vehicle charging infrastructure and alternative fueling infrastructure. Funding is meant to go towards projects that would establish this infrastructure in publicly accessible places, particularly in DACs. The IIJA provides $2.5 billion to be spent under this program over five years.[35] Eligible projects must reduce greenhouse gas emissions and aim to fill the gaps in access to public EV charging.[36] Grant recipients in 2023 AND 2023 received up to $63.9 million (New Mexico Department of Transportation), but most grants were at or below $15 million.[37]

Clean School Bus Program

The Clean School Bus Program provides rebates to fund electric school buses. The program is meant to cover bus purchases, workforce development costs, and infrastructure costs associated with electrifying school bus fleets.[38] The average award amount is $2.4 million.[39] This program can be used in tandem with the Commercial Clean Vehicle Credit and is available to the school districts to apply.

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

The CMAQ program was originally created under the Fixing America's Surface Transportation (FAST) Act but was expanded under the IIJA. The program provides funding to local governments for any project or program that helps to meet the requirements of the Clean Air Act; this includes medium- and heavy-duty vehicle decarbonization programs and related charging infrastructure.[40] In 2024, $526 million has been allocated to California for this program.[41]

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[33] Federal Transit Administration
[34] Federal Transit Administration
[35] FHWA
[36] FHWA
[37] FHWA
[38] EPA
[39] EPA
[40] FHWA
[41] FHWA

BAAQMD programs

Charge! Program

The Charge! Program allocates funding for EV charger installations along transportation corridors, at multifamily housing facilities, transit parking locations, and workplaces.[42] Grant awards vary, and in 2023 ranged from $16,500-2,950,000.[43]

Heavy Duty Vehicles Program

The BAAQMD Heavy Duty Vehicles Program provides funding to help upgrade and replace buses, solid waste vehicles, emergency vehicles, and heavy-duty trucks (over 14,000 lbs.) with low emission vehicles. The funding is only available to public and private institutions, not individual participants. The funding sources available for the projects include the Carl Moyer Program, the Transportation Fund for Clean Air, the Goods Movement, and the Bay Area Clean Air Foundation.[44] Details on funding levels are not available at this time.

School Bus Program

The BAAQMD School Bus Program provides funding to help upgrade and replace heavy-duty school buses (over 14,000 lbs.) with zero-emission vehicles, as well as install supporting infrastructure. The funding is available to public school districts, Joint Powers Authorities, county offices of education, and private fleets. School buses must be located in a Disadvantaged (Senate Bill 535), Low-Income (Assembly Bill 1550), or Assembly Bill 617 Community.[45] The funding sources available for the projects include the Carl Moyer Program, Transportation Fund for Clean Air, Community Health Protection Program, and Mobile Source Incentive Fund. Maximum funding for each piece of equipment may be up to 100% of the equipment cost.[46]

Infrastructure Program

To help support projects that replace vehicles with zero-emission alternatives, the BAAQMD Infrastructure Program provides funding to install supporting infrastructure, such as battery charging and hydrogen stations.[47] Total available funding is $35M and the maximum award to a single applicant is $20M, with specific costs covered ranging from 50-100%.[48] A higher portion of costs can be covered if the project is located in a DAC.

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[42] BAAQMD
[43] BAAQMD
[44] BAAQMD
[45] BAAQMD
[46] School Bus Factsheet
[47] BAAQMD
[48] BAAQMD Webinar

Table 2: External and existing funding sources available to municipality (as of 2024)

Name of Funding Source	Provider	Recipient	Approx. Amount Available	Low-Income/ Disadvantaged Communities (DAC) Considerations	Program Budget Cap	End Date
IIJA						
IIJA – Low and Zero Emissions Public Transportation Funding	Federal Government	Municipality	Up to $104M	Workforce dev. training funds available	$1.5B in fiscal year (FY) 2024; approximately $300k population weighted share for Palo Alto	Funds remain available for obligation for 4 fiscal years.
IIJA – Charging and Fueling Infrastructure Discretionary Grant Program	Federal Government	Municipality	Up to $56M	Prioritizing DAC	$2.5B; approximately $500k population weighted share for Palo Alto	Current opportunity portal is closed
IIJA – Clean School Bus Program	Federal Government	Municipality/ School District	$2.4M average grant	Yes – Justice40 program	$5B; approximately $1M population weighted share for Palo Alto	2023 rebate ang grant program currently closed
IIJA – Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Federal Government	Municipality	Unknown /TBD	Prioritizing DAC	$526M in FY 2024; approximately $100k population weighted share for Palo Alto	Bipartisan Infrastructure Law continues the program through 2026
BAAQMD						
BAAQMD – Charge! Program (2023 program now closed)	Regional	Municipality	$16,500 - $2.95M	Minimum of 60% of total available funding awarded to projects in DAC	Technology Implementation Office (TIO) was originally awarded $2.99M from California Energy Commission (CEC). Additional $15M award in federal grant funding to build out EV charging network.	FYE 2023 now closed

BAAQMD – Heavy Duty Vehicle Program	Regional	Municipality	Unknown /TBD	Unknown/ TBD	Unknown/TBD	Unknown/TBD
BAAQMD – School Bus Program	Regional	Municipality	Up to 100% of the cost of equipme nt	Yes – school buses must operate in DAC, low-income or Assembly Bill (AB) 617 community	Unknown/TBD	Unknown/TBD
BAAQMD – Infrastructure Program	Regional	Municipality	Up to $20M (50-100% of eligible cost)	Yes – higher % of eligible cost if emissions reductions are in DAC	$35M total	Contracts to be executed by early 2025

Funding opportunities available to the City as a utility

Because the CPAU is part of the City of Palo Alto, a diverse set of funding sources are available to the City as a publicly owned utility as opposed to the City as a municipality. The available funding sources result from State programs, specifically the Low Carbon Fuel Standard, the California Cap-and-Trade program, and the ratepayer funded Public Benefits Charge. Detailed explanations of each source are provided below and in Table 3.

Funding sources

Low Carbon Fuel Standard

The Low Carbon Fuel Standard (LCFS) is an established program in California that serves as a funding source for utilities. Under this program, the lifecycle greenhouse gas emissions are calculated for fuels to determine each fuel's carbon intensity. A certain carbon intensity benchmark that declines over time is set for each year, and any fuel with a carbon intensity below the benchmark would generate a credit. Alternatively, fuels with carbon intensities above the benchmark would generate a deficit. Fuel providers are responsible for calculating their fuel's carbon intensity and demonstrating whether they meet the benchmark; if they do not meet the benchmark, they are responsible for purchasing credits from other fuel providers. In this context, the CPAU would be considered a fuel provider to any customers who own electric vehicles and use CPAU- provided electricity. Because this electricity is under the carbon intensity threshold, the Utility generates

credits for any EV driver within their service territory and could sell the credits to other fuel providers who are at a deficit.[49]

State regulations require that revenue generated by the Utility from selling LCFS credits may be spent on rebates or programs meant to reduce the carbon intensity of transportation fuels in California.[50] In 2020, the California Public Utilities Commission (CPUC) issued guidance around how utilities can spend LCFS credit revenues. A portion of revenues are required to be allocated to the California Clean Fuel Reward program, which provides on-bill credit and rebate programs to promote transportation decarbonization. Of the remaining revenue, 75 percent must be allocated towards transportation electrification programs that address equity and resiliency, and the remaining funds can be spent on implementing programs that address EV resiliency, and other programs that promote the adoption of EVs.[51]

Examples of programs funded by LCFS revenues include:

- Pacific Gas and Electric – provide $500 to residential EV drivers
- Sacramento Municipal Utility District – provide either a $599 rebate or a free Level 2 EV charger to residential drivers
- San Diego Gas & Electric – residential EV drivers were able to claim $50 annually through 2020
- Southern California Edison – provide $450 to residential EV drivers[52]

CPAU has used the capital raised from LCFS credits to fund a variety of programs in the past. For example, the CPAU used LCFS revenues to provide credits for ratepayers towards the Electric Service Connection Charges in the event that an electric service upgrade was needed due to EV charger installation.[53]

There are limits to the amount of revenue raised via the LCFS system. CPAU would be limited by the number of EV drivers within the service territory, as the Utility would need to be considered the drivers' fuel provider to generate credits. Revenue is also limited by the credit price, which fluctuates. LCFS credits have proven to provide unexpectedly low revenues in the past; for example, at the time of this report, the California Clean Fuel Reward program has set the reward amount to $0, citing low revenue from selling LCFS credits as one of the reasons for the reduced reward amount.[54]

Cap-and-Trade Revenue

The Cap-and-Trade program is a statewide program run by CARB. Under the program, CARB creates allowances (one allowance equating to one metric ton of carbon dioxide equivalent emissions) with the yearly number of allowances issues equaling that year's economywide cap on emissions. Entities that have greenhouse gas emissions higher than their allocated allowance level would need

[49] CARB
[50] CPUC
[51] Ibid.
[52] Union of Concerned Scientists
[53] City of Palo Alto
[54] Clean Fuel Reward

to purchase allowances at auction or from other entities that are able to emit less and sell their allowances.[55] Program terms and conditions are subject to change by State legislature's action on AB1207, and potential amendments by CARB to the Cap-and-Invest Progam..

The Palo Alto City Council has approved specific uses for Cap-and-Trade revenues. For the CPAU's electric customers, approved uses are:

- Purchases in renewable resources
- Keeping the electric resource mix 100% carbon neutral
- Programs and rebates meant to improve energy efficiency
- Rebates to electric ratepayers

For CPAU gas customers, approved uses are:

- Programs and rebates to improve energy efficiency
- Purchases of, or investment in, biogas
- Investment in carbon reduction activities including projects to reduce emissions caused by natural gas pipeline leaks
- Rebates to gas payers[56]

As of 2024, Palo Alto was receiving between $3 and $5 million per year in revenue from the Cap-and-Trade program; this revenue is used to pay for energy efficiency programs, and to purchase renewable energy credits to support the Utility's plan for carbon neutrality.[57] This revenue is a form of Utility funding and could be allocated towards programs that aim to increase adoption of building and transportation electrification measures.

Public Benefits Reserve

A component of the electric rates charged by the CPAU is the Public Benefits Charge; the revenue from this charge is allocated to the City's Electric Public Benefits Reserve. Publicly owned electric utilities are required to establish this charge on customer distribution services under Public Utilities Code section 385. The funds collected can be spent on cost-effective energy efficiency projects, new investment in renewable energy resources and technology, research and demonstration programs, and services for low-income ratepayers, including energy efficiency services, education, weatherization and rate discounts. The funds within the Public Benefits Reserve, if left unused, carry over to the next year. The reserve amount was about $3 million at the start of the 2022 fiscal year and is projected to increase to about $7 million by the start of the 2027 fiscal year.[58]

[55] CARB
[56] City of Palo Alto
[57] City of Palo Alto
[58] City of Palo Alto

Table 3: External and existing funding sources available to utility

Name of Funding Source	Provider	Recipient	Approx. Amount Available	Program Budget	End Date
Existing LCFS Credit Revenue	State Government	Utility	$6.2M starting Elec. Utility reserves in 2024[59]	$6.2M starting Elec. Utility reserves in 2024[60]	Electric Utility Financial Plan details reserves through FY 2028
Existing Cap-and-Trade Revenue[61]	State Government	Utility	$5.6M starting Elec. Utility reserves in 2024[62]	$5.6M starting Elec. Utility reserves in 2024[63]	Electric Utility Financial Plan details reserves through FY 2028
Existing Public Benefits Reserve	Ratepayers	Utility	$4.6 starting Elec. Utility reserves in 2024[64]	$4.6 starting Elec. Utility reserves in 2024[65]	Electric Utility Financial Plan details reserves through FY 2028

Prospective Strategies

This section provides additional **funding** and **financing** options that could be considered as part of the S/CAP Funding Study. Each option is labeled according to the types of entities that could access or utilize the source of capital:

1. Municipality as a City
2. Municipality as a Utility
3. Third-party
4. Community member

There are strengths and drawbacks associated with utilizing sources within each focus area, and nuances around what funding and financing sources can be used for different implementation measures.

[59] Based on FY24 Electric Utility Financial Plan
[60] Based on FY24 Electric Utility Financial Plan
[61] City council approved 100% of revenue going toward local decarbonization. Unspent revenues from sale of carbon allowances will fund the Cap and Trade Program Reserve.
[62] Based on FY24 Electric Utility Financial Plan
[63] Based on FY24 Electric Utility Financial Plan
[64] Based on FY24 Electric Utility Financial Plan
[65] Based on FY24 Electric Utility Financial Plan

It is assumed that the funding and financing sources in this section would be used to cover any remaining financial gap after the "External and Existing" funding sources are used to the highest extent realistically possible.

Funding sources

Primary entity – Palo Alto as a City

One of the primary strategies that Palo Alto can pursue to fund wide scale electrification is to increase local taxes and implement municipal pricing schemes that generate revenue. These revenues can then be used to implement city-run electrification programs or make direct investments in infrastructure that supports electrification and S/CAP goals, like public EV charging stations. Where these revenues are not sufficient to cover the entire funding requirement for citywide electrification, the municipality may also pursue financing structures, such as municipal bonds, leasing arrangements, and Enhanced Infrastructure Financing Districts. Explanations and examples of each source are available in the following section.

One of the primary funding sources available to the municipality is revenue earned through tax collection. The history of local government taxation in California is informed by the initiatives established via Proposition 13 in 1978, Proposition 218 in 1996, and Proposition 26 in 2010.[66] Proposition 13, or the "People's Initiative to Limit Taxation" was established to limit the property tax rate in California. Because Proposition 13 constrained the amount of revenue that local governments could generate via property taxes, many governments relied upon other avenues to raise revenue, such as property-related fees, general taxes, special taxes, and assessments. Proposition 218, or the "Right to Vote on Taxes", was established in 1996 to require voter approval for these other types of revenue tools. Per Proposition 218, government taxes are either general taxes, which are imposed for any general purpose and require a simple majority vote, or special taxes, which are taxes imposed for specific purposes and require a two-thirds voter approval.[67] Proposition 26, which passed in 2010, added a new definition of local taxes to include all revenue tools imposed by the government, including any fee or charge that the government may impose with a majority vote; the necessary margin of majority depends on the tax type.[68]

Overall, there are three types of taxes that can be imposed in California today:

- **General** – a tax imposed for general government purposes; a majority vote is required for this type of tax to pass, and voters can approve a general tax along with non-binding measures that suggest voter preferences for the use of proceeds
- **Special** – a tax imposed for specific purposes, even if the proceeds are placed in the City's General Fund (discussed below); a two-thirds of voters must approve for this type of tax to pass

[66] https://www.cacities.org/prop218andprop26
[67] https://www.cacities.org/prop218andprop26
[68] Legislative Analyst's Office

- **Ad Valorem** – property taxes imposed based on property values

Examples of each tax type are provided below and explained in detail. Most of the taxes discussed in this report are special taxes, given that the revenue raised by the City would go towards specific electrification projects or programs, as opposed to general purposes.

It's important to note that some types of taxes may have negative equity implications by increasing the tax burden on low-income residents. The equity implications are more significant based on the type of tax, with details outlined in the sections below. Large tax increases can also slow economic growth in Palo Alto, since community members will have less money in their pockets to spend on goods due to their higher tax payments.

In addition to taxes, municipalities can institute assessments. Assessments, which also rely on a municipality's taxing power, are property-related and tied to special benefits; in California, an assessment can be levied against a parcel only for the "the reasonable cost of the proportional special benefit conferred on that parcel." There are specific and complex procedural requirements associated with levying an assessment including notice, a public hearing, and mailed ballot proceedings meant to give property owners information and the right to vote, with each property owner's vote weighted by their property's assessment amount.[69]

Beyond taxes and assessments, the City has alternate options available as funding sources. One option would be to utilize capital from the private sector and engage in a public-private partnership (PPP). PPPs are common strategies that allow municipalities to utilize private capital and speed up development in a beneficial way. In addition, the City's General Fund can be used for any lawful public purpose, including certain projects that would increase the accessibility of electrification.

Taxes and assessments

Special taxes

Climate sales tax

Setting up a climate sales tax would involve increasing the percentage charged on sales of goods within Palo Alto and earmarking the additional revenue for electrification projects. To institute a climate sales tax, the City Council would need to place the measure on the ballot. Because this tax would be imposed for a specific purpose, it would be considered a special tax and would require a two-thirds majority to pass and be instituted. The amount of revenue that could be expected would depend on how the tax was implemented and if it were set to be a percentage of sales or a flat amount on all sales within the city. Currently, sales taxes make up 3.4% of the City's revenue, or about $33 million.[70] Any City-specific sales tax increase would increase that revenue source for Palo Alto.

An example of this type of tax exists in Denver. In 2020, Denver implemented Measure 2A, a 0.25% increase in sales tax that was designed specifically to provide funding towards climate-focused

[69] Legislative Analyst's Office
[70] City of Palo Alto

projects.[71] Certain necessities (food, water, fuel, medical supplies, etc.) were exempt from this tax. It was anticipated that in the first year alone, Measure 2A would raise $36 million in funding for spending on various climate projects and programs.[72] Specifically, the funding is meant to go towards:

- Green workforce development
- Renewable energy
- Environmental justice
- Sustainable transportation
- Adaptation
- Resilience
- Energy efficiency in buildings

The Denver measure includes a mandate to spend 50% of the funding in DACs that have been disproportionately impacted by environmental and climate challenges. Implementing Measure 2A did require voter approval; it passed with about 60% of voters approving.[73]

Instituting taxes on the community to fund electrification may be unpopular with constituents and lead to political obstacles. Additionally, sales taxes are generally considered regressive because low-income residents will contribute more in proportion to their income. Low-income residents spend a larger proportion of their income on the purchase of basic necessities, thus will spend a larger portion of their income on the sales tax itself. For this reason, a climate sales tax may act in opposition to the equity goals of Palo Alto's S/CAP, if it is not implemented with an equity lens applied. However, by keeping basic necessities exempt from the climate sales tax as was done in Denver, some of these equity concerns can be mitigated.

Climate business tax

A climate business tax is similar to a climate sales tax. However, under a climate business tax, businesses would pay the tax as opposed to consumers. Business taxes are levied on most businesses operating within the City, and the implementation of a business tax, another example of a special tax, would require two-thirds voter approval. Palo Alto implemented Measure K, a citywide business tax, passed by voters on the November 2022 ballot. This general tax imposed was $0.0375 per square foot beginning on January 1, 2023, and will increase to $0.075 per square foot on January 1, 2025. It only applies to businesses with over 10,000 square feet in commercial floorspace, and has a maximum of $500,000 in 2025 per taxpayer.[74] The measure was placed on the ballot by the City Council, and passed with 67.4% of the vote.[75] To implement a climate-specific business tax, the City Council would need to add another measure to a ballot and get voter approval, following a similar process to Measure K.

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[71] The Denver Post
[72] The Denver Post
[73] American Cities Climate Challenge
[74] Palo Alto Municipal Code
[75] Palo Alto Online

Another example is the Clean Energy Surcharge (CES) in Portland, Oregon. The CES is a 1% surcharge on retail sales imposed exclusively on large retailers. A large retailer is a business that has retail sales of at least $1 billion, and at least $500,000 within the city limits of Portland.[76] At the time the CES was passed, it was estimated that it would generate between $40-60 million annually, but in the first two years it raised $145 million for climate action.[77] The extent to which this option would generate revenue in Palo Alto depends on the tax rate applied, but this is a promising funding source for the City.

It is possible that a climate business tax imposed on a large retailer would not share the same equity concerns as a sales tax; if it is only applied to retailers with gross income over $1 billion, it is less likely that Palo Alto residents will feel the impact of the tax. That said, it is possible that businesses would pass on additional tax expenses to consumers via higher prices.

Rideshare tax

This would capture any tax or fee applied to the rideshare business specifically, as opposed to all businesses or retailers, to raise funding for the municipality. An example is the Proposition D Traffic Congestion Mitigation Tax implemented by San Francisco in 2019. The tax is applied to all ride-hail trips (i.e., trips with Uber, Lyft, or other rideshare companies) that originate in San Francisco for the portion of the trip that takes place in the city. This measure achieved 68% voter approval in November 2019.[78] The tax rate is 3.25% for rides with a single occupant in a non-zero-emission vehicle, and 1.5% for shared rides or rides taken in a zero-emission vehicle. Proceeds are meant to provide improvements to public transit reliability and safety within San Francisco.[79] The total revenue collected from January 2020 through 2024 (actuals and projected) in San Francisco is equal to $28.7M, with $16M allocated to the Transportation Authority. The Transportation Authority sets aside 2% of the revenue for program administration and 1% for data collection, leaving $15.6M for project implementation. Rideshare companies are prime candidates for regulatory fees/taxes given their impact on local air quality, emissions, and the overall transportation landscape; Palo Alto could take similar action to San Francisco and seek voter approval for a tax on these companies, thus creating a funding source that can be applied to vehicle electrification. Given that this rideshare tax was considered a special tax, two-thirds voter approval would be required.

Parking pricing

An alternative way that the municipality could raise funds would be through parking pricing. This could be an overall increase in the price drivers would pay to park in public lots or on the street or for parking permits, or a demand-based system could be implemented to try and incentivize certain driving behaviors. San Francisco created a demand-responsive parking pricing program and found that beyond financial gains, the program decreased parking search times, greenhouse gas emissions, and incentivized drivers to utilize certain parts of the city.[80] The program, called SFpark,

[76] City of Portland, Oregon
[77] OPB
[78] SF Elections
[79] San Francisco County Transportation Authority
[80] Transportation Alternatives

was established by the San Francisco Municipal Transportation Agency (SFMTA) Board of Directors, as the program did not require voter approval; the pilot phase of the program was funded by the Federal Highway Administrations Urban Partnership Program via an agreement with the SFMTA, the San Francisco County Transportation Agency, and the Metropolitan Transportation Commission.[81] A similar program in Palo Alto would likely be established by the Palo Alto Office of Transportation, which handles parking within the city, and may require collaboration with the Santa Clara County Valley Transportation Authority. While the San Francisco program was largely implemented to assist local businesses in parking areas and decrease the time drivers spent searching for parking, program revenues could be used for transportation improvements, including public EV charging accessibility or the availability of electric buses. Palo Alto could consider a similar program.

While instituting additional fees on the community could be politically challenging and unpopular with constituents, a benefit of parking pricing is that it doubles as a behavior change agent to reduce car use and vehicle congestion.

Congestion fees

A congestion fee would be a pricing structure that charges drivers for driving within certain parts of the city at specific times. One example of a congestion pricing structure exists in London. London established a Congestion Charge in 2003, and it is currently set at GBP 15 per day. Drivers are charged if they drive in the Congestion Charge zone, a highly trafficked area in the center of the city, from 7AM-6PM on weekdays or 12 PM-6 PM on weekends. London has also established the Low Emission Zone (LEZ) and Ultra Low Emission Zone (ULEZ). The LEZ and ULEZ cover a broader area than the Congestion Charge zone and are in effect at all times with some exceptions for major holidays. The LEZ and ULEZ require certain vehicle emission standards, and charge penalties for different vehicle types who do not meet the set standards.[82] Congestion charge net revenues in London brought in GBP 307 million in the 2021-2022 fiscal year.[83] Funding is allocated towards transit improvements to further decrease congestion and improve air quality.[84]

An example of a California congestion fee structure is the San Diego system established in 1998 to implement a tolling structure on the I-15 highway. The system established High-Occupancy Toll (HOT) lanes wherein tolls vary dynamically based on the level of traffic. Tolls rise and fall in $0.25 increments as frequently as every six minutes to maintain free-flow traffic on the high-occupancy vehicle lanes of the highway. As of 2022, the system has generated $7 million in revenue, half of which has been used to support public transit in the area. It has also increased the number of drivers who choose to carpool by 50% and has received overwhelming public support.[85]

Similarly to parking pricing, implementing a congestion fee could be considered the implementation of a tax, and since funding would go specifically towards citywide electrification, this would be considered a special tax. It is possible that Palo Alto may not have the congestion levels necessary

[81] SFMTA
[82] Transport for London
[83] OECD
[84] Intelligent Transportation Systems Joint Program Office
[85] FHWA

to justify this funding mechanism; it also should be noted that these types of programs may be legally challenging to implement (New York City's program was delayed as of June 5, 2024[86]). However, it is one of the multiple types of special taxes that could potentially be implemented in Palo Alto to fund electrification.

Carbon tax

Many jurisdictions around the world have implemented carbon taxes, or a fee charged on a $/metric ton CO_2e basis. Carbon taxes raise revenue for a given jurisdiction, and oftentimes a large portion of the revenue is reserved for environmental and sustainability-focused programs. For example, Ireland has a carbon tax that is set at EUR 56/MT CO2e for 2024. The Irish government anticipates raising EUR 9.5 billion from 2021-2030, with $5 billion reserved for energy efficiency investments.[87] Additionally, Japan has multiple taxes related to the environment, including a gasoline tax, an oil and gas tax, a petroleum and coal tax, and multiple others. Japan's tax is considered 'revenue neutral' as any revenue raised via the taxes is then invested in supplemental energy projects and energy-saving measures.[88] In this context, a carbon tax with proceeds reserved for electrification would be considered a special tax. It should be noted that California does not have a carbon tax due to the robust Cap-and-Trade program that has already been established (discussed below).

Parcel tax

A parcel tax is a form of property tax; however, it is assessed at a rate based on the characteristics of the parcel rather than a rate based on the assessed value of the property. A parcel is a unit of property and different property types may have different tax rates. Parcel taxes often are in the form of a flat fee per parcel. While this method works well to raise a predictable amount of revenue each year, the flat rate results in inequitable implementation; lower-income residents pay a higher portion of their income on the tax compared to high-income community members. One example of parcel taxes used for climate programs is the 2016 Bay Area Measure AA, which requires a $12 parcel tax raising $25 million a year for open space restoration and resilience projects.[89] Measure AA was placed on the ballots of the nine counties in the area by the San Francisco Bay Area Restoration Authority in 2016; it passed with 70% voter approval across the region, and went into effect in 2017.[90]

Parcel taxes are considered non-ad valorem special taxes, and therefore require two-thirds voter approval, but revenues can be used for any type of municipal spending,[91] including public projects that could improve access to electrification, such as public EV charger installation.

Community facilities districts (CFDs)

A CFD is a Special Tax District that funds the acquisition or improvement of public improvements and some private improvements as well as ongoing public services in specified areas. The creation

[86] New York State
[87] Department of Public Expenditure and Reform
[88] Gokhale, Hemangi
[89] San Francisco Bay Restoration Authority
[90] San Francisco Bay Restoration Authority
[91] Ballotpedia

of this type of tax district is authorized by the Mello-Roos Community Facilities Act of 1982.[92] In a CFD, special tax is levied on taxable property within the district and is used to fund facilities or services in the area. Revenue from the CFD can only be used for the purposes for which electors approved at the time of CFD formation.[93] An example of a CFD is the Central Soma Community Facilities District Program in San Francisco. San Francisco utilizes the CFD to finance community improvements including expansion of public transit, improved efficiency of public infrastructure, and other sustainable public projects.[94,95]

To create a CFD, a property owner or the City government would need to initiate the process. The entity proposing the CFD would need to establish goals and policies, and a Rate and Method of Appointment to outline how the tax will be levied, on which property, at what rate, and for how long. Once the CFD is formally proposed, a public hearing would be held. Following the public hearing, an election would be held amongst the residents, or property owners in the event that there are no registered voters in the boundaries of the CFD. The vote would require two-thirds approval. Once the district is formally created, the CFD has the opportunity to issue debt secured by the land within the district.[96] Palo Alto could establish one or multiple CFDs to fund public EV chargers or electrical system upgrades needed for building and transportation electrification.

Ad Valorem taxes

Property tax

A major source of funding for the municipality is property taxes. As mentioned above, one limitation to property taxes is Proposition 13; Proposition 13 falls under the California state Constitution and limits the amount of property taxes a municipality can collect based on historical values. Under this proposition, all properties were valued at their 1975 fair market value and given annual value increases based on the lesser of the inflation rate (measured by the California Consumer Price Index) and 2%. Without new construction or a change in ownership, property values will not increase by more than 2% per year.[97] The one exception would be in the case of a General Obligation (GO) municipal bond issuance. The City would have the option to increase Ad Valorem taxes to finance the repayment of a GO bond that was issued to raise capital for the acquisition or improvement of real property.[98] GO bonds are discussed in detail below.

Regardless of the challenges Palo Alto could face in increasing the amount of property taxes being collected, property taxes are expected to make up the largest source of the City's General Fund revenue in the coming years, and is expected to bring in $64.6 million in 2024.[99] About 73.2% of taxable value in Palo Alto is made up of residential land use, and for every $1,000 that residents pay

[92] Propositions 26 and 218 Implementation Guide
[93] City of Moreno Valley
[94] San Francisco Planning Code
[95] San Francisco Planning
[96] CivicMic
[97] Sacramento County
[98] California Debt & Investment Advisory Commission
[99] City of Palo Alto

in property taxes the City receives $94.[100] Currently, the majority of property taxes go to supporting local schools, but in the future the City could explore whether capital could be allocated to municipally-run programs focused on electrification instead.

There is, however, a limit to local spending, called the Appropriations (Gann) Limit. The Gann Limit was approved by voters via Proposition 4 in 1979, and it effectively sets a spending limit for local governments. While it is possible to increase the appropriations limit with voter approval, as has been done in Berkeley, the increase only lasts for four years.[101] If revenues exceed the set limit, which is passed on spending levels in the 1970s, half of the amount spent over the limit must be allocated to taxpayers, and the other half to K-14 schools. It is unlikely that the City would be at risk of exceeding the limit, but it is something to consider while planning municipal spending.[102]

Assessments

Parking benefit districts

Parking benefit districts (PBD) represent another way for municipalities to raise funding via parking pricing. This strategy involves establishing set geographic areas where parking revenues fund local improvements or projects. To establish a PBD, a vote is required for the members of the assessment district. Members' votes are in proportion to the special benefit they will receive from the district.

An example of a successful PBD, a pilot program in Austin, Texas raised $1.87 million to fund improved streets and sidewalks, public transit, and general conditions for walking and biking in the area.[103] Similarly to a demand-based parking price system, a PBD would be established by the Palo Alto Office of Transportation.[104] Similarly to parking pricing and congestion pricing, mentioned above, this type of funding source is therefore categorized as an assessment as it involves property-related special benefits. Palo Alto currently has multiple parking assessment districts, which are similar to PBDs, specifically the California Avenue area parking assessment district and the downtown parking assessment area

Utility-related funding sources

Primary entity – Palo Alto as a Utility

Targeted gas decommissioning

Targeted gas decommissioning is the process of electrifying all buildings in entire neighborhoods with the purpose of decommissioning entire sections of the gas distribution system. Gas utility savings could be realized from avoided capital investment for aging parts of the gas system or by retiring materials in the system (such as stainless steel) that have higher maintenance requirements. Targeted gas decommissioning as contemplated in this report would be structured as a voluntary program for participants. It should be noted that high program administration costs may be required

[100] City of Palo Alto
[101] City of Berkeley
[102] California Budget & Policy Center
[103] FHWA
[104] City of Palo Alto

for complex targeted gas decommissioning projects, which would minimize the positive impact on utility funding.[105]

Increased electricity sales revenue

Utilities have a mix of fixed and variable costs; fixed costs, which make up the bulk of the total cost, must be covered by the difference between revenue and variable costs. Fixed costs usually represent costs such as running the local distribution system, while variable costs represent the cost of buying electricity to serve demand. As electricity demand increases due to more customers owning EVs and electrifying their homes and businesses, revenue increases, as do variable costs. The utility is projecting higher expenses in renewable energy contracts to meet both the increase electricity demand and to meet the State's renewable portfolio standards. Fixed costs may also increase, but the increase in revenue may end up exceeding the increase in the variable and fixed costs. This revenue is expected to be used to cover electrical system grid modernization upgrades or to fund utility programs. Programs can include incentives or loans aimed at accelerating electrification within Palo Alto, provided that these programs are part of the cost of providing electric service. The amount of revenue available at a given time will depend on how much additional electricity demand has been generated at that time and the projected electric rates customers are paying. Projected revenues will be estimated in the S/CAP Funding Model produced by E3.

Increase in revenue from existing sources

Additionally, an increase in revenue from existing non-ratepayer sources, described above, would create more funding for the Utility. For example, the revenue from the Low Carbon Fuel Standard program would increase the more electric vehicles are registered in Palo Alto.

Utility taxes or transfers to general fund

The City's electric and gas utilities annually transfer funds to the City's General Fund, which fund municipal government activities and can be allocated by Council to any lawful public purpose. Council could opt to divert the capital transferred into the General Fund away from certain general government activities towards electrification or, more likely, could increase the amount of capital being transferred to fund electrification.

Another distinct mechanism that could be utilized is a Utility User Tax (UUT), which Palo Alto already has in place after being approved by Palo Alto voters in 1987. Currently the UUT is a usage tax on electric, gas, water, and telecommunications. Electric, gas, and water tax rates are set at 5% of the charges an electricity/gas/water user in Palo Alto would pay, while the rate for telecommunications is 4.75%. Capital raised via the UUT are placed in the General Fund for the "general governmental purposes of the city"; as stated, the Council can then determine the use for this capital.[106]

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[105] E3

[106] City of Palo Alto

Financing strategies

The funding sources above could be complemented with financing strategies that would allow the community to access large amounts of capital in a short period of time and repay it over decades using some of the revenue sources listed above. A variety of potential financing mechanisms are listed below.

National Clean Investment Fund

Primary entity – Palo Alto as a City and Palo Alto as a Utility

One prospective financing source available to municipalities is capital that will be allocated as part of the National Clean Investment Fund (NCIF), which was created under the IRA. The NCIF is a $14 billion grant program created under the Greenhouse Gas Reduction Fund as part of the IRA. The NCIF will allocate capital to national nonprofits, who will then provide financing to businesses and communities looking to implement relevant projects. Types of financial assistance include debt financing, equity financing, hybrid (mezzanine debt, preferred equity, etc.), and credit enhancements (loan guarantees, etc.). Project categories are:

- **DERs:** small-scale storage and generation (~1-10,000 kW) + enabling infrastructure
- **Zero-emission buildings:** retrofits or new construction; primary focus of reducing emissions, secondary emphasis on occupant health, environmental stewardship, climate resilience
- **Zero-emission transportation:** deployment of zero emission vehicle (ZEV) transportation modes + enabling infrastructure, especially in communities that are overburdened by diesel air pollution and degraded air quality

Qualified projects are projects that reduce/avoid greenhouse gas emissions and air pollution in partnership with/by leveraging investment from the private sector, or projects that assist communities in reducing/avoiding emissions. There are six project requirements:

- Project must be consistent with US greenhouse gas emissions reduction targets
- Must reduce/avoid emissions of other air pollutants
- Must deliver additional benefits in one of the seven categories: climate change, clean energy and energy efficiency, clean transportation, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, development of critical clean water infrastructure
- Must not have otherwise been financed
- Must mobilize private capital
- Would support only commercial technology (technology that has been deployed for commercial purposes at least 3x for a period of at least 5 years in the US)

The nonprofit organizations selected to provide financing to different projects are:

- **Climate United Fund** – awarded $7 billion
- **Coalition for Green Capital** – awarded $5 billion

+ **Power Forward Communities, Inc.** – awarded $2 billion[107]

Once awards are made and the administrative requirements are met, the capital should would be made available to communities for their relevant projects. To apply for project financing, the municipality would need to contact one of the nonprofit organizations from which funding is available.[108] However, as noted above, changes in Federal policy mean this funding may no longer be available.

Municipal bonds

Primary entity – Palo Alto as a City

Municipal bonds are long-term debt instruments issued by a municipality. Municipal bonds can be used to electrify the City's operations directly; for example, they could be issued to cover the upfront cost of electrifying City-owned buildings or City vehicle fleets. Depending on what type of bond is issued, municipal bond revenues can also be used for development aimed at increasing the availability of electrification to Palo Alto businesses and residents, either through public investments that would increase electrification access, such as public EV chargers, or incentive or loan programs that ease the financial burden of participants looking to electrify.

At the time of this report, the average investment grade municipal bond yield to maturity was 3.94% with an average maturity of 12 years,[109] and the average high yield rate was 5.56% with an average maturity of 19 years.[110] That said, bond yields have exhibited significant volatility in recent years. The five-year average investment grade and high yield municipal bond yields at the time of this report were 2.93% and 5.14%, respectively. Municipal bonds can be issued as federally tax-exempt bonds and as federally taxable bonds. If the bonds are issued to fund publicly owned improvements, then they can be issued as tax-exempt bonds. If they are issued to fund grant programs to private businesses, then some types of bonds may be issued as tax-exempt bonds. If they are issued to fund loan programs to private businesses, they will be issued on a taxable basis, In general, the interest rate on taxable bonds is approximately 20% higher than the interest rate on tax-exempt bonds.

There are three types of municipal bonds: general obligation (GO) bonds, revenue bonds, and assessment bonds.

GO bonds

GO bonds are payable solely from an increase in ad valorem taxes. GO bonds require authorization and need two-thirds approval from both voters and the City Council. These bonds can only be used for the acquisition or improvement of real property, which includes rehabilitation, installation of fixtures, or anything connected directly to the property. GO bonds cannot be used to purchase vehicles, equipment, appliances, furnishings, or supplies, and cannot be used to pay for labor that is unrelated to acquisition or improvement of real property, ordinary repairs, or maintenance of

[107] EPA
[108] EPA
[109] S&P Dow Jones Indices
[110] S&P Dow Jones indices

property. Within the context of electrification, GO bonds would most likely be used to finance City-owned building electrification, with the caveat that the financing could not cover certain aspects of the building retrofit (i.e., labor, maintenance, etc.). However, there are examples of California GO bonds being used to cover private development; for example, the City of Berkeley issued $40 million in GO bonds for the purpose of financing the improvement and acquisition of affordable housing in 2022; this was made possible by authorization via voter approval in 2018.[111]

An example of a municipal bond is the bond issued by the Vermont Municipal Bond Bank, an authority of the State of Vermont. $6.1 million of debt was issued in 2017 to raise funds for efficiency upgrades on schools and to develop net zero police and fire facilities in a specific Vermont town. It was considered a 'green' general obligation bond.[112] Another example is the $113 million bond issuance completed in 2023 by the Dormitory Authority of the State of New York. The bond issuance will cover sustainability projects within dormitories at State University of New York colleges; projects include HVAC upgrades, electrical projects, and other building improvements that will contribute towards New York colleges achieving emissions targets laid out by the State's Climate Leadership and Community Protection Act.[113]

An example of this type of financing in California is the 2016 GO bond issuance in San Francisco. The City was authorized to issue up to $260.7 million to fund the Preservation and Seismic Safety Program (PASS) that would enable the City to preserve affordable housing and improve the earthquake resilience of the building stock. Via the San Francisco Mayor's Office of Housing and Community Development, capital raised through this bond issuance was provided as loans to property owners to invest in building upgrades.[114]

Revenue bonds

Revenue bonds are meant to finance facilities for revenue-generating municipal utility systems and are secured by the specific project or revenue stream (including Utility revenue) which is used to pay bondholders. Revenue bonds do not require voter authorization, and only need to be adopted by the City Council. Examples of revenue bonds include electric, gas, water, and wastewater utility revenue bonds. Bonds can also be issued using the incremental tax revenue generated within an enhanced infrastructure financing district (discussed below) as a payback mechanism. Revenue bonds could be issued in order to finance electric utility upgrades or developments, with the implication that the electricity sales tied to the development would be used to repay the bond.

Assessment bonds

Assessment bonds are used to finance public infrastructure and ongoing landscaping and lighting maintenance in specific geographical areas and require the approval of property owners that will benefit from the projects financed by these bonds. The debt service on the bonds is payable from the assessments levied on the property in the area, and the assessments are secured by liens on the

[111] Municipal Securities Rulemaking Board
[112] DOE
[113] Dormitory Authority of the State of New York
[114] San Francisco Mayor's Office of Housing and Community Development

assessed property. In the context of electrification, assessment bonds could likely be used to finance electric system upgrades or EV charging infrastructure development in a specific geographical area, if property owners in the area approved.

Utility bonds

Primary entity – Palo Alto as a Utility

Utility bonds are debt instruments issued by utilities. In Palo Alto, these bonds would technically be issued by the City and are considered revenue bonds; they are secured by a stream of cashflows relating to Utility activity. Utility bonds are typically used for capital projects like new treatment plants or distribution system improvements. For example, in 2009, the City issued $35 million in debt to finance improvements to the Palo Alto water utility system. The debt was secured by net revenues generated by the Water Services Fund. Palo Alto's ability to replicate this type of bond issuance to fund electrification-focused programs will depend on if it can be demonstrated that these programs are part of the utility's cost of providing service, since the City's electric enterprise is governed by California's constitutional limitations on utility rates. These bonds would need to be secured by some revenue stream related to electrification, such as electricity sales. At the time of this report, the average yield to maturity of utility bonds (taken from the S&P Municipal Bond Utility Index, consisting of municipal bonds from the public power, resource recovery, water and sewer, and other utility sectors) was 3.99%, with an average maturity of 13 years. There has been volatility in utility bond yields in recent years, with yields ranging from 2.33% to 4.62% over the last three years. Currently, the average yield to maturity is in the 85th percentile of yields over the same time period.[115]

Municipal Lease Financing

Primary entity – Palo Alto as a City and Palo Alto as a Utility

Another form of financing available to municipalities is lease financing. The general steps of this type of structure are:

- The municipality takes on a project that would involve some type of construction or development of a certain asset
- The municipality leases an asset to a finance entity; it does not have to be the asset that is under development
- The finance entity simultaneously leases the facility back to the municipality through a sublease; although the finance entity is the lessor in this context, use of the asset remains with the municipality
- The finance entity issues lease revenue bonds, and the funds from the sale of the bonds are transferred to the municipality
- The municipality fulfills the obligation to make lease payments over the life of the lease; the lease payments are used to pay the interest expense on the revenue bonds

In this context, the lease is a financing mechanism that the municipality can use to borrow capital without hitting the debt limit in the California Constitution. This type of financing structure is

[115] S&P

commonly known as a "lease leaseback."[116] An example of a lease leaseback is ongoing with the Sacramento City Unified School District; the District is entering a lease leaseback to finance a kitchen and HVAC modernization project.[117] Palo Alto has also used this financing mechanism in the past; for example, in 2021 the City authorized a lease financing structure to finance the construction of the Public Safety Building.[118]

In this context, Palo Alto could use this financing source to cover the upfront cost of large public projects, such as public EV charger installations, or the electrification of government-owned buildings, thus contributing to the goal of citywide electrification. However, as with any type of financing, the municipality is taking on more debt that would eventually have to be paid back when it reaches maturity. That being said, if the City issues asset-backed securities that are backed by revenue-generating assets (i.e., leases) the City can get a lower interest rate which will decrease financing costs as compared to non-asset backed bonds.

Enhanced infrastructure financing districts

Primary entity – Palo Alto as a City

In 2014, California authorized enhanced infrastructure financing districts (EIFDs) through SB 628. There have been several legislative measures passed since then that modify the requirements for EIFDs in California. For example, Assembly Bill (AB) 733 permits EIFDs to cover costs of climate adaptation projects, SB 1145 allows EIFDs to cover infrastructure costs, AB 116 permits EIFDs to issue bonds without requiring a vote by the public.[119] An Enhanced Infrastructure Financing District uses a portion of property tax increment revenues generated by growth within a specific area to fund public projects and other projects of communitywide significance (which includes affordable housing and other privately-owned improvements). When an EIFD is formed, the base year assessed value is established. Tax increment revenue is then generated from the increases in assessed value above the base year value. A predetermined percentage of this incremental tax revenue is then used for public projects and other projects of communitywide significance. The EIFD is initiated by the City Council, which adopts a resolution of intention, then created by a legislative body appointed by the City Council (which would consist of three members of the City Council and two public members), called a Public Financing Authority (PFA); the PFA may decide to sell bonds that are secured, or backed, by the tax increment generated within the EIFD.[120] An example of a California city with an EIFD is West Sacramento, which implemented the EIFD in Yolo County in 2017 with projected revenues of $1.1B to fund public facility improvements and housing.[121] Capital from this financing structure could be used by the Palo Alto to invest in public charging infrastructure, or to create incentive and loan programs that promotes residential and commercial building and transportation electrification, both of which would contribute toward electrification and Palo Alto's climate goals. It is important to recognize that EIFDs only leverage revenues that otherwise would

[116] California State Treasurer
[117] Sacramento City Unified School District
[118] City of Palo Alto
[119] Southern California Association of Governments
[120] City of Santa Rosa
[121] Terner Center Brief: West Sacramento EIFD

go into the City's general fund; from a cash flow perspective, they are equivalent to a general fund lease financing, although the cost of capital may be higher for the EIFD because of its more limited revenue base.

Green banks

Primary entity – Palo Alto as a City, Palo Alto as a Utility, and Third-Party institutions

Green banks are financial institutions that bridge the gap between private capital and sustainability projects. Green banks are established using public funds and are usually considered either public or quasi-public but ultimately rely on third-party private institutions to fund projects. They connect third-party lenders with various entities looking to finance climate- and sustainability-focused projects, facilitating the financing process by connecting the two entities and allowing more projects to be completed using private capital provided by the third-party lenders.[122] Green banks have the opportunity to either connect lenders and borrowers directly, or to borrow third-party capital, which would be a liability on the green bank balance sheet, and subsequently lend it out to cities, utilities, or third-party businesses looking to finance sustainability projects; these loans would be assets on the green bank balance sheet. The extent to which a green bank can choose between these options generally depends on the bank's charter.

An example of a successful green bank is the DC Green Bank; it was established by the District of Columbia Green Finance Authority Establishment Act of 2018, with initial funding granted by the DC government. Focuses of the DC Green Bank include transportation electrification and energy efficiency in buildings, as well as solar development and stormwater resilience projects. The DC Green Bank partners with multiple private capital providers in the region, including community development financial institutions, who serve as the ultimate lenders for Green Bank-financed projects.[123] Over the lifetime of the DC Green Bank, the institution has provided $47.8 million in loans, loan guarantees, credit enhancements, and bonds; the Green Bank received $9.2 million in loan payments over the course of 2023, and has $8.7 million in loan payments due in 2024.[124]

In this context, although private capital would be used, the money would be passed to the municipality for the implementation of various electrification projects, such as the development of public EV charging or electrical system upgrades. The municipality would also be responsible for paying back any loans taken for these projects and any applicable interest expenses.

Public private partnerships (PPPs)

Primary entity – Palo Alto as a City and Palo Alto as a Utility

PPPs are collaborations between a government and a private sector institution. In this context, it would be a collaboration between the City and a private company that would result in some project to accelerate building and transportation electrification. PPPs allow electrification projects to be

[122] NRDC
[123] DC Green Bank
[124] DC Green Bank

completed by leveraging private capital, with the private company then recovering costs from the government or customers on an ongoing basis over the project's lifetime.[125]

For example, in 2013 the New York State Energy Research and Development Authority (NYSERDA) entered a PPP with ChargePoint, an EV charging company, and National Grid, a New York utility. The PPP was created to install 80 EV charging stations throughout New York State, with 67 in National Grid's service territory. Although NYSERDA did provide $1 million in funding for this project, National Grid and ChargePoint provided an additional $550,000, lowering the upfront cost to NYSERDA and providing capital in lieu of additional government spending.[126] Palo Alto could replicate this type of agreement and partner with EV charging companies, or other companies geared towards transportation electrification, to develop more public EV charging and expand access to electrification.

Another example is the PPP formed in 2021 between the Sacramento Regional Transit District (SacRT), Sacramento Municipal Utility District (SMUD), and GiddyUp EV, a private EV charging company. The PPP was formed to construct a high-speed EV charging hub at the Power Inn light rail station in Sacramento. The project cost is $20 million, and GiddyUp EV is financing the purchase and installation of the charging hub. GiddyUp EV will also pay SacRT for the use of parking spaces and will share the revenue generated from the charging site.[127] Under this partnership, GiddyUp EV is reducing the upfront cost that the City of Sacramento would need to pay for public EV charger installation, thus acting as a financing source for an electrification project.

Private companies that are in partnership with the City of Palo Alto may issue corporate bonds to raise capital to invest in electrification. For the purposes of this report, it is assumed that relevant corporations would be EV charging companies, EV manufacturers, heat pump manufacturers, or any corporation with a product or service that would promote electrification. In this context, these bonds would be considered "green bonds," in that the capital raised via debt issuance would go towards a sustainability-focused project. The interest rate of the bond would depend on the company's credit risk, the time to maturity of the bond, and the overall market; issuers would assign a coupon rate depending on the yields to maturity of other similar bonds in the market. As an example, General Motors issued $2.25 billion in green bonds in 2022, with net proceeds exclusively going to the company's Clean Transportation business. The issuance comprised of two separate securities, one with a coupon rate of 5.4% and a 2029 maturity date, and the other with a 5.6% interest and a 2032 maturity date.[128] While there is a possibility that green bonds may have lower yields in the secondary bond market due to increased demand for a sustainability-oriented security, it is not currently clear that this is the case, nor is it clear that it would reduce the coupon rate, or the interest rate actually paid by the issuing corporation.[129] Issuing bonds can benefit corporations by increasing their liquidity and allowing them to invest in business segments that may generate significant profit in the long-run. Issuing a green bond specifically can signify that a corporation is committed to sustainability, and

[125] Investopedia: PPPs.
[126] ChargePoint
[127] FHWA
[128] General Motors
[129] EPA

can improve branding and attract certain customers. However, high interest expenses can be difficult for corporations to pay off, and high debt amounts can hurt a corporation's credit rating.

It should be noted that the City of Palo Alto would not have control over the actions of a private corporation, including the issuance of private bonds. For the purpose of this study, corporate bonds are considered as an instrument used by corporations to finance the development of various business segments that would contribute to the wide-scale accessibility of transportation and building electrification. Using the example of the General Motors green bond issuance, this action would not be influenced by, nor would it directly benefit, the City of Palo Alto; however, the increase in EV availability made possible by the bond issuance would improve Palo Alto residents' ability to access electric transportation.

Applicable Implementation Strategies

Once capital is raised by the municipality, the capital must then be put towards different strategies that will lead to citywide electrification. This section outlines strategies for putting capital use, such as investing directly in infrastructure that supports electrification within the community, like city-owned public chargers, or passing the capital through to customers via incentives or loans.

Specific implementation strategies that can be utilized using capital raised by the municipality include:

- Direct investment
  - Direct Investments in Supporting Infrastructure
  - Public-private partnerships
- Incentives
  - Ratepayer incentives or rebates provided by the utility
  - EV rate program
- Community Member Loans
  - City or Utility Loan Programs
  - Third-party Loans with Utility- or Agency-backed guarantees
  - Energy Savings Performance Contracting
  - Repayment mechanisms
- Leasing agreements / Subscription Services
  - Utility ownership and leasing of assets
  - Energy technology leasing agreement

Direct investment

Primary entity – Palo Alto as a City and Palo Alto as a Utility

Some funding and financing arrangements are intended to facilitate direct investment in appliances, vehicles, or infrastructure upgrades that would contribute to economywide electrification. Specific sources that lead to this type of development include public private partnerships and utility leasing agreements.

Public investment in supporting infrastructure

Public investment is needed to enable the transition to electrified buildings and vehicles. This includes investments in electrification of the municipal operations of the City or investments by the City's utilities. Investments are needed in the electric distribution system to increase capacity and funding would be needed to retire portions of the gas distribution system. Investments in alternative transportation projects such as bike lanes or other mobility projects is another form of public investment. Municipal bonds are commonly used to raise capital for public investment, but public private partnerships, leasing arrangements, or energy savings performance contracting could be used as well. These tools could also be used for other investments that would improve the public accessibility of transportation or building electrification, such as the construction of publicly-owned electric vehicle charging. Palo Alto already owns over 100 EV chargers, specifically for community members who want to charge their vehicles overnight. These chargers were installed on City-owned properties including parking garages, libraries, and a museum.[130] Some of the third-party leasing or subscription arrangements described below could also be used for these purposes.

Public private partnerships

A PPP serves as a funding source for the municipality when a private entity covers a portion of the upfront cost of development, reducing immediate costs to the City, this type of agreement often also results in development that could be viewed as part of the overall implementation strategy. For example, the PPP between ChargePoint, NYSERDA, and National Grid resulted in 80 public charging stations being developed across New York. The agreement resulted in development that contributed to citywide electrification.; this type of agreement often also results in development that could be viewed as part of the overall implementation strategy. For example, the PPP between ChargePoint, NYSERDA, and National Grid resulted in 80 public charging stations being developed across New York. The agreement inherently resulted in some type of development that contributes to citywide electrification.

Incentives

Primary entity – Palo Alto as a City and Palo Alto as a Utility

Incentives or rebates provided by the City or Utility

Providing incentives in the form of rebates or grants is one way to promote electrification. These grants could be provided by the City using the funding and financing sources discussed above. Customers would not repay the City. It should be noted that the City already offers some incentives, Including:

+ Palo Alto Rate Assistance Program: provides bill discounts based on medical need or financial need. Ratepayers qualify for medical need if they have a physician's certification stating that a medical condition causes higher than normal utilities consumption and can receive a 25% discount on monthly gas or electricity charges. Ratepayers qualify for

[130] City of Palo Alto

financial need if they meet certain income requirements and are eligible for 25% discounts on gas and electricity charges and 20% on storm drain charges[131]

- Business Electrification Technical Assistance Program: offers up to $100,000 for commercial participants looking to electrify their businesses. Funding can be applied to heat pumps, HPWHs, and convection ovens.[132]
- HPWH rebate: provides rebate of 55% of HPWH cost (up to $3,500) for CPAU ratepayers who have existing natural gas water heaters, or $500 for ratepayers who have existing electric water heaters.[133]
- Electric Vehicle Charger Rebate Program: provides rebates for multifamily, nonprofits, and public agencies to cover installation and equipment costs for EV chargers (up to $8,000 per EV charging port; $80,000 total project cap), plus an additional incentive to support any associated electric service upgrade fees necessary to support the project ($10,000 per charging port; $100,000 total project cap).

However, additional incentives could be established to further promote electrification.

One challenge with incentives is achieving the scale necessary for communitywide electrification. Providing incentives on the scale required for transitioning the entire community to electric buildings and vehicles requires either very large funding sources or the use of financing. Traditional financing mechanisms most available to the City, such as municipal and utility bonds, may not be sufficient or available for some types of electrification programs. Other strategies may be needed, such as pairing Green Bank or other third-party financing to community members with incentives paid by the City over time (rather than up front) to offset the debt repayment. This would allow the use of smaller funding sources to leverage large amounts of capital without the use of public financing.

Examples of other ratepayer incentives exist throughout the country, but some specific examples from New York include:

- New York State Heat Pump Program: a program run in collaboration between NYSERDA and the NY utilities, the program offers residential ratepayers $700 with the installation of a HPWH and $500-1,500 per heat pump, depending on the type[134]
- Drive Clean Rebate: offers up to $2,000 for participants who purchase or lease a new EV[135]
- Charge Ready NY 2.0: provides incentives for EV charger installation at workplaces, multifamily residential buildings, and public facilities; incentive amounts are $4,000 per public charger (must be in a DAC), and $2,000 workplace or multifamily residential charger[136]

[131] City of Palo Alto
[132] City of Palo Alto
[133] CPAU
[134] NYSERDA
[135] NYSERDA
[136] NYSERDA

These are just some incentives from one jurisdiction; there are many examples run by municipalities and utilities across the country to reduce the cost participants bear to electrify their homes and vehicles that could be replicated within Palo Alto.

EV rate program provided by the Utility

An EV rate program would involve the Utility providing discounted electric rates for EV charging companies that own and operate public chargers, or commercial fleet owners who have electrified their fleets. A common form of this type of partnership involves the Utility providing a reduced demand charge, or even no demand charge. Demand charges are typically charged on a $/kW basis to commercial customers. In this case, the Utility creates a demand charge "holiday" for commercial fleet owners or EV charging companies, reducing the costs they would pay the Utility for charging their fleet or providing public charging, respectively.[137] To be legally valid in Palo Alto, this type of incentive would have to offer some benefit to the public and be funded with non-ratepayer funds to comply with Proposition 26.[138]

A specific example is the rate structure in New Hampshire; small general service EV rates include a temporary demand charge (75% reduced for year 1, 50% reduced for year 2, and 25% reduced for year 3).[139]

Another example is the EV Phase-in Rate (EV-PIR) recently approved by the New York Public Service Commission. Under the EV-PIR, commercial EV charging customers are charged different rates depending on the time of day, season, and the charging station load factor. Charging companies whose stations have lower load factors will be charged lower demand charges, with the lowest tier of load factor receiving a full demand charge holiday ($0/kW charge). The EV-PIR structure is meant to provide operating cost relief in the near-term while EV charging station utilization is still relatively low and will gradually transition into a more cost-reflective rate in the long-run as EVs become more prevalent in New York.[140]

This incentive structure would:

- Reduce charging costs for commercial fleet owners, thus incentivizing fleet electrification
- Reduce utility bills for EV charging companies, thus incentivizing the development of public charging stations within Palo Alto

Establishing incentives can be done from an equity lens in order to promote electrification in underserved communities; the municipality and Utility have the opportunity to provide more incentives and/or higher-value incentives to low-income individuals and can also aim at making building and transportation electrification more accessible to renters. A caveat of incentives is that they can be expensive given that there is no payback schedule; the Utility or municipality is essentially creating a funding source and needs enough capital to do so. Electric utility rates would

[137] Lawrence Berkely National Laboratory
[138] League of California Cities
[139] State of New Hampshire Public Utilities Commission
[140] New York Public Service Commission

need to be structured carefully to cover the cost to serve these loads, and ensure rates reasonably reflect the utility's cost to provide service.

Loans to community members for electrification

Primary entity – Palo Alto as a City or Palo Alto as a Utility

One of the main barriers of electrification is the high upfront cost of EVs, EV chargers, EV charging infrastructure, heat pumps, and panel upgrades. By providing financing in the form of loans to customers, Palo Alto could minimize this barrier and allow more customers to participate in transportation and building electrification. This strategy encompasses Utility loan programs, City loan programs, or third-party loan program; the differentiating factor between these two options is who provides the loan.

City or utility loan programs

Funding and financing sources discussed above would allow the City to gather capital; they could then distribute this capital in the form of loans, with set interest rates and payback periods to which debtors would be held. City-provided or Utility-provided customer loans could, for example, be funded by the issuance of debt; the proceeds from which would be loaned to community members with set interest rates and repayment terms. The municipal/utility debt would be secured by community member repayments, and the cost of debt service could be reduced by incentives funded by other sources such as utility-related sources, listed above, or general, Ad Valorem, assessment, or special taxes that were specifically levied for electrification programs. Loan programs can be financed via GO bonds, general fund lease financing programs, or Mello-Roos special tax bonds.

An example of this is the loans provided via the San Francisco PASS program, as mentioned in the municipal bond section above. After issuing a municipal GO bond San Francisco was able to provide, as of June 2020, $34.3 million of long-term, low-interest financing to residential and commercial building owners to preserve affordable housing and upgrade buildings to improve their earthquake resilience.[141]

New York State and City also have examples of these types of programs. An example from New York City is the Green Housing Preservation Program, which falls under the department of Housing Preservation and Development. This program provides up to $50,000 per residential housing unit for energy efficiency and water conservation improvements, lead remediation, and moderate rehabilitation work. It is a low- or no-interest program; $80,000 is available for 3–15-unit residential buildings requiring more significant improvements.[142] On a state level, NYSERDA manages the Smart Energy Loan program. This program provides funding for the purchase of heat pumps or energy efficiency improvements. Loan amounts range from $1,500-25,000 and loan terms are 5, 10, or 15 years. Interest depends on location, and ranges from around 3.5-4%.[143]

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[141] San Francisco Mayor's Office of Housing and Community Development
[142] NYC HPD
[143] NYSERDA

Utilities can also issue loans to ratepayers to cover the upfront cost of electrification and allow ratepayers to repay their debt over time. One example of a utility loan program is a program run by National Grid in Massachusetts. Customers who have National Grid perform a home energy assessment can apply for a 0% interest loan with a principal value of up to $25,000 and a term of up to 7 years. Loans can cover central heat pumps, mini-split heat pumps, solar water heaters, efficient devices, and other home energy efficiency upgrades.[144] The CPAU could create a similar loan program and offer affordable financing to participants looking to upgrade and electrify their homes or businesses.

A benefit of providing customer loans to incentivize electrification is that the municipality can prioritize equity in their structuring of the loan. By providing low interest rates to low-income participants, the CPAU or Palo Alto can ensure that financing costs are not prohibitive and therefore are not a barrier to an equitable rollout of building and transportation electrification.

However, there are still barriers to using customer loans as a successful implementation strategy. Making participants aware of loan options would require significant outreach and education. Additionally, participants would still have to invest and, most likely, pay at least some interest on their investment. Loans, while helpful in minimizing upfront costs, are less likely to promote electrification than pure incentives in the form of grants or rebates, as discussed below.

Customer loans with Utility- or Agency-backed guarantees

This would involve the Utility or a government agency creating a financing source available to the community by bridging the gap between customers and private lenders. Customers would borrow money from a third-party lender in order to invest in an electric vehicle, home charger, or heat pump, and the Utility or agency would guarantee the loan to ensure that customers received an affordable interest rate. In the event that the customer defaulted on their loan, the Utility would be responsible for making the lender whole.

An example of a similar program is GoGreen, which Palo Alto participants currently have access to. GoGreen is part of the California Hub for Energy Efficiency Financing, a State program focused on clean energy and energy efficiency. Under GoGreen, participating lenders provide capital to homeowners and businesses looking to make energy improvements. The California Alternative Energy and Advanced Transportation Financing Authority, a public agency in the STO, provides lenders with a loan loss reserve. This mechanism serves as a type of guarantee or insurance for the lender, thus decreasing the risk to the lender and allowing them to provide lower interest rates, decreasing the cost of financing to participants.[145] Lower interest rates make electrification financing more accessible to a broader range of households, such as low-income participants in Palo Alto that would otherwise not be able to afford the financing terms.

Energy Savings Performance Contracting

[144] National Grid
[145] GoGreen

Energy performance savings contracting (ESPC) allows building owners to finance energy efficiency upgrades and electrification via electric bill savings. An ESPC program can be established by the municipality to connect building owners with energy service companies (ESCOs); once connected, the entities will enter an ESPC to create a budget-neutral option for building owners looking to electrify while avoiding a high upfront investment.

An ESPC allows the building owner to use future energy bill savings to pay back the upfront cost of the upgrade; this is considered a budget-neutral approach. Municipal governments can establish ESPC programs in order to promote this type of contract and facilitate the electrification process for building owners.[146] An example of this type of program is the Renew Boston Trust, established by the City of Boston; the program will use energy performance contracting and will use the bill savings that result from energy efficiency upgrades to finance investments and cover additional resiliency improvements.[147]

Under an ESPC, the participating customer must achieve utility bill neutrality, meaning that their utility bills may not exceed the level prior to electrification. Traditionally, this would cause this type of program to be limited in the types of technologies that could be financed, based on the ratio of energy savings to capital costs. However, Palo Alto could overcome this limitation by providing an incentive funded by a legally authorized funding source that would be issued in the event that a participating customer's bill exceeds previous levels, essentially closing the gap in utility costs and ensuring budget neutrality. This type of incentive would increase the types of technologies that participants could finance under an ESPC, and increase accessibility of building electrification.

Repayment mechanisms

There are various methods of repayment that can be used for the loans above in addition to the traditional method of having the lender invoice the loan recipient and receive payment. Government agencies have enabled repayment on the property tax bill while utilities have enabled repayment on the utility bill. These repayment methods can provide additional security for the lender, lowering interest rates. They can make it more convenient for community members to repay loans. And they can tie related expenses together. For example, a loan to invest in energy efficiency or electrification is related to changes in costs on the community member's utility bill. Having those expenses tied together through an on-bill repayment mechanism helps the community member see the net change in household expenses resulting from their investment.

Tax-based repayment

Tax-based repayment would involve participants receiving loans from the City (or another third-party) to electrify and then repaying their loans over time via property taxes. This is the key mechanism of PACE financing, discussed in detail under the "Participant Perspective" section as a mechanism for a participant to receive capital to cover upfront electrification costs. But in addition to a financing source for participants, tax-based repayment is also an implementation strategy that the City or a

[146] DOE
[147] C40

third-party, like a green bank, could institute to enable customer adoption of clean energy technologies. Similarly to other strategies that provide financing to participants in order to electrify, a tax-based repayment system would minimize the upfront cost participants would need to cover and reduce some of the barriers to electrification.

On-bill repayment and on-bill financing

On-bill repayment (OBR) and on-bill financing (OBF) allow customers to invest in electrification and repay over time as part of their overall utility expenses. The distinction between the two program types is that OPF allows the utility to incur the cost of a clean energy upgrade, whereas under OBR a non-utility third party provides the capital.[148]

Currently, in addition to providing rebates, the CPAU is conducting a pilot program that allows on-bill repayment for a portion of the cost to install a HPWH. Customers can borrow up to $1,200 from the CPAU to use towards their HPWH and can repay over 5 years via $20 monthly charges on their utility bills. Another similar financing structure is a tariffed on-bill (TOB) program; utilities provide upfront capital and recover costs through site-specific charges. TOB programs are discussed below.

Additional programs exist in other jurisdictions. One example is the NYSERDA On-Bill Recovery Financing Program in New York. This is a low-interest loan program that provides financing to customers looking to make energy efficiency improvements on their homes or install heat pumps. The loans are originated by a third-party (Slipstream Inc.) and provided to customers of participating utilities (Central Hudson, Con Edison, Long Island Power Authority, National Grid, New York State Electric and Gas, Orange and Rockland, Rochester Gas and Electric). Under this program, the loan maximum is $50,000, and the maximum loan term is ten years. The interest rate is the Wall Street Journal Prime Rate + 2%, and payments begin within 2-3 billing cycles of the home improvement work concluding.[149]

Similarly to incentives and customer loans, on-bill repayment programs can be structured to prioritize making capital available to low-income participants or renters. However, a caveat to on-bill repayment, particularly a TOB program, is that ongoing payments made by customers must be less than the amount of energy savings they are receiving from the upgrade in which they have invested. This could impact the ability for the Utility to recoup costs. It could also limit the types of technologies that can be purchased under a TOB repayment structure; if the energy savings are too small relative to the capital expenditures necessary for installation, it may be infeasible for energy bill savings to cover the financing cost adequately. This repayment structure will become increasingly infeasible if electric rates continue to escalate relative to gas rates, making the energy cost savings achieved by switching from a gas space heating device to an electric heat pump smaller, regardless of heat pump efficiency.

Tariffed on-bill

[148] DOE
[149] NYSERDA

TOB programs are also called Inclusive Utility Investment programs, or Tariff-Based Recovery (TBR) programs. These programs allow Utilities to pay for energy efficiency or clean energy upgrades at a customer site and recover costs through fixed, site-specific charges on the customer's energy bill. Charges are less than the estimated savings from energy bill reductions that result from energy efficiency or clean energy upgrades (although this would not necessarily be the case where TOB programs incent electrification). These programs do not require customer credit or income qualification and require no upfront cost to be paid by the customer.[150] A TOB program is an equitable way to provide these types of upgrades.

An example of this type of program is the Residential Income-Qualified Tariff Based Energy Efficiency Pilot implemented by Georgia Power. The pilot program supports energy efficiency upgrades for historically underrepresented customers in areas of Atlanta and Athens, Georgia. Under the program, Georgia Power will pay the upfront costs of energy efficiency upgrades and recover costs through a tariff charge on customer utility bills; the amount of each customer's monthly payment is based on the estimated bill savings that occur due to the efficiency upgrade. Customers will retain 20% of the cost savings as a bill reduction and will pay the rest as a tariff charge.[151]

Leasing for subscription-based or usage-based services

Primary entity – Palo Alto as a City, Palo alto as a Utility, and Third-Party institutions

Under a leasing agreement a private entity (or public agency or utility) makes some type of capital investment that would aid electrification and is repaid over time by community members and/or the City. The entity making the investment is often responsible for ownership and maintenance as well. Lease agreements will sometimes provide for the purchase of the infrastructure after a set period. In the case of a leasing agreement where EV charging companies provide charging-as-a-service, the agreement leads to the development of EV charging infrastructure at multifamily residential buildings, businesses, or public locations and is repaid through charger revenue. Other leasing agreements might involve a monthly or annual lease payment.

City or Utility ownership and leasing of assets

An example of public investment for the City as a Utility would be CPAU owning specific assets and leasing them out to community members to increase access to electrification. This could allow the utility to lease charging infrastructure to residential or commercial participants. Although uncommon, this could also give the utility the opportunity to lease heat pumps to homeowners, thus accelerating and increasing the accessibility of building electrification. This is an uncommon practice in the United States but has occurred in Europe. In 2022, a German HVAC company, Thermondo, and the South Korean company LG started offering heat pump leasing to German clients for a fixed monthly price of EUR 159 per month.[152] If the City as a Utility were to utilize this type of strategy, it could incentivize homeowners to electrify by reducing the barrier of an upfront heat pump cost, and make building electrification more widely available in Palo Alto.

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[150] EPA
[151] State of Georgia Public Service Commission
[152] PV Magazine

Energy technology leasing agreement

A leasing agreement in this context is an agreement between one or more private companies and the user of an energy technology. The private entities pay the upfront cost for some investment, and the user gradually pays the cost of investment and operations over time until they achieve ownership. This is commonly used in clean energy development projects, but has recently been used by East Bay Community Energy, now known as Ava Community Energy, in collaboration with Calibrant Energy and EV Realty in Alameda County, California to fund the installation of EV charging infrastructure that would benefit the residents of multifamily residential buildings. This particular agreement involves the EV charging company providing charging-as-a-service (CaaS), wherein it installs charging equipment and receives payment from EV drivers who utilize their chargers. This type of agreement allows utilities and EV charging companies to share the risk associated with EV charging projects earning back upfront costs; this structure of risk sharing could incentivize private companies to invest in EV charging infrastructure, and could increase the scale of private capital being put into publicly accessible charging while simultaneously minimizing the upfront investment paid by the utility.[153]

This type of agreement could be replicated in Palo Alto to give the CPAU an opportunity to gradually finance EV chargers and avoid high upfront costs while incentivizing third-party EV charging companies to invest in the area. There is generally more money in the private sector, and that capital can be leveraged through leasing agreements. These types of agreements can also enable investments in areas or communities that have historically low electrification adoption rates; in the case of the Ava Community Energy example the leasing agreement enabled EV charging infrastructure to be developed in locations where EV adoption had previously been very low. The risk with leasing agreements is non-performance by the leasing partner or other contractual risk.

Conclusion

It is very likely that Palo Alto will have to employ both funding and financing strategies from each of the four perspectives in order to raise sufficient capital to develop the implementation strategies needed to achieve citywide equitable electrification. Multiple combinations of sources and strategies are possible; these will be explored in the S/CAP Funding Model being developed by E3 to examine costs and benefits that different packages would have from a societal perspective.

Achieving citywide electrification in Palo Alto will come with multiple obstacles, one of which is cost. Heat pumps, electric vehicles, electric vehicle chargers, electrical infrastructure upgrades, and all other investments related to electrification are costly. However, funding and financing sources are available to the municipality, the Utility, businesses contributing to electrification, and both residential and commercial participants. Some combination of these sources will likely be necessary, but Palo Alto can utilize prospective sources in creative ways to promote electrification across the city. As next steps in the S/CAP Funding Study, E3 will evaluate funding and financing

[153] Ava Community Energy

options in a quantitative model, identifying costs to the Utility, municipality, and overall community to electrify.