Residential Heat Pump Financing Mechanisms Analysis

Final Report

ET23SWE0063

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Disclaimer

Executive Summary

California (CA) has set an ambitious climate goal to achieve a 40 percent reduction in greenhouse gas (GHG) levels by 2030 and carbon neutrality no later than 2045. To help achieve this goal, CA has vowed to install six million heat pumps (HPs) across the state by 2030. CA and the state's utility companies and community choice aggregators (CCAs) have instituted several HP incentive programs to spur market transformation initiatives in California. However, the scale of investment needed to accomplish California's HP goal dwarfs publicly available funds, forcing many customers to look elsewhere for capital sources to overcome the large upfront cost barrier of HP technology adoption.

While a number of private and publicly backed financing mechanisms are currently available in the market, customers, particularly low-to-moderate income (LMI) customers, continue to struggle to access low-cost project capital for HP upgrades. Through this market study, the Project Team identified how scalable financing mechanisms, when deployed through a coordinated effort, can more effectively, efficiently, and equitably address the HP first cost barrier and improve access to HP heating ventilation, and air conditioning (HVAC) and HP water heating (HPWH) projects. To start, the Project Team conducted an extensive literature review to establish the decarbonization funding gap and identify existing HVAC- and WH-related financing mechanisms in CA. The team assessed these financing mechanisms across five attributes, considering a solution's applicability to HPs, eligibility criteria, cost to access, convenience, and customer protections. Through this process, the Project Team selected three HP financing mechanisms, point-of-sale lending, equipment leasing, and combined solar and electrification financing, for additional investigation into their potential for helping unlock building electrification at scale. For each of these mechanisms, the Project Team conducted several stakeholder interviews with a diversity of market actors, including finance providers, government entities, installation contractors, and real estate professionals, and completed a financial analysis to evaluate opportunities and gaps to deployment and scale.

Through this qualitative and quantitative research, the Project Team arrived at the following recommendations for the three focus areas:

- **Point-of-Sale (POS) Lending:** The California Public Utilities Commission (CPUC), CA investor-owned utilities (IOUs), and the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) should pursue opportunities to combine the distinctive elements of GoGreen Home (GGH) Financing and financial technology (FinTech) platforms to offer a low-cost and low-friction financing mechanism available to a broad customer segment.
- **Equipment Leasing:** The CPUC, CA IOUs, and CAEATFA should research opportunities to offer a credit enhancement-backed leasing program specifically designed to serve credit-challenged residents, incorporating maintenance and operations coverage, strong customer protections, and a convenient approval process.
- **Combined Solar and Electrification Approaches:** The Project Team does not recommend a tailored financing product for combined solar and electrification projects. However, POS lending, equipment leasing, and other available or emerging financing mechanisms should be designed to serve these projects effectively. Solar-led electrification represents a promising approach for customers seeking to achieve strong bill savings. The Project Team recommends additional research and development into the concept to further promote scale.

Abbreviations and Acronyms

Acronym	Meaning
ALJ	Administrative Law Judge
ASHP	Air-Source Heat Pump
BNPL	Buy Now, Pay Later
CA	California
CAEATFA	California Alternative Energy and Advanced Transformation Financing Authority
CARB	California Air Resources Board
CCA	Community Choice Aggregator
CEC	California Energy Commission
CFPB	Consumer Financial Protection Bureau
CHPC	California Housing Partnership Corporation
DEER	Database for Energy-Efficient Resources
DFPI	Department of Financial Protection and Innovation
DOE	Department of Energy
EBD	Equitable Building Decarbonization
EE	Energy Efficiency
EEM	Energy Efficient Mortgage
EGIA	Electric and Gas Industries Association
ESCO	Energy Service Company
ESPC	Energy Savings Performance Contracting
FinTech	Financial Technology

Acronym	Meaning
GGH	GoGreen Home
GHG	Greenhouse Gas
HARDI	Heating, Air-conditioning and Refrigeration Distributors International
HEEHRA	High-Efficiency Electric Home Rebate Act
HELOC	Home Equity Lines of Credit
HOMES	Homeowner Managing Energy Saving
HP	Heat Pump
HPWH	Heat Pump Water Heater
HTR	Hard-to-Reach
HUD	Housing and Urban Development
HVAC	Heating, Ventilation, and Air Conditioning
IOU	Investor-Owned Utility
IRA	Inflation Reduction Act
LBNL	Lawrence Berkeley National Laboratory
LI	Low-Income
LIHEAP	Low-Income Home Energy Assistance Program
LIWP	Low-Income Weatherization Program
LMI	Low-to-Moderate Income
MESA	Managed Energy Service Agreement
MOU	Municipal-Owned Utility
MUSH	Municipal, University, Schools, and Hospitals sectors
OBF	On-Bill Financing

Acronym	Meaning
OBR	On-Bill Repayment
PACE	Property Accessed Clean Energy
PCE	Peninsula Clean Energy
POS	Point of Sale
PPA	Power Purchase Agreement
PV	Photovoltaic
SCE	Southern California Edison
SCP	Sonoma Clean Power
SEaaS	Sustainable Energy as a Service
SGIP	Self-Generation Incentive Program
SME	Subject Matter Expert
SVCE	Silicon Valley Clean Energy Authority
TECH	Technology and Equipment for Clean Heating
TOB	Tariffed On-Bill
VGS	Vermont Gas Systems
WAP	Weatherization Assistance Program
WH	Water Heating

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Introduction

While heating, ventilation, and air conditioning (HVAC) heat pump (HP) and HP water heaters (HPWHs) continue to grow in market share for California (CA) single family households, upfront cost remains a significant barrier to market adoption. Legislation, incentives, and education efforts have all motivated electrification. However, if the state is to achieve mass market adoption of HP technologies and make significant progress toward decarbonization goals, CA must ensure a robust set of financing products tailored for electrification are available at scale for residential customers. Over the years, multiple publicly supported financing mechanisms for energy efficiency (EE) and clean energy upgrades have been put forward to address certain limitations in market-based offerings, particularly around customer access and finance costs. Those financing products have not achieved scale in CA, especially for low-to-moderate income (LMI) customers. If effectively scaled, publicly supported residential financing products could aid all CA homeowners in adopting HPs and other clean energy technologies and support CA's progression toward achieving its decarbonization goals.

The purpose of this study is to inform the mechanisms by which customers effectively, efficiently, and equitably access this capital. In this CalNEXT market study, the Project Team addresses gaps in scaling public funding backed financing and propose three mechanisms with the potential to support HP market transformation in CA. The Project Team defines the need for more capital to support HP adoption and reviews CA's existing energy and electrification financing offerings. This financing landscape research identifies both the benefits and gaps of the current mechanisms and informs the Project Team's selection of the three products that demonstrate high potential for collectively achieving scale. These mechanisms were selected using the criteria outlined in the Methodology section and focus on addressing unique market gaps while serving the needs of different customer segments.

This Final Report reviews the objectives of ET23SWE0063, background information gained from the literature review, the methodology and approach the Project Team took to complete the market study, the findings accumulated, and the Project Team's recommendations.

Objectives

Through this CalNEXT market study, ET23SWE0063, the Project Team characterizes the CA HP financing market and proposes mechanisms for addressing identified gaps in scaling financing offerings for residential customers. To guide the market research, and mechanism selection and definition, the Project Team developed the following set of research questions:

- What is the current landscape for financing mechanisms for residential HP HVAC, HPWH, and related home upgrades in CA?
- What market gaps are not addressed by the existing suite of financing mechanisms?
- How can diverse financing mechanisms be deployed to overcome these market gaps?

- How are risks and rewards allocated among different stakeholders for each financing mechanism?
- Are there common challenges across financing mechanisms, and how might these challenges be mitigated?
- What role can CA investor-owned utilities (IOUs) play in addressing financing gaps for HP market transformation?

Methodology

This section describes the approach the Project Team used to conduct background research, select point-of-sale (POS) financing, equipment leasing, and combined solar and electrification approaches for future market research, and evaluate these three mechanisms.

Literature Review

The Project Team initially focused on understanding the CA HP financing market and gauging the need for more comprehensive financing mechanisms to enable HP adoption in CA. The team conducted a literature review to document the policies and programs guiding residential sector electrification in CA and the existing financing mechanisms utilized by customers. The Project Team established the following literature review objectives to guide their work:

- Document the present CA policies and programs influencing HP adoption.
- Characterize the existing financing mechanisms for HP HVAC and HPWH upgrades in CA.
- Define the market gaps existing financing mechanisms do not sufficiently address.
- Establish a set of criteria for evaluating and selecting the financing mechanisms for further investigation.
- Use the criteria to select three financing mechanisms for future research.

Researching the CA HP market sector guided by the above objectives, the Project Team conducted a comprehensive review of CA building electrification goals and programs. The Project Team consulted in-house subject matter experts (SMEs) and published literature to compile a list of existing financing mechanisms. This in-depth research helped determine a set of market gaps and define how each mechanism addressed these gaps.

To narrow the list of existing financing mechanisms, the Project Team also developed a set of criteria for selecting which financing mechanisms merit further consideration. The Project Team hypothesizes that the selected financing mechanisms should incorporate the following attributes:

1. At a minimum, resolve first cost barriers to HP adoption. Ideally, financing mechanisms should also address additional cost issues or risk factors, e.g., operations and maintenance.
2. Incorporate strong basic customer protections, including transparency, confidentiality of customer data, and protections against unethical sales practices.

3. Emphasize convenience and simplicity of digital transactions analogous to contractor financing and emerging financial technology (FinTech) solutions.
4. Are unsecured or are secured only by the improvements, not the underlying property.
5. Rely on a value stream other than the borrower's earning capacity and creditworthiness, i.e., offer a solution to LMI customers.

Market Survey and Data Plan

The Project Team created a market survey and data plan to guide engagement with key stakeholders. The data plan supported the determination of data needs to evaluate each financing mechanism, defined solution use cases, and created a data collection strategy. The plan was informed by a gap analysis that identified information the analysis would be required to address:

- Financial benefit from the customer's perspective
- Business opportunity and market appeal from the perspective of finance providers and industry stakeholders
- Ability of proposed financing mechanisms to balance potentially conflicting requirements for broad customer eligibility; simplicity, speed, and convenience; and strong customer protections
- HVAC market share and market potential of each proposed mechanism

Data plan research topics were addressed through a quantitative analysis, which compared the customer and financier's financial outcomes for each proposed financing mechanism, and in-depth interviews with industry stakeholders.

Stakeholder Interviews and Data Collection

The Project Team conducted interviews with stakeholders identified in the market survey and data plan stage. The team drafted interview questions to learn more about each financing mechanism, including loan or lease terms, target market segments, and key opportunities for and barriers to scale. The Project Team also investigated how state or IOU intervention or partnerships might bolster these mechanisms to increase technology adoption and generate utility and grid benefits. In-depth interviews followed a set of interview questions developed for each stakeholder sector. Interview questions can be found in Appendix A. The Project Team conducted outreach to 27 different contacts within the following market segments closely tied to electrification and home improvement financing:

- CA government entities
- Financial providers of solar leases and power purchase agreements (PPAs)
- Lenders offering contractor-originated POS financing
- HVAC lease providers
- Real estate and mortgage industry representatives
- Solar and electrification contractors

The Stakeholder Interviews section of this report includes a list of the interviewed stakeholder organizations, findings, and key takeaways.

Opportunities and Barriers Analysis

The Project Team reviewed key differences in design elements, capital flow management, and risk and reward allocation for each of the three residential financing mechanisms chosen. A primary purpose of this analysis was to test assumptions about how each financing mechanism aligns with customer financial interests. By combining the analyses of estimated capital, operating costs, and market potential with interview findings, the Project Team offers recommendations for how to best integrate public funding to deploy the selected mechanisms at scale, effectively and equitably.

Background

In 2016, CA enacted one of the most ambitious climate goals in the nation, aiming to achieve a 40 percent reduction in greenhouse gas (GHG) levels by 2030. Governor Gavin Newsom expanded this goal in 2022, announcing his ambition for the state to achieve carbon neutrality no later than 2045. The California Air Resources Board (CARB) outlined the state's plan for achieving these goals in the *2022 Scoping Plan for Achieving Carbon Neutrality* (CARB). In this plan, at the direction of Governor Newsom, CARB includes a goal of installing six million HPs across the state by 2030. In 2023, manufacturers agreed to collaborate with the California Energy Commission (CEC) to accomplish this ambitious goal.

In addition to these critical policies, the state, utilities, and community choice aggregators (CCAs) have instituted several incentive programs to spur technology adoption. The Technology and Equipment for Clean Heating (TECH) Clean CA Initiative provides incentives and workforce education for distributors and contractors to stock, sell, and install residential HPs statewide. TECH is designed to layer with other regional programs and provide additional benefits to LMI communities, maximizing impact. Thus far, the state legislature has designated $265 million for TECH. As of May 2024, TECH has incentivized the sale of over 30,000 HPs and HPWHs.[1]

CA recently established the Equitable Building Decarbonization (EBD) Program, which will provide $922 million to fund direct installation of and incentives for low-carbon technologies, including HPs (CEC, Equitable Building Decarbonization Direct Install Program Guidelines). The state's Self-Generation Incentive Program (SGIP) provides an additional $84.7 million to incentivize HPWHs (California Public Utility Commission). CA also funds two low-income (LI) focused energy programs, the Energy Savings Assistance program and the Low-Income Weatherization Program (LIWP), which allow customers to acquire EE and weatherization technologies, including HPs, at no cost. Collectively, CA will spend an estimated $4.55 billion on these two LI focused programs over the next decade, and approximately $1.3 billion on the TECH, EBD, and SGIP programs focused on HP adoption.

CA also administers several federally funded programs that further support acceleration of HP installations. The Low-Income Home Energy Assistance Program (LIHEAP) and Weatherization

[1] See the TECH Clean CA website at www.techcleanca.com.

Assistance Program (WAP) both provide additional EE and weatherization support to CA LI residents (California Department of Community Services & Development). The Project Team estimates federal funding for these programs in CA to total $510 million over the next decade. In 2022, Congress also passed the Inflation Reduction Act (IRA), the largest investment in climate and energy infrastructure in United States (U.S.) history. The IRA will help make meaningful progress on HP market transformation through the Homeowner Managing Energy Savings (HOMES) and High-Efficiency Electric Home Rebate Act (HEEHRA) programs. HOMES will offer residential customers performance-based rebates for whole-home energy retrofits, with additional benefits for LMI customers. HEEHRA provides POS rebates for appliances, including HPs, to LMI residents. CA has applied to receive $582 million from the federal government to implement these programs (CEC, Inflation Reduction Act Residential Energy Rebate Programs). Collectively, state and federal funding for programs related to HP adoption totals nearly $7 billion, as listed in Table 1.

Table 1: CA Public Funding for Electrification

Program Name	Funding Source	Budget
TECH	State	$265,000,000
EBD	State	$922,000,000
SGIP HPWH	State	$84,700,000
Energy Savings Assistance Program	State	$3,667,000,000
LIWP	State	$150,000,000
LIHEAP	Federal	$302,400,000
WAP	Federal	$208,500,000
HOMES	Federal	$292,000,000
HEEHRA	Federal	$290,000,000
Total	**State and Federal**	**$6,914,600,000[2]**

While each of these programs represents a meaningful and crucial investment in CA residential energy infrastructure, the scale of funding needed to accomplish CA's six million HP goal far exceeds

[2] Customers may also be able to access locally offered incentives, but these programs were too numerous to include in this summary and would not significantly alter the total CA electrification funding.

what is currently publicly available. The total cost of a HP HVAC installation averages over $18,000 and can be as high as $40,000 (CEC, Inflation Reduction Act Residential Energy Rebate Programs). While more affordable than HP HVAC, HPWHs are still a sizeable investment at about $6,000 on average and sometimes as high as $10,000 (TECH Clean California). Taken together, the cost of installing six million HPs is likely, at minimum, $90 billion[3]. Considering the additional home infrastructure and EE work that should occur alongside a HP installation, the total figure is likely significantly higher. Meanwhile, the CEC estimated electrification technology costs upwards of $26 billion in the "moderate electrification scenario," a scenario in which CA still does not meet their 2030 climate goal and is far from total electrification (CEC, CA Building Decarbonization Assessment). A study conducted by the Building Decarbonization Coalition, an advocacy organization, estimated the total cost of LMI electrification alone to be as high as $150 billion (Building Decarbonization). Many of the funding sources outlined in Table 1 are one-time grants. As of today, HOMES and HEEHRA are not likely to receive additional funding. Similarly, TECH, SGIP, and EBD are not currently designed to fund building electrification efforts beyond 2030.

In the absence of a clear public funding mechanism, the private capital portion of residential investments will need to come from property owners, either through cash or debt financing. While public funding sources help bring down upfront costs, they do not entirely eliminate incremental costs compared to incumbent technologies. CA income data suggests that the average resident likely cannot pay for a HP installation solely using cash. Based on the 2022 census, the median annual household income in CA was $91,905, meaning the average single family residential customer will spend a minimum of two months of annual income on a typical HP installation (CA 2022 Census). Further, Consumer Financial Protection Bureau's (CFPB) *Making Ends Meet* 2023 surveys indicate that nearly 40 percent of U.S. households had difficulty paying at least one bill or expense in 2022 (Consumer Financial Protection Bureau). These data suggest that most CA residents will need financial assistance when they replace their HVAC or WH system, especially if they choose to upgrade to HP technology. While some LMI customers qualify for the EBD direct install program, many CA residents will only receive incentives to reduce the upfront cost. The TECH initiative's $1,000 incentive stacked with other regional incentives will still not make a HP purchase accessible for CA residents already struggling to pay their bills. The Project Team estimates expanding direct install programs would cost CA $90 billion, as noted above. Consequently, for CA to achieve its six million HP goal, the state must support the development of alternative financing mechanisms at scale.

Without access to abundant cash reserves, CA residents need low-cost, fast, and low-risk financing mechanisms to support HP adoption. The Project Team reviewed the existing financing products available to CA residents and categorized them into three groups:

- Traditional products, representing commonly used loan and lease mechanisms
- Specialized efficiency products, including mechanisms specifically designed to improve access to EE and electrification upgrades

[3] Assumes HP HVAC systems account for 4.5 million installations, and HPWHs account for 1.5 million installations.

- Emerging products, covering nascent approaches aimed at streamlining transactions

This exercise informed the Project Team's selection of financing mechanisms for future research and identification of market gaps. Lawrence Berkeley National Laboratory's (LBNL) *Current Practices in Efficiency Financing: An Overview for State and Local Governments*, provides a useful typology for understanding the general categories of financing mechanisms available to consumers (Greg Leventis, Emily Martin Fadrhonc, Chris Kramer, Charles A. Goldman). The Project Team's analysis borrows from LBNL's categorization of financing mechanisms.

Traditional Products

Traditional products refer to the typical financing mechanisms used for home improvement projects. In this category, the Project Team discusses unsecured and secured lending and leasing.

Unsecured Lending

Unsecured loans do not require the borrower to offer any collateral as security to ensure loan repayment. Instead, borrowers are qualified based on their income, debt burden, and documented history of repayment of previous debts. Well-qualified borrowers can generally access funds under more favorable terms and through a relatively quick application process. However, unsecured loans tend to have higher rates due to the lack of collateral. The CA Department of Financial Protection and Innovation (DFPI) and, on the federal level, the Federal Reserve Bank (Truth in Lending Act), the Federal Trade Commission, and CFPB provide regulatory oversight to protect consumers (Consumer Finance). In spite of these protections, borrowers must be vigilant against identity theft. Examples of unsecured lending include:

- Credit cards
- Loans from a bank of credit union
- POS contractor financing
- State-run programs, including the CAEATFA GoGreen Home (GGH) Financing Program

Consumer and contractor survey data from TECH indicates that about 50 percent of program participants utilize financing, with the significant majority choosing contractor financing programs, credit cards, or a bank or credit union to pay for their HP purchase (Opinion Dynamics, 2022 TECH Survey). Contractors are most likely to offer financing to their customers through a private lender (Opinion Dynamics, TECH Market Assessment 2024). However, GGH Financing participation has rapidly increased since the middle of 2023. GGH[4] offers more favorable terms, including more inclusive eligibility criteria (lower credit score thresholds), lower interest rates, and longer finance terms, due to ratepayer-funded credit enhancements (California Hub for Energy Efficiency Financing, Q4 2023).

[4] More information on GoGreen Financing can be found on their website at www.gogreenfinancing.com/energy-efficiency-home-loans-california/.

Secured Lending

Secured loans require the borrower to offer collateral as security to ensure loan repayment. In the residential sector, typical examples include mortgages, home equity loans, and home equity lines of credit (HELOC). These loans are usually secured by the real estate that is being financed or refinanced. The added security allows lenders to charge lower interest rates and offer longer loan terms compared to unsecured lending; this can also mean a longer and more complicated application process. Favorable lending terms require a combination of good credit and a strong equity interest in real property suitable for collateral.

Secured loans are well suited for large expenditures for customers with substantial equity stakes in real property. The cost of loan origination plus the complexity of the application process makes secured lending less suitable for smaller projects with short planning lead times. The more rigorous application process provides protections against unsecured transaction fraud, such as identity theft. However, the complexity of the legal details and the multiplicity of repayment options can create other forms of abuse. The use of the borrower's primary residence as collateral also introduces a new risk in that a default on the loan could lead to home foreclosure. Residential customers primarily use secured loans for home EE and decarbonization investments when they are planned as part of more substantial home rehabilitation and remodeling projects.

The federal housing authorities have led the primary initiatives to leverage secured lending to advance EE investments. The Federal Housing Authority (FHA) and the U.S. Department of Housing and Urban Development (HUD) offer the Energy Efficient Mortgage (EEM) program to jointly fund the purchase or refinance of a home and the cost of EE improvements. Home buyers can alternatively obtain a Fannie Mae HomeStyle Energy Mortgage or Freddie Mac GreenCHOICE Mortgage to finance EE improvements (Energy Saver). While these programs have been around for several decades, the Project Team was unable to uncover any recent loan data. However, reports from the early 2000s suggest EEMs represent less than one percent of all mortgages (Todd Gerarden).

Equipment Leasing

Under an equipment lease, the equipment user, known as the lessee, pays an equipment owner, the lessor, for the possession and use of an efficiency measure(s). Leases can take two forms: capital leases, which ultimately involve the lessee's purchase of the leased equipment, and operating leases, which do not include purchase as the default outcome. Compared to secured loans, leases have a quicker application process and cover additional costs beyond the equipment. HVAC leasing companies often include annual maintenance and regular repair costs in their offerings, saving a customer the hassle of having to find and pay for a contractor should their system malfunction. Depending on the lease provider, a customer may not have to pass a credit check to determine eligibility (Team HomeServe). Opting for a lease offers a simple pathway to upgrading or replacing a system.

A customer may incur a higher monthly payment for a lease than a secured loan given the included operations and maintenance charges. At the end of the lease term, a customer may also be required to either buy the system at a discounted cost or enter a new lease, adding a potential longer-term cost burden. In addition, customers are not guaranteed to receive incentives or federal tax credits, as they are not buying the equipment themselves. While the lease provider has the option to incorporate rebates into the lease terms, they are not required to do so. Leasing has become a

popular option for car and solar purchases, but the model is less proven or deployed at scale for HP HVAC and HPWH in the U.S. Several questions remain about customer protections and value streams.

Specialized Efficiency Financing Products

On-Bill Financing and On-Bill Repayment

On-bill financing (OBF) and on-bill repayment (OBR) let borrowers pay back the cost of efficiency improvements on their utility bill. Under OBF, a utility sources capital for paying for the improvements. Under OBR, a third party provides the capital, and the utility simply collects payments on the third party's behalf. Loan repayment via the utility bill is seen as a way of reducing lender risk but typically adds the risk of disconnection for participating customers. OBF and OBR also often eliminate the need for a credit check to determine eligibility, using bill repayment history as a proxy.

OBF and OBR programs have historically been primarily implemented by utility cooperatives or municipal-owned utilities (MOUs) but have seen increased interest as tools to spur electrification in recent years. As of 2020, 110 utilities offered OBF programs, 87 of which were cooperatives or MOUs (Tom Stanton and Scott Sklar). While most of these programs focus on increasing EE program participation, a few entities have more recently investigated OBF as an electrification tool. In CA, the IOUs offer OBF programs only to nonresidential customers. However, two CCAs, Sonoma Clean Power (SCP) and Peninsula Clean Energy (PCE), offer OBF to their residential customers. Both programs have limited loan volume to date. As of the end of 2022, SCP's program had received 165 applications and completed 67 projects (Sonoma Clean Power). PCE's program provided 140 loans in its first six months post-launch (October 2022 to March 2023) (Peninsula Clean Energy).

Tariffed On-Bill and Inclusive Utility Investment

Tariffed on-bill (TOB) is structured as a utility investment in lieu of a customer investment. In this model, the utility provides up-front capital to pay for EE and electrification upgrades at a customer's premise. The costs are recovered through a fixed charge on the participating customer's utility bill. TOB requires the on-bill charge to be less than the expected bill savings, providing customer protection. Unlike some OBF or OBR programs or third-party financing, TOB does not require consumer credit checks, upfront customer investment is optional, and cost recovery obligations are tied to the location and utility meter rather than the customer. By underwriting to customer bill savings, offering customers a cash-positive solution, and avoiding the need for credit checks, the approach can be an appealing route for customers who are underserved by conventional financing mechanisms, including renters and LMI households.

Investments through TOB must show substantial expected energy savings, a challenge for many HP installations in CA. Programs often have the highest value proposition in locations with higher gas and lower electricity rates, or when limiting eligibility to non-fuel switching measures. Consequently, while TOB has been applied in several utility and energy cooperative territories in 14 states around the U.S., its application in CA has been limited (ENERGY STAR®) (BayREN). CA IOUs must also receive regulatory approval to add the tariffed charge to customers' utility bills, representing an additional hurdle toward TOB implementation. In May 2024, the IOUs along with Silicon Valley Clean Energy (SVCE) submitted a joint TOB proposal to the CPUC's Clean Energy Financing Proceeding that outlined each entity's plan for administering a TOB program in their territory. The CPUC has until the

end of 2024 to issue a ruling on the joint proposal, and the future of TOB in CA remains unknown at the time of this writing (CPUC, 2023).

Property Assessed Clean Energy

Property Assessed Clean Energy (PACE) financing enables participants to pay off clean energy investments through a special assessment applied by their municipality. PACE offers lenders strong security with long loan terms and often lower monthly payments for borrowers. By using an alternative underwriting approach and enabling loan transfer to future home occupants, PACE opens access to financing for more consumers. PACE has faced significant regulatory challenges but appears to have generated more loan volume than other types of specialized financing products. The residential energy retrofit market in the U.S. was approximately $26.8 billion in 2022 and residential PACE financing was approximately $8 billion in 2022 (Grade Review Research). This means that nationally, PACE financing was used in 29.9 percent of home energy retrofits.

CFPB sheds valuable light on many of the cons of PACE loans in the May 2023 white paper *Property Assessed Clean Energy (PACE) Financing and Consumer Financial Outcomes* (Siobhan McAlister and Ryan Sandler). The authors observed that "PACE loans had relatively high costs compared to primary mortgages, and had particularly high fees relative to the loan amounts." The loans have fees above the regulatory threshold for a high-cost mortgage. Industry stakeholders also characterize PACE as a solution for customers who cannot access affordable credit, but the CFPB report notes that most participants "had other credit at the time they acquired their PACE loan." Media and consumer advocates have also consistently reported customers feeling deceived by PACE providers and having their property taxes increase beyond what they can afford. Consequently, some participants have incurred penalties as significant as home foreclosure.

In CA, residents have had access to PACE loans since 2007. The CFPB reports that between 2014 and 2020, CA customers submitted 221,003 loan applications, of which 77,534 resulted in an originated PACE loan (Siobhan McAlister and Ryan Sandler). Reforms passed by the CA legislature in 2017 modified how PACE was offered in CA by requiring PACE administrators to be licensed by receiving oversight from the DFPI. The legislation also required lenders to determine if a property owner had a "reasonable ability" to pay for the loan (AB-1284 California Financing Law). These changes reduced the rate of mortgage delinquency due to PACE loans, but also reduced loan volume. CFPB reports that new loan enrollments dropped from 5,000 per month at its peak prior to 2018 to an average of 2,000 per month after the reforms were enacted (Siobhan McAlister and Ryan Sandler).

Savings-Backed Arrangements

This category references a suite of finance offerings that have evolved out of Energy Savings Performance Contracting (ESPC). Energy service companies (ESCOs) manage these contracts, coordinating installation and maintenance of a project. Importantly, the ESCO typically provides a savings guarantee for the project and the payment is tied to the project's energy savings. Energy Service Agreements and Managed Energy Service Agreements (MESA) have emerged as variations to the ESPC model. Under an Energy Service Agreement, the customer simply pays for project energy savings or other agreed-upon value streams such that the customer only incurs operating expenses rather than capital investment costs. With a MESA, a provider assumes responsibility for active management of the customer's energy systems, including utility bill payment. Energy Service

Agreements and MESAs can be thought of as the EE equivalent of PPAs for renewable energy generation, in which the customer buys the generated power rather than the underlying hardware.

Across these financing options, the service provider, rather than the building owner, assumes the performance risk of efficiency projects by guaranteeing or sharing energy savings. Consequently, the projects must generate verifiable energy savings as an essential precondition. These projects also typically involve high transaction costs, necessitating large projects, e.g., $1 million or more, to justify the deal. For these reasons, this approach has gained the most traction in the commercial real estate, industrial, and municipal, university, schools, and hospitals (MUSH) sectors.

While a few companies have extended this model to small commercial facilities with some success,[5] the residential sector has yet to adopt the model beyond a few pilots.[6] A 2017 pilot in Santa Monica, CA, sponsored by the CA Housing Partnership Corporation (CHPC) provides an instructive residential example. Through the pilot, EE projects received financing via a capital source that could rely solely on the promise of repayment through energy savings recaptured through the utility bill, i.e., OBR, rather than on a deed of trust or promissory note, while a third-party provided a performance guarantee to buildings owners and tenants against any savings shortfalls. The pilot results stressed the need for a performance guarantee to eliminate the risk of utility bill savings not materializing. Participants needed deep technical assistance and information to both ensure the accuracy of projected utility bill savings and gain comfort with relying on those savings to make payments on an unsecured loan. The CHPC recommended that customers receive a credit enhancement to help ensure savings. A rigorous measurement and verification process is also critical to this type of program. The pilot highlighted a key challenge for EE and electrification projects; the owner-metered savings alone were not able to cover the cost of the comprehensive retrofit. Notably, the Energy Savings Agreement structure eliminated the time-consuming loan approval process that many of the other mechanisms require (California Housing Partnership Corporation).

Emerging Products

A number of emerging products have also gained popularity in recent years as alternative financing tools. CFPB describes three types in *The Convergence of Payments and Commerce: Implications for Consumers* (Consumer Finance).

Super apps, such as WeChat or Alibaba, allow consumers to aggregate all their financial activities into a single app. These apps provide significant convenience and speed for a consumer but limit choice of financial vendors.

Buy Now, Pay Later (BNPL) schemes, such as Afterpay, split payment for a purchase into four, zero-interest payments at the POS. BNPL has evolved to focus on lead generation and marketing platforms.

Embedded Commerce creates a singular platform for transactions by incorporating lending capabilities into non-financing applications, such as social media. Embedded commerce reduces

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[5] Budderfly has extended the model to restaurant and retail franchises. Review Budderfly's website at www.budderfly.com.

[6] Review the Sealed website at www.sealed.com.

purchase friction but allows for easy consumer data access for social media platforms and can lead to unwanted purchases.

These emerging finance products all offer extreme convenience and friction-free transactions, consistent with consumers' rising expectations around digital solutions. They also provide multiple value streams that service providers can monetize, e.g., marketing leads and customer personal data. These low-cost convenient services also may open the door to new forms of abuse, demonstrating a clear lack of customer protections. Service providers may also have conflicts of interest that lead to presenting biased information to the borrower.

Market Gaps to Scale

To assess the finance-related gaps for HP technologies, the team evaluated the identified finance mechanisms across the five attributes that were determined as critical for success:

1. **Applicable to HP upgrades**
2. **Broad customer eligibility:** to achieve CA's ambitious HP adoption goals in an equitable manner, the funding to support HP adoption must be available to virtually all households.
3. **Low cost:** financing should be available under low-cost terms, both on a monthly payment and on a lifecycle cost-of-ownership basis.
4. **Simple, fast, and convenient:** customers have increasingly high expectations for financial transactions to be simple, fast, and convenient.
5. **Strong customer protections:** finance mechanisms must shield customers from exploitative business practices and provide clear and transparent information to support informed decision-making.

The five key attributes, as they relate to each financing mechanism, are described in detail below.

Applicable to HP Upgrades

Secured lending and PACE are the only finance mechanisms that the Project Team judged to be strongly applicable to HP installations in CA. Unsecured lending is typically constrained by the customer's credit limit and preexisting debt load; leasing is strongly applicable in other markets, but has not yet been demonstrated in CA. Neither OBF or OBR nor TOB are broadly available to residential customers in CA for energy upgrades. Savings-backed arrangements are applicable to HP HVAC upgrades in the nonresidential sector and to solar installations in the residential sector, but such financing mechanisms are not available for residential HVAC upgrades in CA. TOB and savings-backed arrangements are further constrained by the low expected bill savings when switching from natural gas to fully electrified residential HVAC systems. Finally, the emerging products described above apply primarily to consumer goods.

Broad Customer Eligibility

The listed finance mechanisms are limited to customers who can demonstrate an acceptable level of creditworthiness. PACE originally did not consider personal credit history, but that requirement was added in 2018 as part of CA's customer protection reforms. Secured lending, PACE, and possibly

savings-backed arrangements all require home ownership. TOB and savings-backed arrangements are further constrained by the need to show expected energy savings.

Low Cost

As noted above, secured lending products can offer relatively low-cost financing because the borrower puts up collateral as security. The IOU-sponsored OBF programs in CA provide zero-interest loans to nonresidential customers. TOB, if adopted for residential customers in CA, would recover only the utility's principal investment from the customer and not include interest. Alternatively, leasing and unsecured lending include interest. Credit enhancements can reduce the cost of a loan, but most customers do not utilize lending with such a feature. At least one emerging product, BNPL, features zero-interest payments over four installments.

Simple, Fast, and Convenient

Unsecured lending and emerging products appear to offer the simplest and fastest path to access debt capital because they consider only the borrower's personal creditworthiness. The open-end versions of these finance arrangements, e.g., credit cards, offer even greater convenience because the borrower is prequalified for a predetermined credit limit; borrowers repay funds over time without the need to repeat the qualification process. The Project Team rated secured lending the weakest on this criterion because, in addition to establishing the borrower's creditworthiness, it entails establishing the value of the property that serves as collateral, e.g., appraisal. Secured lending also needs an established legal relationship between the new lien and any preexisting liens that may apply to the same property. As leasing does not require the same credit check as lending, the approval process can be streamlined. OBF and TOB have not been deployed in residential settings in CA beyond the small SCP and PCE pilots, so the Project Team rated both mechanisms as "unknown" for this category.

Strong Customer Protections

The Project Team rated the CPUC-sponsored financing mechanisms, notably OBF, OBR, and TOB, as offering the strongest customer protections because of the more rigorous protections they require (or would require if enacted as proposed). The original incarnation of PACE would have merited a "weak" designation, but the reforms of 2018 appear to have improved protections. The emerging products appear to function largely outside of regulatory oversight. Secured and unsecured lending, leases, and savings-backed arrangements all have varying levels of customer protections based on the provider.

Selected Mechanisms

By evaluating the different financing mechanisms through these five lenses, the Project Team elected to conduct additional research on **unsecured POS lending, equipment leasing, and combined solar and electrification-focused financing.** These three approaches offer different strengths. Unsecured lending provides the most convenient approach; leasing allows for broader eligibility; and combined solar and electrification financing proposes a low operating cost option which improves a customer's overall life cycle cost of ownership. Each mechanism has barriers that warrant additional investigation. Conducting stakeholder interviews and data collection allowed the Project Team to better understand and provide recommendations for scaling each mechanism.

Stakeholder Interviews

The Project Team collected quantitative and qualitative data through the literature review and stakeholder interviews to inform our evaluation of the three financing mechanisms. Over several months, the Project Team conducted outreach to nearly 30 stakeholders, completing 14 60-minute interviews with a variety of industry participants. Table 2 provides a summary of all interviewed organizations.

Table 2: Interviewees

Organization	Industry	Interview Date
Appraisal Institute	Real Estate Industry	8/6/24
BlocPower	Lease Provider	8/27/24
California Choice Energy Authority (CalChoice)	Joint Powers Authority	8/6/24
California Alternative Energy & Advanced Transportation Authority (CAEATFA)	State-sponsored contractor-originated POS financing	8/19/24 10/5/24
CMP Appraisals	Real Estate Industry	8/6/24
EGIA (Optimus Financing)	Lending platform offering contractor-originated POS financing and leasing	8/30/24 10/4/24
Elephant Energy	Electrification contractor	8/23/24
GoodLeap	Lending platform offering contractor-originated POS financing	9/16/24
GreenSky	Lender offering home improvement financing	9/23/24

Organization	Industry	Interview Date
Northern Pacific Power Systems (NPP)	Solar and Electrification Contractor	9/3/24
Sealed	Former Energy Service Agreement Provider	9/26/24
Vermont Gas Systems (VGS)	Energy Utility Lease Provider	9/11/24

Interview Findings

POS Lending Mechanisms

MARKET OPPORTUNITIES

The Project Team's research during the literature review phase suggested most residential customers utilize unsecured lending should they elect to finance their HP purchase. In particular, the Project Team focused on POS contractor-originated financing and compared these financing mechanisms to the state-backed GGH financing program. The Project Team hypothesized that the speed, convenience, and familiarity of POS financing mechanisms make these tools more attractive to contractors and customers than the more time-intensive GGH process.

Market interviews validated this hypothesis. The Project Team spoke with multiple POS FinTech solution providers in the home improvement space to learn about their products and loan volume. Each of the interviewed FinTech providers indicated they originate several hundred million to over a billion dollars in loans annually in CA, significantly higher than GGH's $43.89 million in 2023. The FinTech providers all pointed to contractor experience as a primary driver of volume. POS FinTech mechanisms are designed to seamlessly fit within a contractor's existing business practices. The products can approve a customer for a loan in a matter of minutes and require limited explanation to their customers, allowing a contractor to maintain focus on the sale. In contrast, GGH's process up until recently included a written application. While GGH now uses an online portal for the application, customer approval still includes a multistep and multiday process, making the state-backed financing less appealing to many contractors. Customers rarely shop around for the best financing offer, and POS lenders have responded to this trend by building solutions contractors want to use rather than those that necessarily offer a better deal to a customer.

POS FinTech providers are also able to offer broad customer eligibility by working with multiple lenders. For example, EGIA's Optimus Financing platform has multiple tiers of solutions based on a customer's creditworthiness. When a customer elects to finance through Optimus, they are automatically paired with a lender based on whether they have a prime, near prime, or subprime credit score. Optimus can offer financing to customers with credit scores as low as 400. As a result, a contractor has confidence that their customers will be approved for financing every time.

Notably, contractors appear willing to accept higher costs for these more straightforward products. All of the FinTech providers the Project Team spoke with confirmed that their solutions require contractors incur dealer fees ranging from a few percent to greater than 20 percent. While contractors would prefer to avoid these fees, FinTech providers help their participating contractors incorporate these additional fees into their payment schedules as a standard cost of doing business to reduce friction.

These POS product design elements all lead to a more attractive product for contractors. However, GGH can still offer a lower cost option to both contractors and customers. GGH does not have dealer fees, and their lenders' interest rates range from four to ten percent. These two financing avenues primarily solve for different barriers to financing; POS financing solves for speed and convenience, while GGH solves for cost. The Project Team, consequently, sees an opportunity to combine these benefits through a public-private partnership to offer a financing mechanism with broad customer eligibility, a straightforward application process, and low costs for contractors and customers.

MARKET GAPS

The Project Team's interviews revealed that a number of POS FinTech providers have previously engaged with CAEATFA regarding partnership opportunities. However, to date no collaboration has emerged from those discussions. FinTech platforms have achieved scale while offering products that include dealer fees, higher interest rates, and limited customer protections. Some interviewed providers expressed hesitancy in the value of a partnership that might require them to incorporate additional customer protections that reduce the seamless nature of their current products.

On the GGH side, they have improved their technological infrastructure and seen significant jumps in loan enrollment over the past couple of years. Still, GGH must upgrade their software systems to manage the scale of loan volume of FinTech platforms. Their online application requires a more manual and lengthy process than FinTech products.

Equipment Leasing

MARKET OPPORTUNITIES

The Project Team's interviews with lease providers indicated an opportunity to serve credit-challenged customers. The Project Team engaged with a utility-sponsored lease program, a climate tech start up-designed lease product, and a major POS lease platform. While each of their lease products had different mechanics, all three focused on serving customers with limited or no access to financing alternatives due to low credit scores. Providers do not need to require a credit check to determine eligibility, or they can reach customers with credit scores below 500. For example, Vermont Gas System's (VGS's) lease offer exclusively looks at bill repayment history for qualification. As a lease provider retains ownership of the equipment, they can theoretically repossess the equipment should a customer fail to fulfill their monthly payments. While repossessing equipment comes with its own challenges, the option does allow a provider to lower their risk exposure by having potential recourse for nonpayment.

Leases also often include system maintenance and repair costs in the monthly payments. These included services provide convenient, reliable, and timely equipment maintenance that maximizes system performance. Most homeowners do not regularly service their HVAC systems, so the built-in maintenance may provide efficiency improvements and non-energy benefits. The Project Team's analysis of various lease costs suggest that the additional maintenance and repair fees do not

significantly increase a customer's monthly payments and provide piece of mind in the instance of equipment failure or malfunction. Incorporating operations and maintenance coverage also may contribute to a lease provider's ability to offer longer terms, and in turn, lower monthly payments.

Lastly, as with POS contractor-originated financing, providers can also offer leases at the kitchen table to customers deciding to purchase a HP. This fast and straightforward process allows leasing to serve customers in emergency replacement situations and fits easily within a contractor's existing business model.

MARKET GAPS

Despite the promising ability of leases to reach customers who would not otherwise have access to financing, these mechanisms have not achieved scale in the HVAC and WH industries. The Project Team did not identify many lease products originating significant volume annually. The lease provider representatives the Project Team interviewed expressed skepticism over an unfamiliar product limiting uptake. While customers are comfortable with leasing for the automobile and solar industries, they do not typically consider a lease when purchasing a new HVAC or WH system. If a customer can pay upfront or has the credit to access to traditional financing, they tend to choose those more understood avenues. Increased customer and contractor education about the opportunities of leasing, especially for credit-challenged customers, and testimonials demonstrating leasing's success could help these financing mechanisms reach a larger audience.

LI advocates may also express concern over digital applications for lease applications opening the door for predatory financing. As leases serve customers with low credit, these products may include high interest rates. Without access to alternative forms of capital, low-credit borrowers may need to swallow these higher interest rates if they want to adopt HP technology. To combat this concern, lease providers can offer longer lease terms to create lower monthly payments or institute customer protections that limit exposure to predatory practices.

Combined Solar and Electrification Approaches

MARKET OPPORTUNITIES

Lastly, the Project Team investigated mechanisms that offer improved project financing focused on combining multiple green upgrades, including solar, storage, and heating and cooling electrification. As noted in the introduction, customer energy and bill savings are not guaranteed with the installation of a HP. In CA, where there are high electricity prices and low natural gas prices, financing mechanisms like TOB and Energy Service Agreements that rely on positive bill savings to underwrite financing face significant challenges when applied to electrification projects. The Project Team instead centered interviews and additional research on combining solar and storage installations with HP upgrades. Current CA residential IOU electricity rates range between $0.32/kWh and $0.40/kWh. At this price point, fuel switching from gas to electric has the potential to increase customer costs. However, when a customer converts to solar, the electricity they self-generate has an estimated levelized cost in the $0.10 to 0.15/kWh range. When the customer consumes that electricity, it displaces retail purchases at substantial cost savings to the customer. This price advantage, combined with a HP's high coefficient of performance (COP) can lead to heating at a lower cost than gas. Critically, this means that combining a HP with a solar and storage project could create additional bill savings for the customer versus solar and storage alone.

The Project Team hypothesized that this operational economic advantage could be attractive to finance providers. The Team contemplated two ways the bill savings could be incorporated into the financial terms:

- **Sustainable Energy as a Service (SEaaS).** In this scenario, the Project Team hypothesized that a combined electrification and renewable energy project would be financed in two discrete parts. The Renewable portion would be financed as a conventional PPA, with charges tied to the renewable energy production on a price-per-kWh basis. The electrification portion would be financed as an Energy Services Agreement, with charges tied to the combined gas and electric metered heating and cooling bill savings. Bill savings would be enhanced by the ability to power the electric equipment with below-market self-generated renewable electricity.
- **PPA.** In this scenario, the electrification and renewable energy upgrades would be financed as a single capital project through a PPA. The price per kWh would necessarily be higher than for a solar-only project, but the higher kWh charge would still be less than the retail rate and the electric bill savings would be augmented by gas bill savings from electrification.

MARKET GAPS

To evaluate the approaches described above, the Project Team interviewed solar and electrification contractors and a solar PPA program implementer. While all stakeholders were proponents of solar-led electrification and recognized the value of thinking more holistically about home electrification, the Project Team documented limited enthusiasm for the SEaaS approach. One stakeholder noted that Energy Service Agreements for EE have failed to scale, particularly in the residential sector, where the methodology challenges of quantifying savings, combined with the relatively low value of savings compared to transaction costs, all add up to a high-risk low-reward scenario.

While the PPA approach would hypothetically avoid some of the methodology challenges associated with SEaaS, the Project Team still found limited appetite for this model. One solar PPA program implementer offered an alternate approach that they currently apply to solar plus storage projects. In this model, the solar array is financed as a PPA with a per-kWh charge on the solar production, while the battery is financed as a lease. This approach could be extended to electrification upgrades to avoid the complexity of a combined PPA. Since HP leases are already within the analysis scope of this research, the Team concluded no further investigation was warranted of financing models unique to solar-led electrification.

Interviewed stakeholders indicated that improving contractor training and consumer awareness stand as larger barriers to solar-led electrification than access to financing. Currently, only a handful of contractors focus efforts on whole home electrification, and they largely serve a customer base that is both educated about decarbonization and able to afford it.

Financial Modeling

The team also used quantitative data collected in interviews to develop a financial model comparing the various financing mechanisms studied. This financial model uses a pro forma cash flow analysis to estimate the cash flow impacts and lifecycle cost of ownership for the customer. The Project Team does not intend for this model to precisely predict financial outcomes for customers and financiers

under each financing mechanism, as these impacts heavily depend upon the individual borrower and financier. The team also did not estimate the mechanisms' market size or potential. Instead, the financial model facilitates a simple, data-driven comparison of representative scenarios for each financing mechanism studied herein.

Scenarios

The Project Team used at least one scenario to represent each financing mechanism discussed. The scenarios evaluated included:

- Full upfront cash payment
- GGH, representing a loan that is part of the GGH Financing portfolio
- Credit card or personal loan financing for customers in three different credit score groups: Fair (640–699), Good (700–749), and Excellent (750+)
- Leasing, which the team also used to represent SEaaS financing (discussed in further detail below), in two scenarios:
    - A "traditional" lease
    - A lease-to-own agreement
- POS financing, also using two scenarios:
    - A prime borrower
    - A subprime borrower

The Project Team used cash payment and credit card and personal loan scenarios as counterfactuals for the sake of comparison with the scenarios representing financing mechanisms studied herein.

The Project Team also considered developing a unique scenario in the financial model representing a SEaaS agreement pairing a HP with rooftop solar. In this scenario, the combined capital expense would be recovered via a PPA charge on the solar production. By necessity, that charge would be higher per-kilowatt-hour than a PPA charge for a solar-only project scope. After discussing financial terms with a solar PPA provider, the team concluded that a customer would more likely finance only the rooftop solar system through the PPA and finance the HP and any auxiliary equipment with a standard lease. Taking that approach, the SEaaS scenario becomes equivalent to the leasing scenarios. While the team remains interested in pairing electrification with rooftop solar as a means of lowering operating costs and accelerating uptake, it was concluded that this option does not require adding a scenario distinct from the ones already under consideration to the financial model.

Assumptions

The Project Team used several global assumptions throughout the financial model to accurately and fairly compare each scenario. In all scenarios:

- A ducted unitary HP HVAC system with three tons cooling capacity is installed in a single family home and replaces a central natural gas furnace and ducted air conditioning system of the same cooling capacity.
- The installed HP HVAC system has an expected useful lifetime (EUL) of 23 years, consistent with the latest 2026 published value from the Database for Energy-Efficient Resources (DEER).
- The total cost paid and borrowed by the customer is $18,893, reflecting the median total project cost of a ducted, 16-Seasonal Energy Efficiency Ratio (SEER), three-ton unitary HP HVAC with no duct replacement or duct sealing installed in a single family home, as documented by TECH for an incentivized project through September 2024.[7]
- The period of analysis is 15 years. This constant analysis period was selected so that the total cost of ownership for each financing mechanism would be calculated over the same time period. For all financing mechanisms with a contract period shorter than 15 years, the remaining costs borne by the customer between the end of the contract period and year 15 only include repairs and maintenance.
- Annual maintenance costs are $91.22 for owned equipment. For leased equipment, maintenance costs are borne by the lessor, who may charge a supplementary maintenance fee.
- Monthly repair costs are calculated as the original installed cost, multiplied by the probability that the equipment will fail in a given month, where the probability of failure comes from a decay function that assumes that 50 percent of installations will fail by the end of their useful life. For leased equipment, repair costs are borne by the lessor for the duration of the lease term.
- Customers who buy but do not lease the equipment qualify for a 30 percent tax credit, payable one year after installation.

The Project Team elected not to model some elements of long-term cash flows that would be relevant to a financier and/or customer's calculation of the total cost of ownership. The Project Team did not include these elements in the model because they do not vary across scenarios and therefore are not instrumental in comparing scenarios. These omitted elements include:

- Operating cost savings or losses incurred by the customer
- Any change in first cost, operating costs, and financing terms achieved by adding a rooftop solar photovoltaic system and/or battery energy storage system to the project
- Any scenarios representing secured financing, like a mortgage or HELOC, as these scenarios almost always compare favorably to unsecured financing; the Project Team elected not to study secured financing in depth as part of this report

[7] Per the TECH Clean California public reporting website as of September, 2024. https://techcleanca.com/heat-pump-data/heat-pump-data-visuals/

Finally, the Project Team applied unique assumptions to each scenario that reflected unique features identified via research and interviews.

- **Cash:** Global defaults apply.
- **GGH:** Modeled as a ten-year term at seven percent interest, based on information available from CAEATFA on typical financial terms. Lender charges no dealer fees.
- **Credit Card, Excellent (750–850):** 18 percent interest. Monthly payment is calculated as the greater of (a) minimum monthly payment of two percent of the outstanding balance, or (b) fixed monthly payment amount for a payment stream over ten years.
- **Credit Card, Good (700–749):** 24 percent interest. Minimum monthly payment of 2.5 percent of the outstanding balance.
- **Credit Card, Fair (640–699):** 26 percent interest. Minimum monthly payment of three percent of the outstanding balance.
- **Lease to Own:** Modeled as a 15-year term at ten percent interest. Customer pays a supplementary annual maintenance agreement fee of $150. Lessor covers all repair costs during the lease term. Customer has the option of buying the upgrade at year 16 for $1; the investor's investment is fully recovered so the sale price is less than the residual value.
- **Traditional Lease:** Modeled as a six-year term at 27 percent interest. No maintenance charge. All repair and replacement charges are the responsibility of the lessor for the duration of the lease. This scenario is modeled on a product offering that is available to customers with FICO scores less than 549. In practice that product has a project cap of $10,000. The results shown assume the default project cost for the sake of comparability with other options.
- **POS, Prime:** Modeled as a ten-year term at ten percent interest. Lender charges contractor dealer fees of 17 percent of the installed cost, which gets added to the base installation price.
- **POS, Subprime:** Modeled as a ten-year term at 16 percent interest, no dealer fees.

Findings

Table 3 provides a summary of the financial outputs for the finance models considered, given the model parameters summarized above. The table offers a comparison of customer financial impacts in terms of monthly payments, total lifecycle interest, and lifecycle cost of ownership. The cash and credit card options provide a benchmark for comparison with the lease and POS options.

The final two rows of Table 3 compare the lifecycle cost of ownership using two discount rates: a seven percent and a three percent annual discount rate. The seven percent scenario represents a customer with greater appetite for risk, more willing to forego future savings in exchange for present savings. The three percent scenario represents a more fiscally conservative customer, to whom future savings are relatively more valuable.

Table 3: Financial Model Outputs

	Solution Category	Cash Payment	GGH	Credit Card/ Personal Loan			Lease/ SEaaS		POS Financing	
	Subcategory			Excellent: 750–850	Good: 700–749	Fair: 640–699	Lease to Own	Tradi-tional	Prime	Sub-prime
Customer Cash Flow Impacts	Monthly Interest Payment ($)	0	219	340	417	443	216	532	257	316
	Annual Interest Payment ($)	0	2.6K	4.1K	5.0K	5.3K	2.6K	6.4K	3.1K	3.8K
	Maximum Payment Due in any Month ($)	18.9K	219	378	472	567	216	532	257	316
Customer Lifecycle Costs	Cumulative Lifetime Interest Paid (Nominal $)	0	7.4K	20.3K	26.1K	22.4K	17.7K	19.4K	8.7K	19.1K
	Residual Asset Value[1] (Present Value $)	18.9K	5.3K	5.3K	5.3K	5.3K	2.3K	9.2K	5.3K	5.3K
	Lifecycle Cost of Ownership, 7% DR[1] (Present Value $)	18.8K	18.9K	28.7K	33.6K	32.4K	24.0K	33.9K	22.1K	27.3K
	Lifecycle Cost of Ownership, 3% DR[2] (Present Value $)	20.1K	24.0K	35.3K	40.8K	38.4K	31.2K	38.9K	27.8K	34.0K

[1] Calculated using a seven percent annual discount rate.
[2] Calculated using a three percent annual discount rate.

Based on the modeling assumptions described above, the Project Team offers the following observations:

- Cash purchases offer the lowest cost of lifecycle ownership but face the obvious drawback of substantial first-cost and cash flow barriers. Using a credit card or personal loan resolves the first-cost issue but at a substantial lifecycle cost, due to high interest rates. The availability of credit card debt is also constrained by the customer's credit limit. Minimum monthly payments are set as a percentage of the outstanding debt, which can translate into high payments for big-ticket items like a HP, at least until the debt is paid down.
- GGH offers a lifecycle cost of ownership (both nominal and net present value) far superior to any other finance product evaluated. That fact that loan products like POS financing enjoy a far higher market share suggests that customers and contractors value other product attributes more than minimizing lifecycle cost, or that other barriers prevent customers from accessing GGH.
- Because the lease-to-own scenario incorporates an annual maintenance agreement, the lessor can offer a 15-year term at a competitive rate. This combination translates into a low lifecycle cost of ownership and the lowest monthly payment, so it is a win-win from the customer's perspective if equipment ownership is not a priority. It also shields the customer from large individual cash payments occurring in a single month, especially unbudgeted repairs and replacement, since the financier retains the risk of paying for equipment repairs. While this

option does not enable the customer to claim any tax credits, that feature is of little consequence to customers with too little income to incur a tax burden.

- The traditional lease scenario is a viable option for credit-challenged customers who cannot qualify for a conventional loan. This feature is possible because the lessor retains ownership of the equipment. As modeled, this option requires a higher monthly payment because the interest rate is comparable to credit card debt and the lease term is only six years, compared to ten years for the other loan products and 15 years for the lease-to-own scenario. The primary advantage of this option is that it can be offered to credit-challenged customers excluded from other options.
- POS financing consistently outperforms credit card and personal loan financing in terms of the customer's lifecycle cost of ownership because of the lower interest rates offered. One of the ways lenders can offer competitive interest rates is by charging the contractor merchant fees that then get embedded in the upfront project cost. Like credit card debt, POS financing offers loan qualification processes that are fast and convenient.
- The lifecycle cost of ownership in the three percent annual discount rate scenario suggests that more financially risk-averse customers may be less inclined to use lease-to-own financing due to the relatively long 180-month agreement period. However, lease-to-own is still one of the more appealing options to these customers in terms of lifecycle cost of ownership. To these customers, the relative value of financing mechanisms with low-cost, short-term structures is greater than it is to more risk-prone customers who place less value on future savings.

Recommendations

As described above, the Project Team has identified two finance mechanisms — POS financing and leasing — with potential to serve residential customer segments in CA traditionally underserved by existing financing mechanisms for home electrification. POS lending offers an especially compelling solution to the issue of transaction friction. While ratepayer-funded credit enhancements have enabled GGH to offer particularly attractive financial terms, contractors and customers show a clear preference for POS loan products, which suggests that low transaction friction is more important than low cost.

POS Lending Mechanisms

The Project Team recommends that the CPUC, IOUs, and CAEATFA pursue opportunities to combine the distinctive elements of GGH and FinTech platforms to offer a low-cost and low-friction financing mechanism to a broad customer segment. Ideally, GGH would offer one or more loan products that could be pre-qualified and approved at the proverbial kitchen table as part of the contractor's project proposal. The Project Team recommends the resulting POS financing mechanism include the following attributes:

- **Build on existing finance infrastructure.** User-friendly FinTech software makes for a more seamless contractor and customer experience. Leveraging existing POS infrastructure will make the product more readily accepted by contractors, while also building on the embedded

market capacity, including contractor networks and investor relationships. The Project Team recommends that CAEATFA seek out avenues for integrating their own improved financial infrastructure with FinTech platforms to make participation in GGH straightforward and fast.

- **Affordable and accessible capital.** A POS loan product supported by ratepayers or taxpayers should offer borrowers more affordable and accessible capital, compared to prevailing terms in the existing POS financing marketplace. CAEATFA could seek out ways to pair their ratepayer-funded loan loss reserve with an existing POS offering to reduce interest rates. Alternatively, the IOUs, CPUC, and CAEATFA could invest in a new form of loan guarantee, credit enhancement, or interest rate buydown to make financing more affordable and accessible to a wider swath of CA residents.
- **Customer protections that meet or exceed industry standards.** The private sector has developed streamlined information systems to evaluate customer creditworthiness and automate loan decisions in a way that complies with state and federal consumer lending laws. CAEATFA and/or the IOUs would need to conduct independent due diligence to confirm that the embedded customer protections are sufficient to justify ratepayer or taxpayer support.
- **Kitchen table loan qualifications.** POS products benefit from rapid loan approvals. The Project Team recommends making this attribute a cornerstone of a future financing product. The Project Team recommends that CAEATFA and/or the IOUs ensure that any supplementary customer protections or reporting requirements they judge should be part of a financing product do not undermine this fundamental value proposition of POS finance.
- **Leverage.** Each dollar of ratepayer or taxpayer support should generate more than a dollar of customer financial benefit. This ensures that the finance solution offers a greater ratepayer and taxpayer value than an ordinary incentive. The Project Team recommends that any new financing mechanisms be evaluated and compared using this heuristic to maximize the efficiency with which ratepayer and taxpayer monies are spent.

Equipment Leasing

Along with POS financing, the Project Team believes that equipment leasing offers some potentially valuable attributes that merit additional investigation and testing. Leases can unlock access to HPs for those with poor credit while offering lower monthly payments and including maintenance and repair coverage. They also offer a similar POS advantage described in the POS Lending Mechanisms section. If implemented with a form of credit enhancement or guarantee, leases could offer an affordable financing pathway to a customer segment with historically few options.

The Project Team's research indicates a successful decarbonization lease product would likely also include the following core attributes:

- **Inclusive customer eligibility.** A lease product should be able to serve at least some customers who would not qualify for a loan.
- **Affordable monthly payments.** Lease payments should be equal to or less than the payments for a comparable loan product, albeit potentially over a longer contract term. Ideally, payment terms would also require the financier to cover equipment maintenance and repair costs for the duration of the lease.

- **Fair terms for the end of lease.** Lease terms should allow for the customer to assume ownership of the upgrades at the end of the lease or buy the upgrades for a reasonable price, such as the fair market value of the equipment at the end of the lease.

However, with limited availability and uptake in CA, the Project Team recommends further research into the customer protections needed, especially around predatory lending practices, to confidently roll an equipment leasing program out to CA residents.

Combined Solar and Electrification Approaches

While the Project Team did not identify the need for any unique financing mechanism to unlock the benefits of solar-led electrification, interview results did confirm the potential for this approach to improve electrification economics. Combining solar and electrification project scopes might also offer a more attractive pathway for customers to pursue electrification as a planned project rather than an emergency replacement. The Project Team believes the finance products discussed above are sufficient to support solar-led electrification. The Team does not recommend the development of additional tailored solutions, as long as solar-led electrification projects are considered within scope for the loan products on offer.

However, for solar-led electrification to succeed, more contractors need to understand how to plan for residential solar installations that will eventually serve fully electrified buildings. Currently, a group of solar industry contractors, engineers, and data scientists have come together to form Agile Electrification, a collaboration helping contractors understand the value of solar-led electrification and demonstrate its impact to customers. Initiatives like Agile Electrification can help bring more contractors on board and make the broader industry more comfortable with solar-led electrification.

The Project Team recommends that future research focus on building out solar-led electrification and testing implementation through pilot projects. Developing a proof of concept for this approach will lead to greater interest and investment. The Project Team recommends a future study dedicated to investigating these questions around solar-led electrification.

Conclusion

The Project Team's literature review and stakeholder engagement provided a clear picture of the multiple financing mechanisms available on the market today for customers seeking to complete home electrification projects. Many of these financing products already serve customer segments with barriers to accessing capital. The Project Team believes that the market should continue to offer a suite of financing mechanisms to customers. However, a more coordinated approach, with financing mechanisms designed to serve specific customers segments and project types may offer improved opportunities for increasing access to HP technologies. By seeking out avenues to integrate publicly and privately funded financing initiatives, CA can thoughtfully support scaling these products to more seamlessly and cheaply allow a greater number of CA residents to electrify their homes.

As general categories, both POS financing and leasing show promise for expanding customer access to affordable financing. Within these categories, the Project Team sees value in offering multiple

finance products tailored to the spectrum of customer financial situations and project scopes, especially for solar-led electrification projects, which offer particularly promising economics. To arrive at this robust portfolio of finance products, the CPUC, the IOUs, and/or CAEATFA could enlist the services of a broker rather than try to negotiate specific loan terms with individual lenders. The broker should be capable of developing multiple finance products with multiple lenders, based on predetermined parameters for the finance products CAEATFA wishes to offer. This broker could also be tasked with providing a convenient contractor and customer user interface that quickly guides the customer through the different finance products and steers the customer to the best fit for their needs.

Without new financing mechanisms, the cost of home electrification in CA will be unduly born by ratepayers, taxpayers, and private citizens — a particularly needless expense when financiers are ready and willing to offer new products. With the right balance of convenience, leverage, and customer protections, the Project Team believes that CPUC, the IOUs, and CAEATFA have an opportunity to quickly scale new financing mechanisms that make electrification more affordable and equitable.

Bibliography

AB-1284 California Financing Law: Property Assessed Clean Energy program: program administrators, 2017-2018, www.leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1284.

BayREN. Water Upgrades Save. www.bayren.org/waterupgradessave. Accessed 16 May 2024.

California Air Resources Board. 2022 Scoping Plan for Achieving Carbon Neutrality. 2022, ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

California Department of Community Services and Development. Low Income Home Energy Assistance Program. www.csd.ca.gov/Shared%20Documents/LIHEAP-Fact-Sheet.pdf.

California Department of Community Services and Development. Weatherization Assistance Program for Low-Income Persons. 15 Apr. 2022, www.csd.ca.gov/Shared%20Documents/2022-Draft-DOE-WAP-State-Plan.pdf.

California Energy Commission. California Building Decarbonization Assessment. 2021, www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment.

California Energy Commission. Equitable Building Decarbonization Direct Install Program Guidelines. 2023, www.energy.ca.gov/publications/2023/equitable-building-decarbonization-direct-install-program-guidelines.

California Energy Commission. Inflation Reduction Act Residential Energy Rebate Programs. www.energy.ca.gov/programs-and-topics/programs/inflation-reduction-act-residential-energy-rebate-programs.

California Housing Partnership Corporation, Financing Energy Savings Through On-Bill Repayment, March 2017, chpc.net/wp-content/uploads/2017/03/Santa-Monica-Test-Web.pdf.

California Hub for Energy Efficiency Financing. Energy Efficiency Financing Programs Quarterly Report and Program Status Summary: Q4 2023. www.treasurer.ca.gov/caeatfa/cheef/quarterly/2023/20231231.pdf.

California Public Utility Commission. "CPUC Provides Additional Incentives and Framework for Electric Heat Pump Water Heater Program." www.cpuc.ca.gov/news-and-updates/all-news/cpuc-provides-additional-incentives-and-framework-for-electric-heat-pump-water-heater-program.

Coalition for Building Decarbonization. Towards an Accessible Financing Solution. buildingdecarb.org/wp-content/uploads/Towards-an-Accessible-Financing-Solution.pdf.

Consumer Finance. *The Convergence of Payments and Commerce: Implications for Consumers.* www.consumerfinance.gov/data-research/research-reports/the-convergence-of-payments-and-commerce-implications-for-consumers/.

Consumer Financial Protection Bureau. Making Ends Meet in 2023. Dec. 2023, files.consumerfinance.gov/f/documents/cfpb_making-ends-meet-in-2023_report_2023-12.pdf.

Current Practices in Energy Efficiency. Lawrence Berkeley National Laboratory, 2021, emp.lbl.gov/publications/current-practices-efficiency.

Energy Star, Inclusive Utility Investment, www.energystar.gov/products/inclusive_utility_investment, reviewed on May 16th, 2024.

Federal Trade Commission. "Consumer Finance." FTC, www.ftc.gov/news-events/topics/consumer-finance. Accessed 16 May 2024.

Future of California Consumer Energy Finance. Berkeley Law, June 2023, www.law.berkeley.edu/wp-content/uploads/2023/06/Future-of-CA-Consumer-Energy-Finance.pdf.

Gerarden, Todd. Rebuilding Mortgages for Energy Efficiency. Federation of American Scientists, programs.fas.org/energy/btech/policy/Rebuilding%20Mortgages%20for%20Energy%20Efficiency.pdf.

GoGreen Financing. Energy Efficiency Home Loans California. www.gogreenfinancing.com/energy-efficiency-home-loans-california/. Accessed 16 May 2024.

Grade Review Research, Energy Retrofit Systems Market Size & Share Report, 2023-2030, www.grandviewresearch.com/industry-analysis/energy-retrofits-systems-market.

Greg Leventis, Emily Martin Fadrhonc, Chris Kramer, Charles A. Goldman, Current Practices in Efficiency Financing: An Overview for State and Local Governments, 2016, https://eta-publications.lbl.gov/sites/default/files/lbnl-1006406.pdf.

HomeServe. Can I Lease an HVAC Unit? 25 Apr. 2022, www.homeserve.com/en-us/blog/home-improvement/hvac-leasing/.

Opinion Dynamics. TECH Clean California: Time 1 Market Assessment Final Report. 29 Feb. 2024, shorturl.at/ejEL2.

Opinion Dynamics. TECH Customer Post-Install Survey Topline Findings. Nov. 2022, techcleanca.com/documents/628/TECH_Single-Family_Customer_Post-Install_Survey_Topline_Findings_Q4_2022.pdf.

Peninsula Clean Energy. Peninsula Clean Energy Board of Directors Meeting. 23 Mar. 2023, www.peninsulacleanenergy.com/wp-content/uploads/2023/01/03-23-2023-BOD-Presentation.pdf.

Public Utilities Commission. Rulemaking 20-08-022, Proposed Decision of ALJ Park and ALJ Toy. 9 June 2023, docs.cpuc.ca.gov/PublishedDocs/Published/G000/M516/K812/516812166.pdf.

Renewable Energy and Energy Efficiency: Status and Prospects. National Renewable Energy Laboratory, 2015, www.nrel.gov/docs/fy15osti/62605.pdf.

Siobhan McAlister and Ryan Sandler, Consumer Financial Protection Bureau, Property Assessed Clean Energy (PACE) Financing and Consumer Financial Outcomes, May 2023, www.consumerfinance.gov/data-research/research-reports/property-assessed-clean-energy-financing-and-consumer-financial-outcomes/.

Sonoma Clean Power. Strategic Action Plan, Customer Offerings & Incentives Programs. 2023, sonomacleanpower.org/uploads/documents/SAP-2-17-23.pdf.

Stanton, Tom, and Scott Sklar. Utility Tariff On-Bill Financing: Provisions and Precautions for Equitable Programs. NRRI Insights, pubs.naruc.org/pub/0E0B2716-947E-B0A8-2899-3DCA0F0C8F16.

TECH Clean California. "Cost Detail - HPWH" and "Cost Detail - HVAC" Dashboards, techcleanca.com/public-data/data-visualizations/. Accessed 16 May 2024.

United States Census Bureau. 2022 California Census. www.census.gov/quickfacts/fact/table/CA.

United States Department of Energy. "Energy-Efficient Mortgages." Energy Saver, www.energy.gov/energysaver/energy-efficient-mortgages. Accessed 16 May 2024.

Appendix A: Interview Questions

HVAC Lease Provider Questions

Questions About Customer Value Propositions

- Can you talk us through the details of your financing product, including:
    - Typical term
    - Cost, including monthly payment, interest rate, and fees; this includes any required regular maintenance
    - Customer protections
    - Measures included
    - Equipment replacement
- Can you describe the advantages of a lease from a customer perspective? Compared to a conventional loan for an HVAC purchase, how does leasing impact the customer's monthly payments, maintenance costs, lifetime HVAC ownership costs, etc?
    - What reasons do customers give for selecting a lease over another payment option?
    - What role does the lease play in helping to close the deal with the customer on a new heat pump?
    - When someone declines a lease, what reason do they give?
- What is the profile of your typical customer? Do you target a specific demographic? How much does credit score, income, or owner/renter status matter in customer targeting and eligibility?
- What happens at the end of your agreement with the customer? Are there any special terms, ownership treatment? Can a customer choose to buy the equipment at the end of the lease even if they did not elect to “lease to own” initially? If the customer does not choose to purchase the equipment, what do you do with it?

Questions About Contractor Value Propositions

- What are the top three sources of your leads? What role do contractors play?
- Can you describe the advantages of a lease from a contractor’s perspective? How does offering leasing impact the contractor’s project revenue, close rate, and cash flow? How do you recruit contractors?

Questions About Market Share and Market Potential

- Can you give us a sense of your current deal flow? How do you think that compares to lease competitors, other financing products?
    - What factors have influenced change in customer interest?

- Where do you see areas of opportunity to expand leasing in CA? What barriers exist today to scaling?
- Do you envision public entities or utilities playing a role in your solution?

Contractor-Originated POS Financing Provider Questions

Questions About Customer Value Propositions

- Can you talk us through the details of your financing product, including:
  - Typical term
  - Cost, including monthly payment, interest rate, and fees
  - Customer protections
  - Measures included
  - Equipment replacement
- Can you explain the loan application process?
  - What fraction of your loan applicants get approved for financing?
  - How long does it take?
  - Can a customer get qualified for a loan to pay for the emergency replacement of broken equipment?
- Can you describe the advantages of your loan product from a customer perspective? How do your loan terms compare to other typical loan products, such as credit card debt and HELOCs?
  - What reasons do customers give for selecting your product over another payment option?
  - What role does financing play in helping to close the deal with the customer on a new heat pump?
  - When someone opts for a different payment mechanism, what reason do they give?
  - What aspects of the loan product influence a customer's decision to finance with you most (interest rate, special introductory terms, monthly payment amounts, approval timeline, etc.)?
- What is the profile of your typical customer? Do you target a specific demographic? How much does credit score, income, or owner/renter status matter in customer targeting and eligibility?

Questions About Contractor Value Propositions

- Can you describe the advantages of offering financing from a contractor's perspective? How does offering financing impact the contractor's project revenue, close rate, and cash flow?

Questions About Market Share and Market Potential

- Can you give us a sense of your current deal flow? How do you think that compares to competitors, other financing products?
    - What factors have influenced changes in customer interest?
- Where do you see areas of opportunity to expand financing in CA? What barriers exist today to scaling?
- Do you envision public entities or utilities playing a role in your solution?

Financial Providers of Solar Leases and PPAs Questions

- Can you talk us through the details of your financing product, including:
    - Type of offering (lease, PPA, MESA, etc.)
    - Typical term
    - Cost, including monthly payment, interest rate, and fees
    - Customer protections
    - Equipment replacement
- What measures can be included in the lease/PPA (probe on rooftop solar; battery energy storage; upgraded service panel; electric vehicle (EV) chargers; other electrical, plumbing, or HVAC upgrades)?
- Can you describe the advantages of a lease/PPA from a customer perspective? Compared to a conventional loan, how does the lease/PPA impact the customer's monthly payments, maintenance costs, lifetime solar ownership costs and if you've ever included HVAC in a project, on lifetime HVAC cost, etc?
    - How much do you think your product influences project close rates, compared to other purchasing options?
    - What reasons do customers give for selecting your product over another payment option?
    - What role does financing play in helping to close the deal with the customer on a solar project?
    - When someone opts for a different payment mechanism, what reason do they give?
- What is the profile of your typical customer? Do you target a specific demographic? How much does credit score, income, or owner/renter status matter in customer targeting and eligibility?
- What happens at the end of your agreement with the customer? Any special terms, ownership treatment? What are the top three sources of your leads? What role do contractors play?

Questions About Market Share and Market Potential

- Where do you see areas of opportunity to expand your services in CA? What barriers exist today to scaling?
- What is your experience with including HVAC upgrades or electrification measures with solar and storage? What are the pros and cons of bundling electrification measures with combined solar and storage projects?
- What interest do you have in offering a full building electrification financing mechanism, and what operational opportunities/challenges do you envision with such a product?
    - How much do you upsell someone on other green/efficient products to install at the same time as solar and storage?
    - How often does a customer add more green/efficient measures to a deal? Can you make more money adding those other measures?
    - How often do you see customers evaluating other green/efficient upgrades at the same time as solar and storage?
- Do you envision public entities or utilities playing a role in your solution?

HVAC Contractor Questions

Contractor Background

- What services do you provide to your customers? (Probe on ducted AC, ducted HPs, mini split, etc; other upgrades, such as EE improvements, upgraded knob and tube, upgraded service panel, rooftop solar, battery energy storage.)
- What priority do your customers place on the following when undergoing an electrification project (high/medium/low):
    - Upfront cost
    - Long-term savings on operations and maintenance
    - Health and comfort
    - Energy independence: “future-proof" against gas and electricity rate hikes and blackouts

Role of Financing

- Do you offer financing to your customers? Why did you choose to do so? If not, why not, was there something blocking you from doing that?
- How often do your customers accept the financing option(s) you offer? How do they typically pay for your services when they don’t accept your financing offer(s) (cash, HELOC, credit card, contractor financing, lease, consumer loan, etc.)? Do you see differences with specific demographics?

- What role does financing play in enabling a HP project to move forward? Has that changed over time?
- What reasons do customers give for selecting a certain type of financing over another payment option?
    - What aspects of the loan product influence a customer's decision to finance with you most (interest rate, special introductory terms, monthly payment amounts, approval timeline, etc.)?
- How does utilizing the financing product impact your bid prices?
- Who are the top lenders for POS financing? Which lender platform do you use? What do you like most about it? What do you like least?

Solar Contractor Questions

- What services do you provide to your customers? (probe on rooftop solar, battery energy storage, upgraded service panel, EV chargers, other electrical, plumbing, or HVAC upgrades)
- What is a typical project cost? What measures are typically included in that cost? How does utilizing the financing product influence that cost?
- How do customers typically pay for your services (Cash, HELOC, credit card, contractor financing, lease, consumer loan, etc.)? Do you see differences with specific demographics?
- Do you offer financing to your customers? Which type/platform do you offer/use? Why did you choose to do so? If you don't, was there something blocking you?
- If you've ever done a HP, what role does financing play in enabling a HP project to move forward? Has that changed over time?
- What promotions influence a customer's decision to finance with you most (and what is your ability to offer these promotions)?
    - Low-interest rates
    - Special introductory terms
    - Low monthly payments
    - Same-day qualification/approval
- What is your experience including HVAC upgrades with solar and storage? What operational opportunities/challenges do you see with these types of projects?
- Can you describe the value customers place on the following when undergoing an electrification project:
    - Upfront cost
    - Long-term savings

- Health and comfort
- Energy independence: “future-proof" against gas and electricity rate hikes and blackouts

Real Estate and Mortgage Industry Representative Questions

- Can you describe your experience with solar leases and their impact on home valuation?
- Can you describe the pros and cons of a solar lease or PPA from the perspective of the following factors:
  - Appraisal issues
  - Issues securing a mortgage
  - Impacts on escrow
  - Impacts on real estate professional’s responsibilities in the transaction
  - Impacts on title insurance, property insurance
  - Any tax implications
  - Issues with liens, UCC filing
- What usually happens upon resale? Seller buys out the lease? Buyer assumes the lease terms? Other?
- How might the inclusion of HVAC in a lease or PPA impact the above? Do you foresee additional challenges arising?

Appendix B: Pro-Forma Financial Model