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GOGREEN HOME ENERGY FINANCING PROGRAM

STATEWIDE EVALUATION REPORT

FINAL

CALMAC STUDY ID: CPU0401.01

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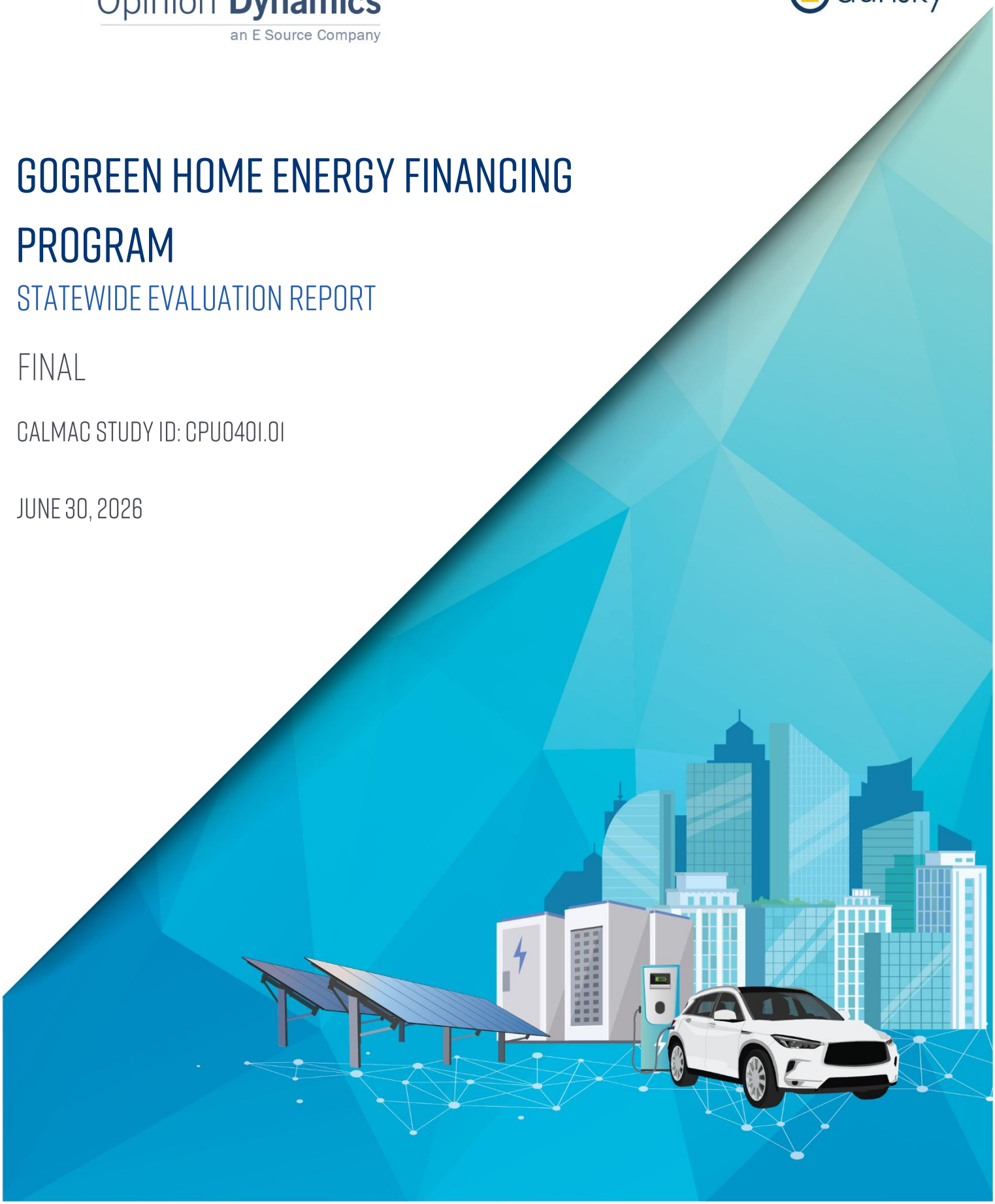

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This project was a collaborative effort under contract to the CPUC. The evaluation team would like to thank the CPUC Staff, Investor-Owned Utilities, and the California Alternative Energy and Advanced Transportation Financing Authority for guidance and input throughout the project planning and execution. Finally, the evaluation team would like to thank the residential homeowners, and lender and contractor representatives who took the time to support this study by responding to research efforts.

LEGAL NOTICE

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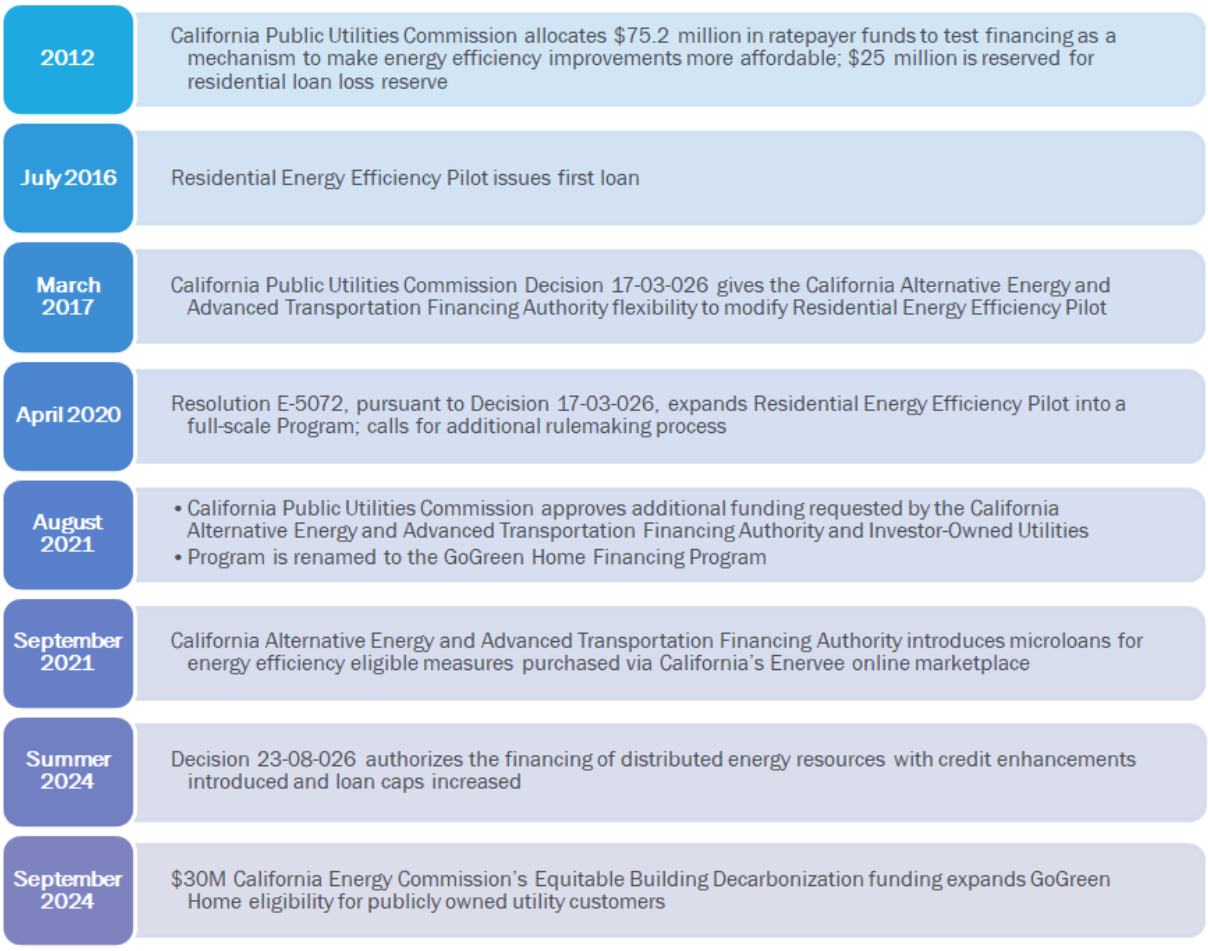
I. EXECUTIVE SUMMARY

In 2012, the California Public Utilities Commission (CPUC) directed the state's investor-owned utilities (IOUs) to allocate $75.2 million to launch and test a series of innovative energy efficiency financing pilots through an initial period ending June 30, 2022. The CPUC later expanded the Residential Energy Efficiency Loan (REEL) Pilot into a full-scale program through Resolution E-5072, pursuant to Decision 17-03-026, issued on April 17, 2020. In August 2021, CPUC rebranded the program as the GoGreen Home Financing (GGH) Program as part of a renewed marketing effort.

Over the decade since its inception, GoGreen Home has issued 12,981 loans, including 9,661 loans evaluated in this report (July 2023 through June 2025), representing a total of $242.12 million in financing over the program's lifetime, with $180.69 million disbursed within the evaluation window. Loan sizes varied by product type, with average amounts of $20,637 for standard loans, $40,245 for distributed energy resources (DER) loans, and $1,655 for microloans. Collectively, loans issued over the evaluation timeframe reduced natural gas consumption by 218,035 therms and electricity consumption by 15,044 MWh through energy efficiency projects, and reduced grid electricity consumption by 6,209 MWh through DER projects. In all, these projects reduced emissions by 2,368 tCO_2.[1]

Figure 1. GGH Program History



[1] The REEL evaluation estimated energy impact for 212 out of a total of 12,981 evaluated projects through GHG Program but did not estimate emissions reduction. Hence, the aggregate emissions impact is likely a bit higher.

1.1 PROGRAM DESIGN

The GGH Program leverages financing to make EE improvements more affordable for residential customers, with a focus on reaching underserved customers. The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) administers the GGH Program statewide, as one of its California Hub for Energy Efficiency Financing (CHEEF) programs. The GGH Program connects California homeowners and renters with lenders to finance their energy efficiency projects through three types of loans.[2]

- **Standard loans:** Up to $50,000 for major EE improvement projects typically implemented through GGH contractors.
- **Standard-DER loans:** Up to $75,000 Loans for DER projects. Implemented through contractors, typical measures[3] include rooftop solar+battery, battery, and EV charger installations.
- **Microloans:** Up to $5,000 for eligible energy measure (EEM) purchases. Offered through Enervee, Southern California Gas (SoCalGas), and Southern California Edison (SCE).

Borrowers must use at least 70% of their GGH loan to fund EEMs. The claim-eligible portion of the loan amount includes the cost of the EEMs and up to 30% of the cost of additional home improvements, as well as any costs incurred during EEM installation (e.g., permits, electric panel upgrades).

For each project or equipment purchase financed via a GGH Program loan, CAEATFA puts money into Loan Loss Reserves (LLR) accounts equal to a percentage of the portion of the principal amount of an enrolled loan that qualifies for reimbursement in the event of a charge-off. This percentage is set at 5% for loans distributed to market-rate borrowers and 20% for loans distributed to borrowers eligible for credit enhancement (see Section 4.3.2 for eligibility details). The LLR account mitigates a large portion of lender risk, allowing lenders to offer loans with better terms (i.e., lower interest rates and longer payback periods) and to broaden loan eligibility to market segments that may otherwise lack access to financing with favorable terms.

Over its program phase (July 1, 2022 – June 30, 2027), the CHEEF suite of programs, of which GGH is prominent in terms of loan volume, has $43.9 million to fund LLRs pursuant to CPUC authorization of funds. Currently, disbursed LLR funds are held with Zions Bank and earned $1.5 million in interest during the evaluation period, and $1.7 million in total since the inception of the program. As a result, unlike many other programs, the LLR can generate net interest income if defaults are sufficiently small relative to interest earned on reserve funds. In addition to the GGH Program loans, borrowers may qualify for utility rebates to further lower the upfront cost of eligible equipment. Table 1 compares key features of the GGH Program's standard loans and microloans during the evaluation period (July 1, 2023–June 30, 2025).

Table 1. GGH Program Component Comparison

Program Feature	Standard Loans	Standard-DER Loans	Microloan
Eligible loan size	<$50,000	<$75,000	<$5,000
Typical eligible program measures	Eligible energy efficiency measures (EEEMs) installed by a GGH participating contractor	Rooftop solar, battery storage, EV charger installations	EEEMs purchased on SoCalGas, SCE, or Enervee California marketplace
Number of participant loans	6,911	869	1,881
Average loan amount	$20,637	$40,245	$1,644

[2] CAEATFA classifies their projects into standard loans and microloans. For evaluation purposes, we separated standard loans into standard-DER loans and standard loans given different measure, impact, and borrower profile of standard loans for traditional measures and DER measures.
[3] A "measure" refers to a specific technology, equipment type, or intervention that provides energy-related benefits to the customer and/or the electric grid.

Program Feature	Standard Loans	Standard-DER Loans	Microloan
Average interest rate	5.84%	6.29%	10.19%
Average loan payback terms	123 months (10.25 years)	165 months (13.75 years)	60 months (5 years)
Number of participant lenders	9 (3 statewide, 6 regional)	7 (3 statewide, 4 regional)	2 (currently 1 active participant)
Default rates	1%	1%	16%[a]

[a] Notwithstanding borrower and loan characteristic differences; for context, credit cards had a delinquency rate of 2.9 percent and buy-now-pay-later loans report default rates of approximately 2 percent. For additional see page 57 of this report.

During the evaluated period, the GGH Program saw significant growth in program impacts compared to the previous evaluation period. Table 2 lists the key accomplishments of the GGH Program during the evaluation period. Since the previous evaluation, the GGH Program has seen greater overall loan uptake, particularly for fuel substitution projects that encourage gas-using customers to switch to electric equipment, in line with California's clean energy goals.

Table 2. REEL Pilot and GGH Program Activity Comparison

Highlighted Performance Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Activity for (July 2023-June 2025)
Average program loans per year	106	777	4,831
Average loan size	$17,246	$18,253 (standard loan) $1,498 (microloan)	$20,637 (standard loan) $1,644 (microloan)
Average financing generated per year	$1,828,067	$12,289,839	90,344,076
Average loan payback terms	117 months	106 months (standard loan) 60 months (microloan)	127 months (standard loan) 60 months (microloan)
Number of participant lenders	4 total lenders: 2 statewide 2 regional lenders	10 total lenders: 2 statewide lenders 6 regional lenders 2 microloan lenders (currently 1 active participant)	10 total lenders: 2 statewide lenders 7 regional lenders 1 microloan lender
Total emissions reduction	*Not Estimated*	575.87 tCO_2	2,368.36 tCO_2
Natural gas saved	1,262 therms	80,740 therms	218,034 therms
Electricity saved	63.7MWh	556 MWh	5,938 MWh

An important distinction between standard loans and micro-loans is that they target very different segments of California households. Standard loans, particularly DER loans, primarily serve higher-income Californians, while micro-loans function as the program's principal access point for underserved communities. Nearly all standard loan recipients (99.8%) are homeowners, compared with only 55.1% of micro-loan participants; similarly, 83% of micro-loan recipients have credit scores below 700 and 77% earn less than $100,000 annually, versus 9% and 32% of standard loan recipients and just over 2% and 16% of DER loan recipients, respectively (for more details on participant demographics, see section 4.3 "Borrower Characteristics"). These loan types also serve different purposes for participants: standard loans are most commonly used for HVAC upgrades and building envelope improvements, whereas micro-loans are used almost exclusively for appliance purchases (see Figure 3. Sankey Diagram - Standard Loan Measure DistributionFigure 3 & Figure 4 for more detail). Despite these differences, all three loan types appear to be highly influential in participants' project decisions. Majorities of borrowers across loan types report they would have delayed or scaled back their projects in the absence of financing, though the nature of this reported influence varies by loan purpose, with micro-loan recipients typically financing appliance purchases and more frequently indicating delays or lower-cost alternatives, while standard and DER loan borrowers, who more often finance larger home upgrades and solar installations, report slightly lower but still substantial levels of program influence.

A feature of this program is its ability to earn interest rates on the LLR funds while only expending ratepayer funds in administrative costs and in the cases of borrower default that necessitates payouts to banks using the LLR fund. Comparing interest earnings with default-related payouts provides an estimate of the net financial position of the LLR fund. During the evaluation period, the LLR fund experienced a net expenditure (interest earned minus default payouts) of $438,974, and over the full program lifespan, a cumulative net expenditure of $697,807.

In addition to LLR-related activity, GGH incurs broader program implementation costs. Due to data limitations, administrative and marketing costs are reported for CHEEF as a whole rather than for GGH specifically. Over the program lifespan, CHEEF incurred $17.7 million in administrative costs and $9.4 million in marketing, education, and outreach costs. During the current evaluation period, CHEEF incurred $7.7 million in administrative costs and $3.1 million in marketing, education, and outreach costs.

I.2 RESEARCH OBJECTIVES AND METHODS

The evaluation period covered GGH Program performance from July 1, 2023, to June 30, 2025. The evaluation sought to address the following research objectives:

1. Assess the GGH Program's scalability and growth
2. Assess the GGH Program's leverage of private capital and on-the-ground support
3. Gauge the GGH Program's reach of underserved Californians
4. Verify GGH Program energy savings and fuel substitution impacts

The team undertook the following tasks as part of the evaluation:

- **Data Review and Program Staff Interviews:** The team reviewed existing program materials/data and conducted two in-depth interviews with CAEATFA and one with Enervee staff to confirm details of program design and implementation, inform evaluation tasks, and understand program participation.
- **Participation Analysis:** The team analyzed primary participation data from CAEATFA, including loan details, demographic details of participants, and EEMs installed with loans, details of participating contractors, and details of financial transactions between CAEATFA and participating financial institutions to assess program accomplishments over time and characterize participants in terms of borrower characteristics.
- **Impact Analysis[4]:** The team verified energy savings produced by GGH-financed measures via a consumption analysis for standard loans (both DER and non-DER projects), applied per-unit savings deemed appropriate by the California electronic Technical Reference Manual (eTRM) to microloan equipment, and estimated resulting emissions reduction.[5]
- **Participant Surveys:** The team fielded online surveys with GGH program participants to support the team in understanding the participant experience. The team completed 72 online surveys with standard loan participants, 72 standard-DER loan participants, and 138 with microloan participants. The evaluation team developed the sample and survey targets to achieve 90% confidence with 10% precision.
- **Conjoint Survey:** The team fielded a conjoint survey[6] with GGH program nonparticipants to better understand what finance products are most desirable to potential borrowers. The survey also included self-reported measures of

[4] "Impact analysis" refers to the analytical methods used to estimate the outcomes of program-funded measures, such as energy savings, demand reductions, and emissions impacts, using approaches such as consumption analysis and deemed savings.
[5] "ETRM Overview." California Technical Forum, www.caltf.org/etrm-overview. Accessed 01 March. 2024
[6] A conjoint survey is a survey-based research method in which respondents choose between hypothetical options with varying features, allowing researchers to estimate the relative importance of those features and the trade-offs customers are willing to make.

these preferences, questions evaluating their familiarity with other program offerings available to them, and items aimed at understanding the barriers to participation that customers face. We fielded this survey among 103 market-rate nonparticipants and 78 underserved nonparticipants to evaluate differential preferences by market segment.

- **In-Depth Interviews:** The team performed in-depth interviews with participating contractors (20 interviews) and lenders (8 interviews) to get their perspective on potential improvements for the program, customer interactions, barriers and opportunities for GGH financing, and their general participation experience.

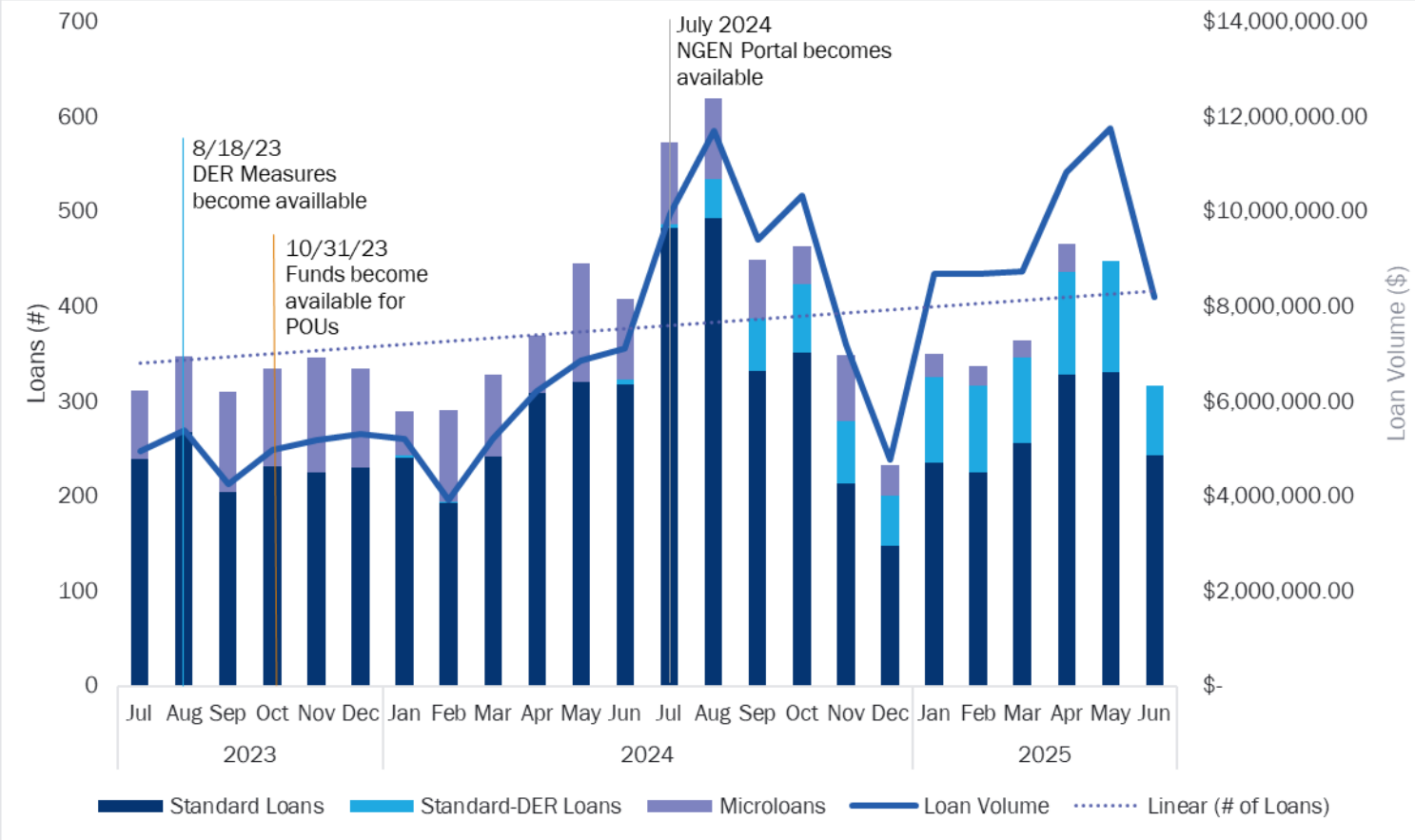
I.3 CONCLUSIONS AND RECOMMENDATIONS

In this section we provide an abbreviated overview of our conclusions and recommendations based on the evaluation findings. Section 8 provides more detailed support for these conclusions and recommendations.

Research Objective 1: Assess GGH Scalability and Growth

Conclusion 1: The Program has seen strong growth in both standard loan and microloan disbursement; in no small part due to the popularity of newly introduced DER measures. Additionally, the survey findings highlight the Program's role in unlocking new projects. Only a small share of projects (15% of DER standard loans, 22% of micro-loans, and 24% of non-DER standard loans) would have been very likely to proceed without financing. Moreover, projects likely would have finished at a later date in most cases, and non-DER projects likely would have been smaller.

Quantity and Volume of GGH Loans: July 2023–June 2025



Conclusion 2: Satisfied contractors continue to play a crucial role in driving program growth. However, the larger scale of DER projects poses new process-related challenges for some contractors.

- **Recommendation:** To support continued growth in standard loans, the program could address contractor cash-flow and process transparency, particularly for DER projects. Introducing partial or milestone-based payments at defined project stages could reduce upfront financial burden, especially for smaller contractors (or those less active in the program), and encourage broader contractor participation. In parallel, implementing standardized status notifications, improving lender integration within the contractor portal, and setting expectations for lender responsiveness may improve predictability, reduce delays, and increase contractor willingness to recommend GGH.

Conclusion 3: Debt aversion and uncertainty about realizing actual cost savings may discourage participation among some households. The Program's rapid growth suggests that these factors have not constrained uptake to date.

- **Recommendation:** The Program should continue supporting both standard loans and micro-loans as complementary products serving distinct borrower segments. Given that 68% of market-rate respondents and 88% of underserved respondents report that taking on additional debt is at least somewhat concerning when considering a micro-loan for an appliance purchase, micro-loans should remain structured to minimize upfront and monthly repayment burdens in order to better align with the needs of debt-averse, cash-constrained, and underserved households.

Research Objective 2: Assess GGH Leverage of Private Capital and On-the-Ground Support

Conclusion 4: GGH has expanded private capital and on-the-ground capacity, though delivery remains highly concentrated.

- **Recommendation a:** Contractor delivery is still very concentrated. For example, 47% of all projects are completed by just 26 firms. To reduce concentration in program delivery, the program should focus on activating enrolled contractors with little or no GGH activity across the portfolio. Variation in contractor participation is largely driven by operational frictions, including lengthy and unpredictable loan approvals, limited process transparency, and the financial strain of pay-at-completion payments, which disproportionately affect smaller and lower-volume contractors. Potential actions to remedy these issues include targeted outreach to inactive or low-volume contractors, brief re-engagement or refresh trainings, and enhanced onboarding support for contractors completing their first projects, such as checklists or dedicated assistance during initial applications. The program could also incorporate sales training, including scripts and guidance on how to discuss financing options with customers. Additionally, the program can provide guidance that helps contractors identify participating lenders by geography, specialization (e.g., DER vs. non-DER), and service performance, so contractors can more easily partner with lenders that meet their business needs. The Program can also test targeted incentives and operational improvements that reduce participation barriers for contractors (and lenders) with few completed projects.

Number of Projects by Enrolled Contractors Since 2016

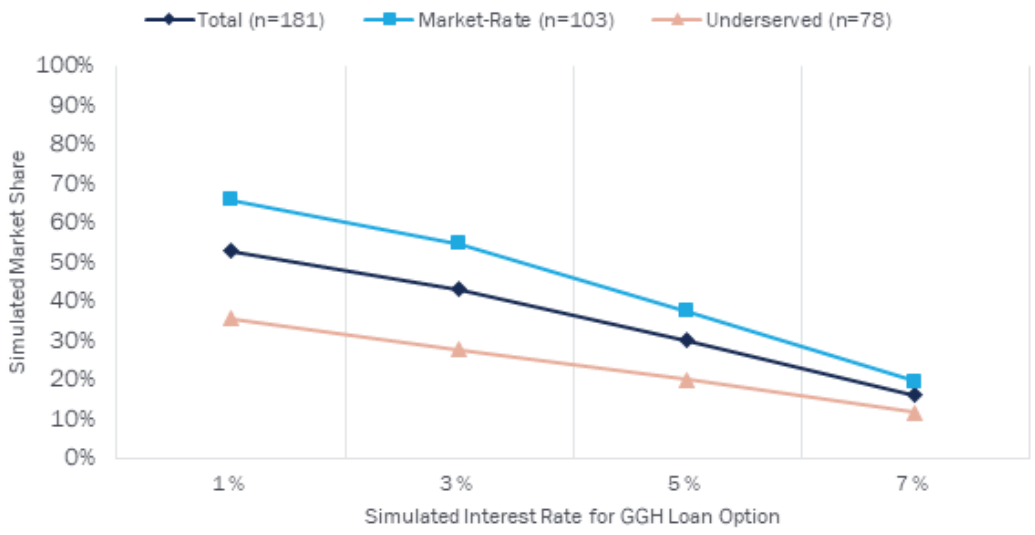
Number of Projects By a Contractor (Range)	Contractors		Projects	
	Count	Percent	Count	Percent
None	980	54%	0	0%
1 to 10	710	39%	2,010	22%
11 to 30	74	4%	1,294	14%
31 to 60	33	2%	1,425	16%
61 to 100	11	1%	847	9%
More than 100	15	1%	3,480	38%
Total	1,823	100%	9,056	100%

- **Recommendation b:** There are non-participating credit unions that offer products similar to GGH standard DER loans; however, GGH rates are often more competitive than comparable private alternatives. GGH implementation staff should proactively engage credit unions that offer these DER loan products in the GGH program by emphasizing the benefits of the loan loss reserve and other risk-mitigation features. We also find that GGH's

offering of unsecured DER loans of $75,000 are quite rare within the market, and many interviewed lenders indicated they would be unable to offer a product at that level without GGH support. As a result, GGH enables credit unions to provide loans of this size to members interested in installing clean energy measures. This expanded lending capacity is another benefit GGH can highlight to encourage new lender participation in light of the DER measure expansion.

Conclusion 5: Interest rates are the most important loan attribute for most potential borrowers. But monthly payment burden is also an important consideration for potential underserved borrowers.

Conjoint Exercise: Segmented Market Share by Interest Rate



- **Recommendation:** Given the central importance of interest rates in borrower decision-making, the Program should prioritize strategies that preserve low interest rates, including continued optimization of risk mitigation tools such as the LLR. Preserving the program's low interest rates is especially important in the current high-rate environment, where borrowing costs remain elevated and future rate movements are uncertain.

Research Objective 3: Gauge GGH Reach of Underserved Californians

Conclusion 6: Elevated risk with microloans may limit underserved borrower participation in the program overall.

- **Recommendation a:** The Program can increase LLR contributions for microloans, reflecting the higher risk. The drawback of this option is that it implies a larger role for ratepayer funds.
- **Recommendation b:** Under current GGH Program regulations, the interest rate cap is tied to the yield on new 10-year U.S. Treasury bonds plus 750 basis points (one basis point equals 0.01%). An additional risk premium allowance can further rationalize microloan interest rates. While this will increase direct costs for borrowers, it can reduce the likelihood of a decline in the creditworthiness of the same borrowers due to defaults.

Conclusion 7: While overall program participation has expanded, there remain underserved gaps in certain regions of California.

- **Recommendation a:** The program could explore low-cost, region-specific strategies to increase engagement among lenders and contractors already operating in low-participation areas, with a particular focus on contractors who are registered but have little or no recent GGH activity in those regions. Collaboration with the community choice aggregators and regional energy networks in these areas, targeted communications, regionally tailored refresh trainings, or reminders of program benefits, may help determine whether low participation reflects limited awareness, local market conditions, or other region-specific barriers. The Program should also provide tailored education and resource materials to lenders and contractors on complementary programs available to eligible customers, including DER-focused initiatives for disadvantaged communities (e.g., DAC-Single-family Affordable Solar Homes and similar offerings). This is especially important for contractors. While some lenders operate statewide and use standardized, professionalized lending processes, meaning a relatively small number of well-run lenders could potentially serve many regions, contractors are typically far more geographically constrained and ultimately drive most program participation.

Loan Density by County

- **Recommendation b:** Before pursuing expansion in low-participation regions, the program could invest limited effort in understanding the operating conditions and needs of contractors in lower-density or rural markets. Targeted focus groups, interviews, or similar feedback mechanisms may help assess feasibility and identify potential program adjustments that could improve contractor participation in these areas.

Conclusion 8: Credit enhancements improved targeting of credit-challenged borrowers, though risks remain.

- **Recommendation:** The program could consider incorporating borrower debt-to-income ratios alongside credit score and other existing criteria when targeting credit enhancements. Doing so may further refine risk targeting, support more effective use of LLR funds, and strengthen lender confidence while maintaining access for underserved borrowers.

Research Objective 4: Verify GGH Energy Savings and Fuel Substitution[7] Impacts

Conclusion 9: The Program increased its GHG emission reductions substantially, both in aggregate and per project.

- **Recommendation:** The Program has progressed beyond energy savings as one of the key metrics for success. On December 14th 2017, the CPUC issued Resolution E-4900, which identified "appropriate metrics for determining the long-term viability of energy efficiency financing pilots in general, and residential energy efficiency loan program (REEL, now known as GGH) in particular, pursuant to Decision 17-03-026".[8] In 2021, Decision 21-05-031 stated that "energy savings goals alone, while important, do not capture the full set of policy goals and benefits of energy efficiency".[9] Given the introduction of DER projects, primarily solar and battery, clean energy generation as well as GHG emission reductions should be key metrics of program success henceforth.

[7] CPUC defines "fuel substitution" as switching from one CPUC-regulated fuel to another, such as replacing natural gas with electricity. In contrast, "fuel switching" is defined as replacing energy use from an unregulated fuel (for example, propane) with a CPUC-regulated fuel such as electricity. CAEATFA tracking data does not make this distinction and refer to relevant projects as "fuel switching" and do not capture the baseline fuel type. As a result, these projects may represent either fuel switching or fuel substitution. For consistency, this report uses the term "fuel switching" to refer to both fuel switching and fuel substitution.

[8] Resolution E-4900

[9] Decision 21-05-031 May 20, 2021, page 72. D21-05-031

Conclusion 10: There is substantial variation in impacts within different measures financed through standard loans.

- **Recommendation:** Given the limited evidence of energy savings (or other notable program impacts) from cool roofs and windows and doors relative to their program cost, the Program could consider whether these measures should be eligible for GGH loans (unless bundled with other measures as part of a whole-home project). This can help the Program rationalize eligibility of measures, should financing funds be limited in the future. Another option is to prioritize continued availability in regions or climate zones where these measures are more likely to deliver savings. Existing tools, such as the California Building Code climate zone guidance, could support a low-cost, stepwise implementation. However, this may cause difficulty for contractors and borrowers and reduce their ease of participation.

Electric Energy Impacts for Top Three End-Uses – No Fuel Switching

Participant Segment	Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	Energy Impacts as % of Baseline kWh
HVAC	2,327	6,863	381	885,569	6%
Cool Roofs	1,116	*	*	*	*
Windows and Doors	668	*	*	*	*

*Energy savings estimates are not statistically significant.

Conclusion 11: Current fuel switching data tracking protocols may be underrepresenting overall program impacts.

- **Recommendation:** GGH program implementers in conjunction with program allies should refine fuel-switching data tracking at the project level to reduce misclassification across loan types. Mandatory collection of initial fuel data from contractors or participants can be the easiest way to accurately track fuel switching and ensure all program impacts are represented in evaluation.

2. INTRODUCTION

The remainder of the report is organized as follows: Section 2 presents a brief introduction and context of the program and this evaluation. Section 3 presents the research objectives, questions, and discusses the methodologies used to address them. Section 4 discusses the program participation in terms of regular and underserved borrowers, measures installed, relative contributions to program funding from different sources, participating financial institutions, and participating contractors. Section 5 presents estimates of energy and GHG impacts. Section 6 assesses the effectiveness of the loan loss reserve mechanism in attracting private capital and provides attractive EEM financing for residential borrowers. Whereas Section 7 provides a brief overview of the residential EEM financing landscape in California and the loan attributes preferred by Californians.

2.1 PROGRAM DESCRIPTION

The GGH Program aims to expand EEM adoption by reducing the upfront cost hurdle for customers through financing. This evaluation focuses on GGH Program operations and performance from July 1, 2023, to June 30, 2025, and serves as an update to the *2024 GoGreen Homes Impact Evaluation*.[10] The program is administered by CAEATFA. This evaluation analyzed multiple types of GGH Program loans:

- **Standard loans:** There are two types of standard loans.

[10] https://pda.energydataweb.com/api/view/3962/CPUC%20Group%20B%20GGH%20Evaluation%20Report_FINAL%202024-07-30.pdf

- **Traditional standard loans:** Up to $50,000 for EEEM improvement projects typically implemented through GGH contractors. These are typically whole-home upgrade projects that include measures such as HVAC or building envelope. The maximum loan term is up to 15 years.
- **Standard-DER Loans:** In 2024, the program expanded to include loans for clean energy measures such as rooftop solar, battery storage, and EV chargers. Loans for projects including rooftop solar and battery storage have a $75,000 loan cap and a longer maximum loan term (up to 20 years) because these projects typically cost more.[11] Please note that this is not terminology used by the implementer. We use this to differentiate the newly introduced measures that can potentially serve as DERs.

- **Microloans:** Up to $5,000 for smaller scale EEEM purchases made through Enervee marketplace or IOU online marketplaces. EEEMs financed via microloans are typically appliances available to homeowners and renters, and many are eligible for self-installation (i.e., they do not necessarily require a contractor).

During the most recent evaluation period (July 01, 2023–June 30, 2025), the GGH Program continued to operate LLR funding as a risk mitigation strategy for private lenders that enroll and offer GGH Program loans to customers. For each project financed via a GGH Program loan, CAEATFA deposits a percentage of the original loan amount into the LLR fund. The LLR can cover up to 90% of lenders' potential losses in cases of loan default. This mitigates a significant portion of lender risk, enabling lenders to offer loans for EEEMs at lower interest rates, with longer payback periods, and broader eligibility criteria. The better loan terms and expanded eligibility criteria reduce monthly loan payments and aim to enhance market coverage in underserved segments, such as LMI or credit-challenged borrowers.

Until January 2024, the LLR percentage was 11% for loans distributed to market-rate borrowers and 20% for loans distributed to borrowers identified as underserved. In January 2024, CAEATFA changed the LLR contribution methodology to a default rate of 5% (from 11%) and 20% for borrowers with a credit score of 700 or lower (up from 640 or lower). At the same time, the program changed the LLR rebalance methodology so that CAEATFA could recoup funds more quickly from in-process and paid-off loans to make the LLR funding available for new participants faster than before.

In addition to the GGH Program, borrowers may apply for utility rebates to further reduce the upfront cost of eligible equipment. Utility rebates for EEEMs purchased via the Enervee marketplace or IOU online marketplaces operated by Enervee are applied at the point of sale. If eligible, standard loan borrowers typically receive rebate payments after the project is completed; in some cases, contractors may apply for the rebates themselves and offer an upfront discount to their residential customers.

2.2 DETAILED PROGRAM HISTORY

The California Public Utilities Commission (CPUC) initiated the state's energy efficiency financing efforts in 2012 by requiring investor-owned utilities (IOUs) to commit $75.2 million to a portfolio of pilot programs designed to test new EE financing approaches, with the pilot phase scheduled to conclude on June 30, 2022. In 2013, via Decision 13-09-044, the CPUC specified that only $65.9 million of those ratepayer funds would be initially allocated to the financing pilots; the remaining $9.3 million would be held in reserve until the CPUC conducted a midpoint review of program performance. With the allocated funds, the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) launched the California Hub for Energy Efficiency Financing (CHEEF) to administer the financing pilots across multiple customer segments and strategies.

[11] The GGH Program requires any loan for a rooftop solar project to include battery storage as well.

Decision 13-09-044 also specified that $25 million in ratepayer funds would be allocated to fund a loan loss reserve (LLR).[12] The LLRs improve residential customer access to financial products for the adoption of eligible energy measures (EEMs) with better loan terms.[13] In 2016, CAEATFA launched the Residential Energy Efficiency Loan (REEL) Assistance Pilot to increase access to financing for residential EE improvements, particularly among underserved customer segments. The REEL Pilot offered loans up to $50,000 (standard loans). In March 2017, the CPUC issued Decision 17-03-026, giving CAEATFA flexibility to modify the REEL Pilot to maximize pilot performance. In December 2017, the CPUC issued Resolution E-4900 to establish metrics for measuring financing pilot success and require regular evaluation, measurement, and verification (EM&V) of the financing pilots to monitor pilot performance.[14] Opinion Dynamics completed the REEL Pilot's first evaluation in January 2020.

The CPUC expanded the REEL Pilot into a full-scale program via Resolution E-5072 pursuant to Decision 17-03-026, issued on April 17, 2020. In August 2021, the Program was renamed the GoGreen Home Financing (GGH) Program as part of a renewed marketing effort. Decision 21-08-006, issued on August 5, 2021, mandated the completion of a second evaluation of the GGH Program by April 30, 2024. In September 2021, CAETAFA introduced microloans to the Program. Microloans differed from standard loans in that they had different underwriting rules and were only available for select EEEMs up to $5,000. In October 2021, CAEATFA and the IOUs issued an Advice Letter to the CPUC requesting additional funding for the CHEEF suite of programs. With nearly $24 million remaining in its initial budget allocation (per Decision 13-09-044), CAEATFA and the IOUs requested $51.2 million in incremental ratepayer funds to finance the CHEEF suite of programs from July 2022 through June 2027, equating to a total budget of $75.2 million. These incremental funds were approved by CPUC via Decision 21-08-006 via Rulemaking 20-08-022 in August 2021.

In 2023, the CPUC issued Decision 23-08-026, authorizing CAEATFA to support the financing of clean energy technologies beyond the initial suite of previously facilitated Eligible Energy Efficiency Measures (EEEMs). This allowed GGH to support other distributed energy resources such as solar, battery storage installations, and electric vehicle (EV) chargers. Credit enhancements for these measures were introduced during the summer of 2024. Because of the high cost of these measures, loan caps and maximum loan terms were increased to $75,000 and 20 years, respectively, for any project involving rooftop solar and battery storage.[15] Since these technologies were new to the program during the previous evaluation, this updated evaluation will provide CPUC with additional data, specifically around how customers use GGH to support California's decarbonization goals by adopting distributed energy resources (DERs).

Over the evaluation period (July 1, 2023, to June 30, 2025), program staff undertook several initiatives to expand GGH eligibility and improve program efficiency. Building on authorization from the CPUC to seek non-IOU ratepayer funding (D.21-08-006), CAEATFA executed an agreement with the City of Palo Alto Utilities (CPAU) to provide funding for GGH credit enhancements. While CPAU serves a relatively small service territory, it represents the first non-IOU utility to participate in the program and establishes a replicable model to support GGH non-IOU contributions for credit enhancements on behalf of their customers or constituents.

In January 2024, CAEATFA implemented changes to the LLR contribution. The updated framework reduced the default LLR contribution to 5% from 11%, while leaving the contribution rate for credit-challenged borrowers at 20%. This reduced the average contribution rate from 15.8% to 7.8% of loan value, enabling more efficient deployment of credit enhancement funds while continuing to mitigate lender risk. A further change to the program's rebalance methodology allowed funds from in-process and paid-off loans to be recaptured and redeployed much more quickly.

[12] In this context, loan loss reserves are ratepayer funds set aside by the program implementer to cover losses on the eligible portions of the GGH loans.

[13] A list of eligible energy measures can be found at www.gogreenfinancing.com/residentialmeasures.

[14] CPUC Resolution E-4900. 2017-12-14. Accessed on 2026-01-09 at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M198/K717/198717879.PDF

[15] The GGH Program requires any loan for a rooftop solar project to include battery storage as well.

Following the 2023 announcement that the TECH Clean California Initiative would not renew funding to enhance heat pump loans for customers of publicly owned utilities (POUs), CAEATFA staff actively pursued replacement funding to avoid program disruption. In September 2024, CAEATFA entered into an agreement with the California Energy Commission's (CEC) Equitable Building Decarbonization (EBD) program to deploy $30 million in California Climate Investments (CCI) funds to support financing for electric measures. Under the agreement, $18 million is allocated to provide credit enhancements to heat pumps and other electric measures in POU service areas regardless of gas provider. An additional $9 million is designated to support an interest rate buy-down (IRBD), targeting 0%–2% rates for low-income households in disadvantaged communities installing heat pump technology. Figure 1 shows the program changes over time.

2.3 PROGRAM CHANGES SINCE LAST EVALUATION

Between July 2023 and the current evaluation, the GGH Program underwent a series of changes that both broadened its reach and reshaped how its resources are deployed.

- **Expansion to POUs:** In September 2023, following CPUC authorization to add non-IOU ratepayer funding to the program (D.21-08-006), CAEATFA signed its first agreement with a POU (CPAU). These funds are being used to provide credit enhancements for GGH customers. As such, CPAU served as a model for other non-IOUs that may wish to partner with the program in the future and offer their own customers access to credit enhancements.
- **Updated LLR Methodology**: At the start of 2024, the Program adjusted its approach to credit enhancement funds in response to low default rates (1% for standard loans and 16% for microloans in the previous evaluation). The LLR methodology was revised, lowering the standard borrower contribution from 11% to 5%. Moreover, LLR enhancements of 20% were provided only to credit-challenged borrowers, defined as those with no credit score or a credit score of below 700. Until January 2024, a borrower was defined by the GGH Program as underserved if they met one or more of the following criteria: (1) credit score below 640, (2) property in an LMI census tract (i.e., census tract area median income (AMI) does not exceed 120% the AMI of metropolitan area, county, or state), and (3) LMI household income (household income at or below current annual income limit determined by California Department of Housing and Community Development based on country and family size).

  This reduced the average LLR contribution rate by nearly half, from 15.8% to 7.8% of loan value, freeing up funds to serve more loans without compromising lender protection. At the same time, the annual rebalance process was updated to recapture funds from loans that were either in process or paid off more quickly, making them available for redeployment sooner.
- **Contractor Portal:** In July 2024, CAEATFA launched the online GoGreen Home Portal designed to improve the contractor experience and streamline workflows. The portal also reduced the administrative burden on lenders and lowered program costs by internalizing previously outsourced functions.
- **Expansion to Clean Energy Measures:** The Program also expanded its focus to support large-scale clean energy upgrades, including rooftop solar, battery storage, and EV charging. In September 2024, CAEATFA entered into a new funding agreement with the CEC's EBD program.[16] The agreement provided $30 million in CCI funds to back electric measures. Although GGH had previously partnered with TECH Clean California (TECH), the agreement with CEC's EBD further expanded funding for electrification projects. Of the $30 million, $18 million was directed toward credit enhancements for heat pumps and other electrification projects in POU territories, and $9 million was reserved for IRBDs that could deliver rates as low as 0% to 2% for low-income households in disadvantaged communities to install heat pumps. By January 2025, TECH funding for residential customers was exhausted. The EBD partnership then stepped in to fill this gap, providing stability for lenders and contractors in a changing

[16] The Equitable Building Decarbonization Program is a California Energy Commission initiative that funds building electrification and energy upgrades in low- and moderate-income and disadvantaged communities through direct install programs and statewide incentives.

incentive market. It also ensured that households typically excluded from the clean energy transition had access to attractive financing during a crucial phase of California's initiative to install six million heat pumps by 2030.

2.4 PURPOSE OF THE STUDY

The overarching purpose of this study is to reassess the GGH Program's performance during the evaluation period (July 2023–June 30, 2025) using similar metrics to those used in previous evaluations to inform discussions between the CPUC and CAEATFA about the future of energy financing in California. Based on metrics adopted in Resolution E-4900 through D.21-08-006, as well as additional performance metrics agreed upon by the CPUC and the evaluation team (collectively, Opinion Dynamics with subcontractor Dunsky), this study has the following specific research objectives:

1. **Assess GGH scalability and growth** by analyzing:
   a. Growth in the number of loans on a month-by-month basis over the evaluation period
   b. The number of loans made by the program, average loan size, total amount of financing generated (since the previous evaluation), and loans by measure type.
   c. Loan performance to date in terms of defaults, late payments, and use of LLR.
2. **Assess GGH leverage of private capital and on-the-ground support** by tracking:
   a. The number and type of participating financial institutions and program-certified contractors (i.e., program partners), including an analysis of the distribution of participation across partners.
   b. Any changes CAEATFA made from the previous evaluation to attract additional funding for GGH, and the total amount of private capital attracted to date.
   c. Any program modifications CAEATFA implemented since the previous evaluation (or proposes to implement) to improve consumer protections and attract additional lenders.
   d. Contextualizing GGH financing terms with the broader market for residential energy efficiency financing
3. **Gauge GGH reach of underserved Californians who would not otherwise have participated in EE and decarbonization upgrades** by reviewing:
   a. Credit scores of loan participants reported on an aggregate basis.
   b. Length of time allowed for applicants to pay back the loans.
   c. Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, AMI, or other poverty statistics.
   d. Whether participants would have qualified for existing private EE loan programs at interest rates and terms that they can afford or would accept.
4. **Verify GGH energy savings and fuel substitution impacts** by assessing:
   a. Customer meter data provided by the utilities to conduct a consumption analysis of standard loan projects and understand how much energy savings and other impacts GGH produced, including electric and gas savings, taking into account fuel shifting from gas to electric and decarbonization efforts, per participant and overall.
   b. Deemed savings for microloan measures from California's eTRM to estimate energy savings for EEEMs purchased through the California Enervee Marketplace and financed through the GGH Program; and
   c. Source energy and CO_2 emission reductions from financed projects (including fuel substitution measures).

3. METHODOLOGY OVERVIEW

This report includes results from a range of data collection and analytical methods to support the evaluation of GGH Program performance. Table 3 summarizes the specific tasks undertaken to conduct this evaluation. Detailed descriptions of technical methods are available in Appendix E.

Table 3: Summary of Research Activities

Evaluation Task	Summary of Research Activities Performed
Data Review and Program Staff Interviews	The evaluation team reviewed existing program materials and data provided by CAEATFA and participating utilities. Additionally, the team conducted in-depth interviews with CAETFA to confirm program design and implementation details, inform subsequent evaluation tasks, and understand program participation.
Participation Analysis	The evaluation team analyzed primary participation data to assess program accomplishments over time and to characterize participants by borrower, lender, and contractor characteristics.
Consumption Analysis	The evaluation team verified energy savings produced by measures financed through GGH standard loans using a consumption analysis for standard loan projects. The team estimated annual per-household electricity and gas impacts by net metering and fuel-substitution status using a two-way fixed-effect (TWFE) model.
Engineering Analysis	Energy savings produced by microloans were estimated by taking a deemed savings approach using California eTRM.
Participant Surveys	The evaluation team administered two online surveys to GGH program participants (one to standard loan participants and one to microloan participants). A total of 282 participants completed the surveys: ▪ 72 standard loan participants ▪ 72 standard loan participants who installed at least one DER/clean energy measure ▪ 138 microloan participants The surveys supported the evaluation by capturing participants' experiences, household characteristics, motivations for upgrades and financing, the influence of financing availability on upgrade decisions, awareness of alternative financing options, and, among DER participants, details of their specific upgrade choices. The survey was offered in English and Spanish and provided a $20 incentive for qualified respondents.
Nonparticipant Conjoint Study	The evaluation team also conducted a conjoint study with Californians who had not previously participated in the GGH Program. The online survey asked respondents to select a hypothetical loan from a set of randomized options that varied by APR, loan term, loan source, out-of-pocket expense, and contractor endorsement. Results from this conjoint analysis were used to assess financing preferences among nonparticipants, allowing GGH to refine loan structures and policies to better align with Californians' financing preferences. The conjoint study was fielded to two borrower groups: ▪ 103 Market Rate respondents ▪ 78 Underserved respondents (defined by CARE/FERA participation) These groups were expected to have distinct financing preferences; however, given the response rates for each borrower group, most of the conjoint analysis was conducted at the total respondent level. Where there are notable differences by borrower groups, we discuss that in the findings. The survey was offered in English and Spanish and provided a $50–$100 incentive to qualified respondents.
In-Depth Market Actor Interviews	The evaluation team conducted in-depth interviews with participating contractors and lenders to gather their perspectives on potential improvements to the program, customer interactions, barriers and opportunities for GGH financing, and their overall participation experience. The team completed 20 contractor interviews and 8 lender interviews, using samples that ensured variation in participation and geography to gain a broad understanding of the program. The evaluation team provided an incentive of $50-$100 for qualified respondents, depending on the expected length of the interview.

4. PROGRAM PARTICIPATION IN NUMBERS

The evaluation team conducted a participation analysis using program data provided by CAEATFA to assess GGH Program growth over time.

4.1 GROWTH IN LOANS DURING THE EVALUATION PERIOD

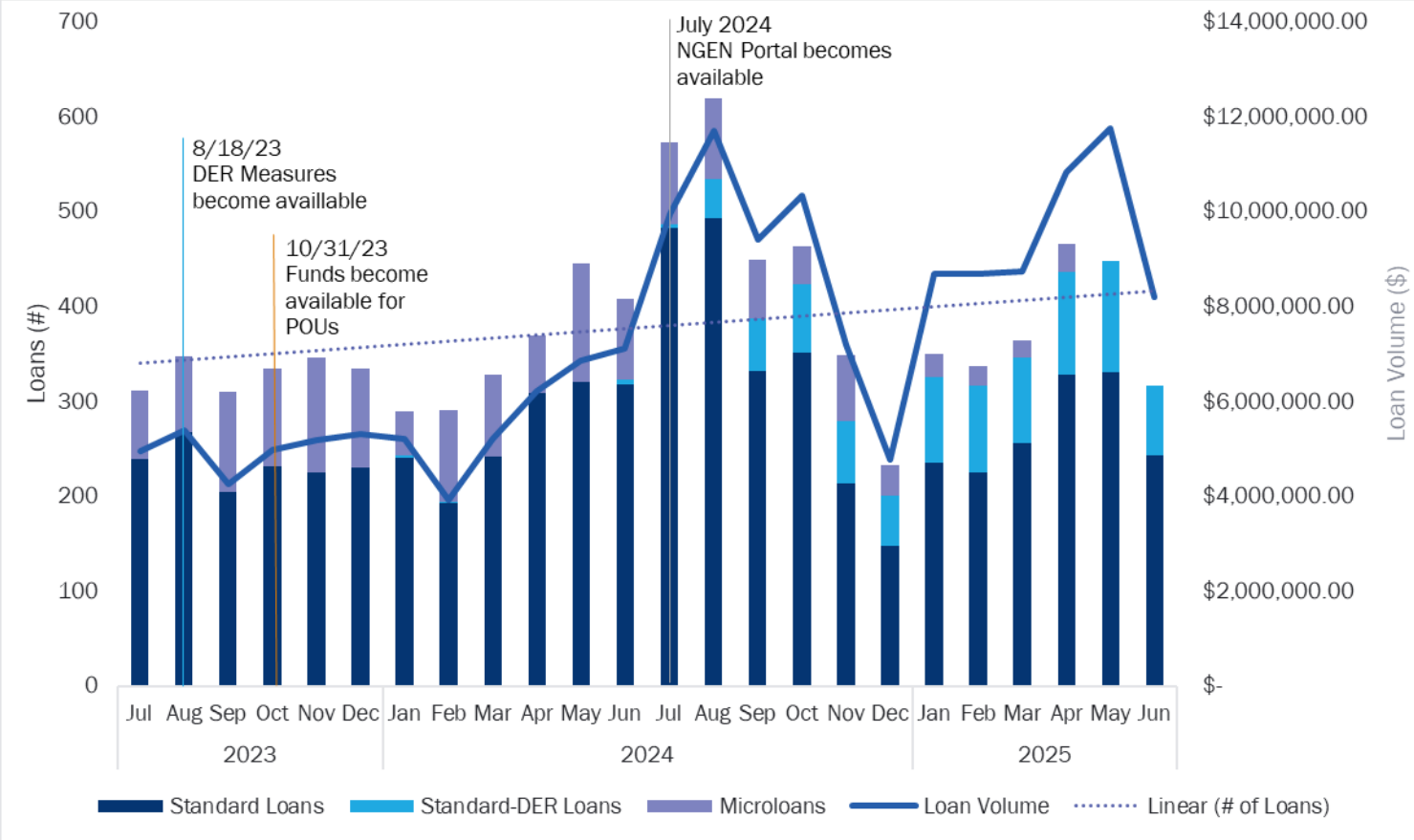
The GGH program evolved from its inception as the REEL pilot launched in 2016. The Program has offered standard loans for EEEM measures to IOU customers since its start. In September 2021, the Program began offering microloans for relatively inexpensive eligible EEEM measures, with a focus on facilitating the use of efficient appliances. DER measures such as solar and battery installations and EV chargers became available for financing in August of 2023 via Decision 23-08-026. The first loan to a non-IOU utility participant was provided in September 2023. These changes to the program, along with favorable broader market conditions (section 7.1.1), led to a robust loan growth through the program.

Figure 2 shows the number of standard loans, standard-DER loans, and microloans facilitated each month from July 2023 to June 30, 2025. During the evaluation period, the GGH Program facilitated 9,661 loans (6,911 standard loans, 869 standard-DER loans, and 1,881 microloans). The total loan volume distributed from each source amounted to $180.69 million. These 9,661 loans were issued for projects at 9,395 unique properties. This evaluation period saw the highest monthly loan volume in the program's history. See Appendix C for the number of loans per quarter from 2018 to June 2025. For example, before Q3 of 2023, the number of loans per quarter did not exceed 482. In Q2 of 2025, over 1,600 loans were originated.

DER measures were eligible for standard GGH loans since August 2023. However, the first standard-DER loan did not originate until January 2024. In August 2024, 42 standard-DER loans were originated, and the trend of increased DER measure adoption through the program continued through June 2025. Despite a downward trend in the number of microloans over the evaluation period (Figure 2), the adoption of loans for DER measures led to overall growth in program participation from July 2023 to June 2025.

While the number of loans per month from June 2023 to July 2025 generally increased during the evaluation period, it fluctuated, with a peak in the summer of 2024 and a low in December 2024, following typical renovation seasonal patterns. The number and monetary volume of loans distributed each month also increased over the evaluation period; $4.97 million in loans was disbursed in July 2023, and $8.2 million in June 2025.

Figure 2. Quantity and Volume of GGH Loans: July 2023–June 2025



Source: CAEATFA tracking data. Note: See Appendix C for data notes.

The average loan amount was $20.6K for standard loans, $40.2K for standard-DER loans, and $1.6K for microloans (Table 4). The average loan term was just under 11 years for all standard loans (the median was 10 years for standard loans and 15 years for standard-DER). All microloans had five-year loan terms. The average interest rate for standard loans was 5.8%, increasing from 4.9% in the last evaluation period. Similarly, the average interest rate for microloans increased from 9.2% to 10.2%. The Federal Reserve increased U.S. interest rates to combat high inflation, with rates peaking in July 2023.[17]

Table 4. GGH Loan Product Summary

Characteristic	Standard Loan		Standard-DER Loan		Microloan	
	Average	Range	Average	Range	Average	Range
Loan amount	$20,637	($1,500–$72,714)	$40,245	($7,755–$75,010)	$1,644	($160–$4,956)
Interest rate	5.84%	(0.00%–10.49%)	6.29%	(3.98%–9.99%)	10.19%	(9.81%–12.09%)
Loan term	123	(6–240)	165	(19–240)	60	(60–60)
Monthly payment	$272	($23–$3,128)	$459	($101–$2,631)	$35	($3–$105)
Total number of loans	**6,911**		**869**		**1,881**	

Source: CAEATFA tracking data

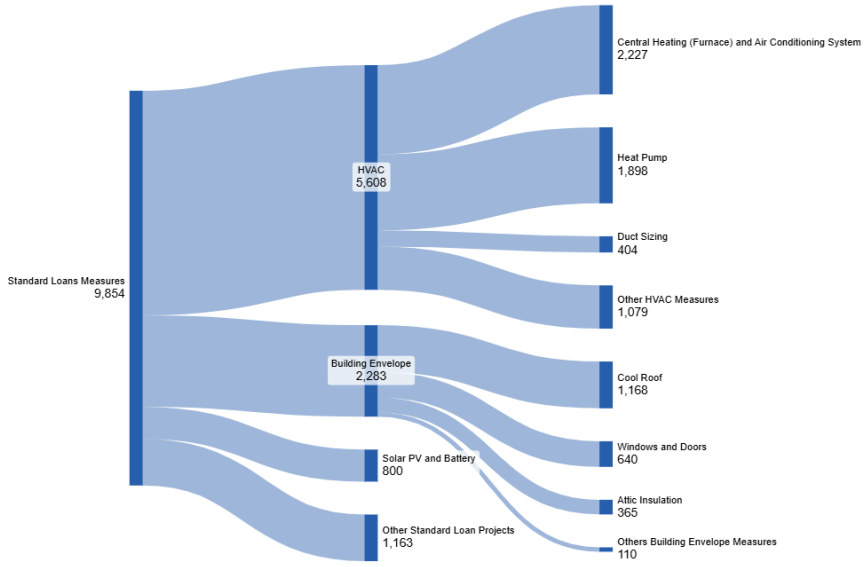
[17] https://www.forbes.com/advisor/investing/fed-funds-rate-history/

FINANCED ENERGY MEASURES

Across all 9,661 loans, 82% of projects involved installing a single EEM, while the remaining projects involved installing multiple EEMs. In total, the 1,881 microloans financed 2,310 measure installations, while the 7,780 standard loans financed 9,854 measures.[18]

Figure 3 and Figure 4 illustrate the key measures installed through standard and microloan projects. Among standard loans (Figure 3), HVAC measures account for the largest share of installed measures (57% of all standard loan measures). The most common HVAC measures included central heating and air conditioning systems (23%) and heat pumps (19%). Building Envelope measures were also common, accounting for 23% of measures installed through standard loans. Cool roofs (12%), windows and doors (7%), and attic insulation (4%) were the most common Building Envelope measures. The newly introduced Solar PV+Battery measure and battery-only projects comprised a notable portion of installed measures (8%) financed with standard loans. Within microloan projects (Figure 4), there is a strong concentration among appliance measures (96%), primarily driven by clothes washers and dryers (40%), and refrigerators (34%).

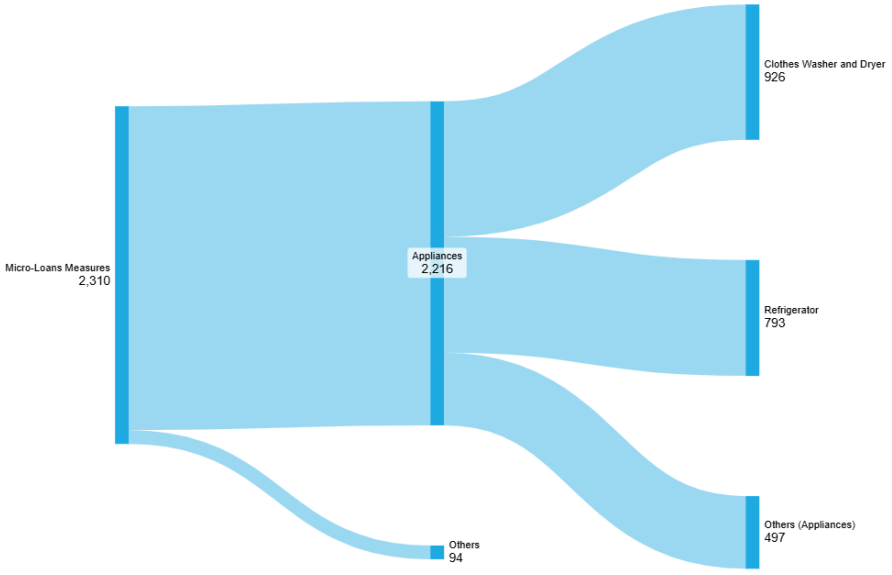
Figure 3. Sankey Diagram - Standard Loan Measure Distribution



Note: A single project may include the installation of multiple measures that span more than one measure category. As a result, the total number of measures shown in the figures will exceed the total number of projects.

[18] For purposes of this analysis, multiple windows/doors installed in the same project is counted as one measure. Similarly, measures such as attic insulation or cool roof are counted as one measure, regardless of the size of the installed measure.

Figure 4. Sankey Diagram - Microloan Measure Distribution



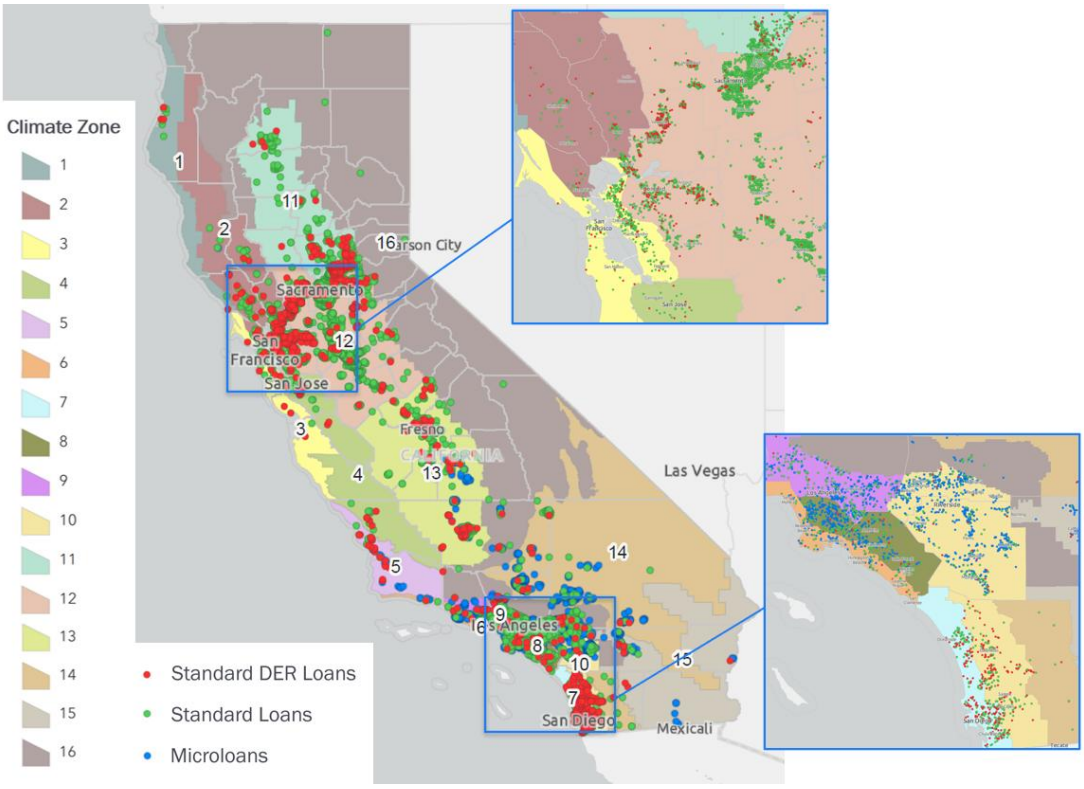
Note: A single project may include the installation of multiple measures that span more than one measure category. As a result, the total number of measures shown in the figures will exceed the total number of projects.

4.2 GEOGRAPHIC DISTRIBUTION OF LOANS

The evaluation team mapped the geographic distribution of standard loans, standard loans for DER, and microloans across the 16 climate zones in California (Figure 5) and loan density by county (Figure 6). Loans of different types spanned California's climate zones, although participation was relatively lower in climate zones 1, 15, and 16 than in other climate zones. The previous evaluation found that loans were more concentrated in the North Central Corridor (Climate zones 2, 3, 4, and 12) than in Southern California (Climate zones 7, 8, 9, 10). The overall geographic distribution of participation remained largely unchanged, although the density of loans (per 100,000 residents) in most California counties increased since the last evaluation (due to statewide program growth). Standard loan projects were most prevalent in the Bay Area, the Sacramento area, and the Los Angeles area (climate zones 3, 4, 6, 8, 9, and 10), with some spread throughout the Central Valley (climate zones 11, 12, and 13). Whereas standard-DER loans were concentrated in the Sacramento and Bay Area (Climate zones 2, 3, 4, and 12), as well as in Southern California, where they were more prevalent in San Diego (Climate zones 7 and 10) than in Los Angeles (Climate zones 6, 8, and 9).

Participation is generally still lower in the north and north-east part of the state (climate zone 1) as well as in the southeast (climate zones 14 and 15). As evidenced by Figure 6, the highest loan density (loans per 100,000 residents) was in the Sacramento and Bay Area, particularly in Solano and El Dorado counties (Climate zones 2, 3, 4, and 12). Other counties highly served by the program are Yolo, Stanislaus, and Placer (Climate zones 11, 12, and 16).

Figure 5. Geographic Distribution of Loans by Loan Type



Note: The California Energy Commission established 16 climate zones for building energy-efficiency standards based on Heating Degree Days (HDD) and Cooling Degree Days (CDD), energy-use profiles, geographic boundaries, budgets, and more.[19] All areas within a zone share similar energy-relevant weather conditions.

Figure 6. Loan Density by County

[19] CEC. Climate Zone Tool, Maps, and Information (2025). Accessed here.

4.3 BORROWER CHARACTERISTICS

We examined the key characteristics of program borrowers; specifically, property ownership, borrowers' credit scores, DTI ratios, and LMI status for properties across the three loan types. One expressed goal of the program is to engage underserved borrowers, or borrowers who would not have otherwise been able to take out loans for EEMs. Our analysis revealed that standard loan borrowers were primarily property owners with high credit scores and low debt-to-income ratios, and their properties were in neighborhoods deemed less environmentally hazardous per the CalEnviroScreen tool (not necessarily disadvantaged communities), although many resided in low- and moderate-income areas. Microloan borrowers, by contrast, were a mix of owners and renters, often with credit scores below 700, and residing in disadvantaged communities. Since the launch of microloans, that portion of the program has historically been the aspect that more underserved borrowers take advantage of; in the previous evaluation, more than half of all microloan borrowers had credit scores below 700, resided in disadvantaged communities, and had annual household incomes below $70,000.

HOME OWNERSHIP

Table 5 shows that nearly all standard loan borrowers for DER and non-DER measures were property owners, whereas microloans were more evenly split between owners (55%) and renters (45%). This closely follows the statewide trend, where, in 2024, about 55% of Californians owned homes,[20] and about 44% rented them.[21] Around 40% of US renters stay at their homes for one to four years. Since microloans facilitate the adoption of efficient appliances that renters can take with them upon departure (such as clothes washer, dryer, and smart thermostat), the higher proportion of renters taking out microloans rather than standard loans speaks to the program's ability to meet renters' needs.

Table 5. Borrowers' Relationship to Property

Borrower's Relationship to Property	Number of Loans	Percentage of GGH Loans
Standard Loans (n=6,911)		
Owner	6,898	99.8%
Renter	13	0.2%
Standard-DER Loans (n=869)		
Owner	869	100%
Renter	0	0%
Microloans (n=1,881)		
Owner	1,036	55.1%
Renter	845	44.9%

Source: CAEATFA tracking data

CREDIT SCORE

Table 6 presents the FICO scores of borrowers in the evaluation period across the three loan types. Eighty-one percent of standard loan borrowers had a "very good" or "exceptional" FICO score, up from 52% in the previous evaluation period. Borrowers taking loans for DER measures were more likely to have a very good or exceptional FICO score compared to borrowers with standard loans. However, only 6% of the microloan participants fell in the same FICO score category.

[20] FRED. Homeownership Rate for California (2024). Accessed here.
[21] Public Policy Institute of California. California Renters (2024). Accessed here.

The GGH Program attempts to reach underserved and credit-challenged borrowers. One uncommon feature of the program is that borrowers with credit scores as low as 580 are considered for loans under GGH. While there is no universal minimum credit score threshold, borrowers typically need a score of 700 or higher to qualify for a personal loan with favorable terms.[22] However, for applicants with credit scores between 580 and 640 who wish to borrow more than $20,000, the lender must verify the borrower's income as part of the underwriting process. Very few standard loan borrowers in the evaluation period could be considered "underserved" by their FICO score alone. During the current evaluation period, only 1% of standard loan borrowers had a FICO score of 640 or less, down from 4% in the previous evaluation period. Unlike standard loan borrowers, 55% of microloan borrowers had a FICO score of 640 or less.

Table 6. FICO Scores Among Borrowers

FICO Credit Score Range	Standard-Loan	Standard-DER Loan	Microloan
580–640 (Fair)	1%	<1%	55%
641–700 (Fair/Good)	8%	2%	28%
701–760 (Good/Very Good)	20%	15%	10%
761–820 (Very Good/Exceptional)	45%	51%	5%
821+ (Exceptional)	26%	32%	1%
No FICO	<1%	0%	0%

Source: CAEATFA tracking data

DEBT-TO-INCOME RATIO

DTI ratios, although not an indicator of underserved status for the GGH Program, are often used by lenders to assess a borrower's creditworthiness and ability to repay a loan. According to financial sources, borrowers with DTI ratios above 36% are often considered risky, and borrowers with ratios above 55% are commonly considered too risky for lending, even with an LLR.[23] As shown in Table 7, during the evaluation period, about 40% of standard and standard-DER loan borrowers had DTI ratios between 36% and 55% (loans with a higher lending risk), similar to the proportion in the last evaluation period. The GGH Program does not track DTI ratios for microloan borrowers.

Table 7. DTI Ratios Among Borrowers

DTI Ratio	Standard-Loans	Standard-DER Loans
Under 25% (Less risk)	31%	30%
25%–35% (Some risk)	30%	30%
36%–45% (More risk)	25%	28%
46%–55% (Most Risk)	13%	12%
Data Unavailable	<1%	<1%

Source: CAEATFA tracking data

Note: The GGH Program does not track DTI ratios for microloan borrowers

LOW-TO-MODERATE INCOME CENSUS TRACT

LMI Census Tracts are a measure of income levels in census tracts relative to the California average, set by the Department of Housing and Urban Development.[24] Each loan was designated as being in an LMI census tract or outside of one, although this may not accurately reflect the borrowers' own income. Table 8 shows the distribution of standard, standard-DER, and microloans taken out in LMI and non-LMI census tracts. Standard-DER loans were evenly distributed

[22] Experian. What Credit Score is Needed for a Personal Loan? (2025). Accessed here.
[23] Freddie Mac. *Monthly Debt-to-Income Ratio* (2025). Accessed here.
[24] US HUD. *Notice CPD-24-04* (2024). Accessed here.

across LMI and non-LMI census tracts, while 61% of standard loans were in LMI zones (compared to 57% in the last evaluation). An even higher 74% of microloans were taken out in LMI zones (similar to the proportion in the last evaluation period). In contrast, about 29% of all Californians live in LMI census tracts.[25] While this may suggest that loans are being taken out in lower-income areas, it does not necessarily indicate that the borrowers themselves are underserved.

Table 8. Borrowers in LMI Census Tracts

Property in LMI	Standard-Loans	Standard-DER Loans	Microloans
Previous Evaluation Period			
Yes	57%	N/A	71%
No	43%	N/A	29%
Current Evaluation Period			
Yes	61%	50%	74%
No	39%	50%	26%

Source: CAEATFA tracking data

Note: Standard loans for DER measures became available during the current evaluation period.

CALENVIROSCREEN SCORE

The California Environmental Protection Agency (CalEPA) developed the CalEnviroScreen tool to identify communities disproportionately burdened by multiple sources of pollution and socioeconomic stressors. Moreover, communities in the 25% highest-scoring census tracts, as determined by CalEPA, are considered disadvantaged communities. The tool considers various indicators and computes a composite score reflective of the cumulative impacts of pollution and socioeconomic factors at the census tract level. As shown in Table 9, 12% of standard loan borrowers and 6% of standard-DER loan borrowers from the evaluation period were in the most vulnerable census tracts, based on their CalEnviroScreen Scores (the highest 25th percentile for pollution burden and socioeconomic vulnerability). A further 23% of standard loan borrowers and 14% of standard-DER loan borrowers were in the second-most-vulnerable census tracts. The distribution of standard loan borrowers by CalEnviroScreen Score is similar to that in the previous evaluation period. Compared to standard loan borrowers, a higher percentage (30%) of microloan borrowers were in the most vulnerable census tracts. The average CalEnviroScreen score across the state is 50, indicating that most standard loan borrowers live in census tracts less vulnerable than the statewide average. In contrast, most microloan borrowers live in census tracts more environmentally vulnerable than the statewide average.

Table 9. CalEnviroScreen Score Among Borrowers

Vulnerability	CalEnviroScreen Score (Percentile)	Standard Loan	Standard-DER Loan	Microloan
Least Vulnerable	0 – 25	32%	49%	11%
	26 – 50	34%	31%	30%
	51 – 75	23%	14%	30%
Most Vulnerable	76 – 100	12%	6%	30%

Source: CAEATFA tracking data

HOUSEHOLD INCOME

The GGH Program does not routinely collect income information from participants; however, as part of both the current and prior evaluations, a representative sample of participants was asked to self-report household income. Results from

[25] Low-Income or Disadvantaged Communities Designated by California - Dataset - California Open Data

these surveys are presented in Table 10. Across both evaluations, income distributions differ substantially by loan type, with microloan participants consistently reporting lower household incomes than standard loan participants. This contrast is most pronounced at the tails of the income distribution. In 2025, nearly 40% of microloan participants reported annual household incomes below $50,000, compared with just 8% of standard loan participants. At the upper end of the distribution, only 4% of microloan participants reported incomes of $200,000 or more, while nearly one-fifth (19%) of standard loan participants did.

Standard loans for DER measures, introduced after the previous evaluation, exhibit a distinct income profile. DER loan recipients are more concentrated among higher-income households than participants receiving traditional standard loans, with more than 70% reporting household incomes above $100,000. Because DER loans were not offered during the previous evaluation period, direct cross-year comparisons for this loan type are not possible; however, their introduction contributes to a greater overall concentration of higher-income participants in the current evaluation's participant pool.[26]

Comparing income distributions within loan types across evaluation years provides insight into program participants across time. Among standard loan participants, the share reporting household incomes below $100,000 was 16% in 2022, but 32% in 2025. Correspondingly, the proportion of standard loan participants reporting incomes of $100,000 or more was 62% in 2022, and 55% during the current evaluation.

Income distributions among microloan participants were more stable across evaluation periods. There is some evidence of a modest shift toward higher-income households, with the share reporting incomes above $100,000 increasing from 16% in 2022 to 21% in 2025; however, the overall income profile of microloan participants remains largely consistent with the prior evaluation.

Table 10. Income Distribution from Participant Surveys

Range	2022		2025		
	Standard Loan	Microloans	Standard Loan	Standard-DER Loan	Microloan
Less than $50,000	4%	34%	8%	1%	39%
$50,000 to less than $100,000	12%	40%	24%	15%	28%
$100,000 to less than $200,000	38%	13%	36%	43%	17%
$200,000 or more	24%	3%	19%	28%	4%
Prefer not to say	23%	10%	13%	13%	12%

Source: Standard Loan and Microloan Participant Surveys
Note: Standard Loan n=72, Standard-DER Loan n=72, Microloan n=138
Question: Which of the following categories best represents your annual household income before taxes in 2024?

As an alternative indicator of income or socioeconomic status (SES), the evaluation also asked respondents whether they receive state or government assistance, such as California Alternative Rates for Energy (CARE) or the Family Electric Rate Assistance Program (FERA). Consistent with the income results presented above, participation in government assistance programs differs substantially by loan type (see Table 11). Among microloan participants, 57% report receiving CARE, FERA, or similar assistance, compared with only 14% of standard loan participants and 3% of DER participants. Across multiple measures of income and SES, these results demonstrate that the demographic

[26] For standard loans in particular, changes in item nonresponse may partially explain observed differences across years. The share of standard loan participants selecting "prefer not to say" declined between evaluations (from 23% in 2022 to approximately 13% in 2025), suggesting that some of the apparent compositional shift may reflect changes in reporting rather than underlying participant characteristics. Overall, despite the introduction of DER loans for the 2025 evaluation, which led to a greater concentration of higher-income participants across all loans, income stratification persists, with micro-loans continuing to serve lower-income households and standard loans more commonly used by higher-income participants.

profiles of participants in the two loan categories are markedly different, with microloans being far more concentrated among lower-income Californians. This pattern closely mirrors findings from the previous evaluation period, during which 62% of microloan participants and 9% of standard loan participants reported receiving government assistance.

Table 11. CARE/FERA Status of Survey Respondents

Qualify for or Receive Government Assistance	Standard Loan	Standard-DER Loan	Microloan
Yes	14%	3%	57%
No	79%	86%	28%
Don't know	4%	8%	10%
Prefer not to say	3%	3%	4%

Source: Standard Loan and Microloan Participant Surveys

Note: Standard Loan n=72; Microloan n=138; Standard DER n=72

Question: Many California households may qualify for discounted electric or gas rates through income-based assistance programs such as the California Alternate Rates for Energy (CARE), Energy Assistance Program Rate (EAPR), or Family Electric Rate Assistance (FERA) program. Are you currently enrolled in any of these programs on your household energy bills?

4.3.1 UNDERSERVED BORROWER PARTICIPATION

One goal of the program is to engage underserved borrowers, or borrowers who would not have otherwise been able to take out loans for EEEMs. This section outlines equity segment criteria, discusses program participation in relation to these criteria, shows the geographic distribution of loans with respect to components of underserved criteria, and examines the effect of updates to the underserved LLR enhancement criteria on reaching underserved participants.

Figure 7 displays the distribution of underserved borrowers across the state and the census tracts that qualify as underserved under the CPUC definition.[27] As shown, many underserved tracts had no underserved borrower participation, especially in the northern and eastern parts of the state. However, this closely mirrors the general lack of program participation in those areas. Most underserved borrowers were located in underserved census tracts, though some exceptions occurred. As previously mentioned, the majority of standard loan (61%), standard-DER loan (50%) and microloan (74%) borrowers resided in LMI census tracts. These proportions are marginally higher than in the last evaluation period, notwithstanding newly available standard-DER loans that went to higher-income households.

[27] The CPUC's Environmental & Social Justice Action Plan Version 2.0 lists definitions for hard-to-reach, underserved, and disadvantaged communities, outlined in Table 58 in Appendix B.

Figure 7. Geographic Distribution of Underserved Loans and Underserved Census Tracts

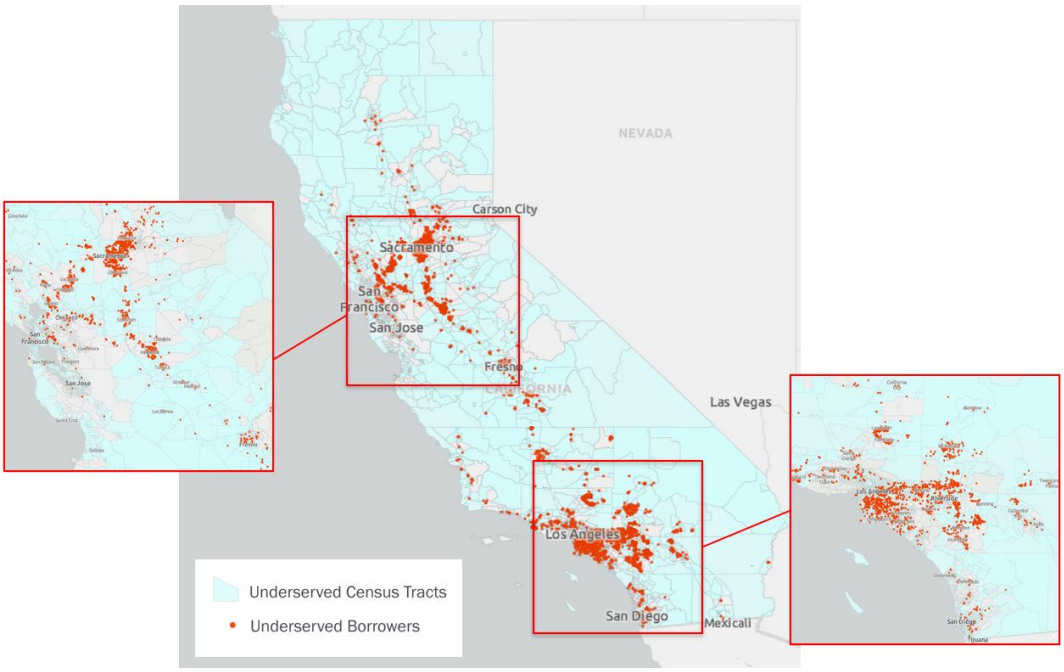


Figure 8 shows the geographic distribution of loans and disadvantaged community (DAC) census tracts based on CalEnviroScreen 4.0 data.[28] As expected, loans were allocated across census tracts within and outside DACs. However, loans were allocated to some DACs much more than to others, with many still garnering no participation in the program. Particularly, borrower participation in Eastern California DACs is low, and participation in the central corridor DAC is moderate. One feature of the borrower participation in DAC and non-DAC areas is that a substantial non-DAC participation occurs in areas adjacent to DACs. Since relative income levels are a determinant of DAC status, and program participants have higher incomes than the median Californian, this finding is not surprising. Moreover, this finding suggests that a demography-targeted credit enhancement, as recently enacted by CAEATFA, may be more appropriate than a geography-targeted enhancement.

Figure 9 details the geographic distribution of loans against the backdrop of LMI-population density across the state. Loans tend to be concentrated in areas with high LMI populations, though some rural parts of the state have issued very few loans through the program. Program participation is also not concentrated in areas with the lowest levels of low-to-moderate income density. Taken together, this suggests that the program is most attractive to moderate- to upper-moderate-income households. These findings are consistent with findings from lender interviews that most demand still comes from market-rate borrowers, given significant project cost, limited understanding of the EE technologies, and with survey findings that show that potential underserved borrowers tend to be debt-averse, highly sensitive to monthly payment amounts, and generally unfamiliar with available financing options (details to be discussed in Section 7.2).

[28] CalEnviroScreen, *CalEnviroScreen 4.0 Data* (2022). Accessed here

Figure 8. Geographic Distribution of Loans by Disadvantaged Community Tracts

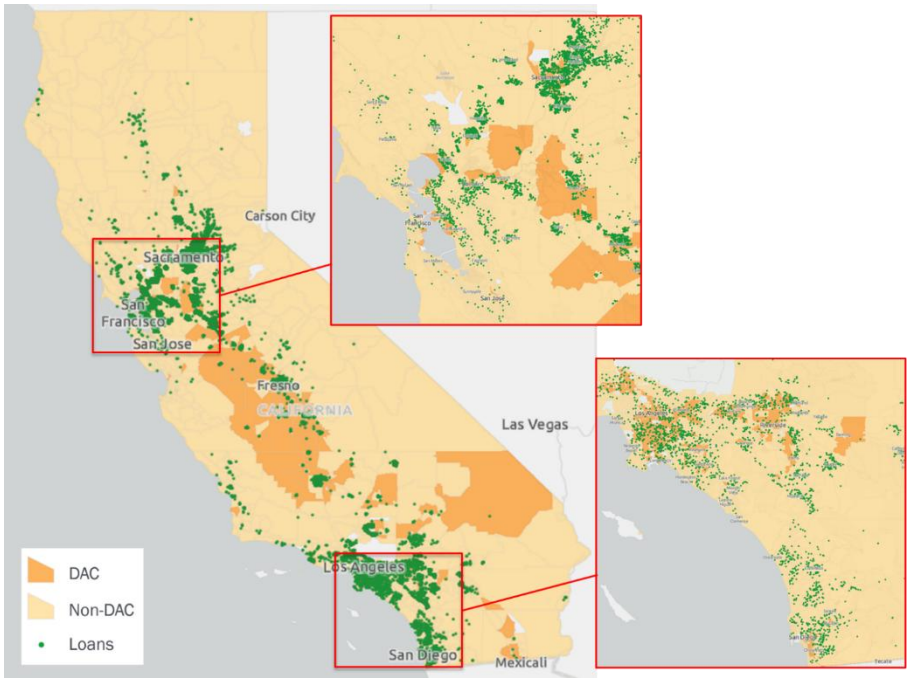
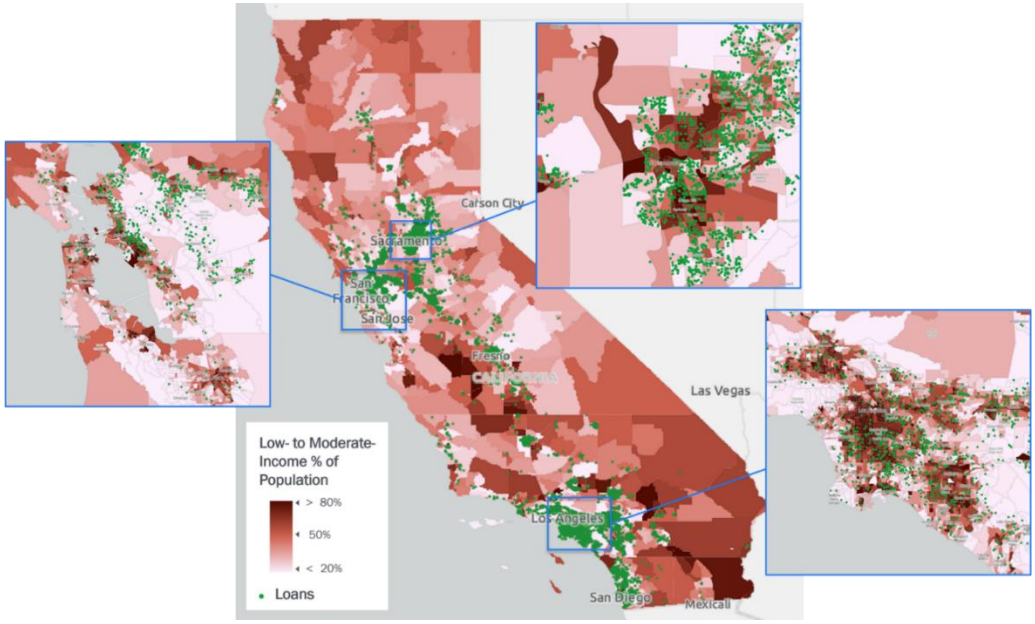


Figure 9. Geographic Distribution of Loans by Low- to Moderate-Income Population Density



4.3.2 EFFECT OF CHANGES IN UNDERSERVED BORROWER CREDIT ENHANCEMENT

The GGH Program encourages lending to underserved borrowers by offering a higher credit enhancement to underserved participant loans. For loans that do not qualify for credit enhancement, the current LLR contribution is 5%, down from 11% since January 2024. An enhanced 20% LLR contribution offers a greater reduction in risk for underserved borrowers, thereby allowing lenders to expand their reach to riskier borrowers. Between July 2023 and December 2023, the credit enhancement was applied to loans from borrowers identified as meeting at least one of the

GGH Program's underserved criteria: borrower credit score is below 640 (i.e., credit-challenged); property is in an LMI census tract; or household income is LMI. In January 2024, along with the change in the LLR contribution rates for loans from borrowers who were not underserved, the 20% contribution was maintained only for credit-challenged borrowers with credit scores of 700 or lower (rather than the previous threshold of 640 or lower), and other previously used criteria were abandoned. The evaluation team analyzed how the incidence of receiving credit enhancement varied across FICO scores, DTI ratios, and the share of loans to LMI census tracts.

Between July 2023 and June 2025, CAEATFA provided enhanced 20% LLR contribution for 1,421 of the 6,911 standard loan borrowers (21%), 19 of the 869 standard-DER borrowers (2%), and 1,659 of the 1,881 microloan borrowers (88%). Table 12 shows the distribution of credit scores among credit-enhanced loans before and after the program regulation change. Before the change, 59% of standard loans received a 20% credit enhancement, and 52% were issued to borrowers with credit scores above 700. After the change in 2024, less than 1% of standard loans to borrowers with high FICO scores received credit enhancement.

Among the microloans issued after the regulatory change, 88% received credit enhancement, and 81% were issued to borrowers with credit scores below 700. An additional 7% of microloan borrowers with higher credit scores also received the credit enhancement. After 2024, more microloans issued to borrowers with lower credit scores received credit enhancements, expanding access to credit-challenged borrowers through higher LLR contributions. Thus, the 2024 policy change improved channeling credit enhancement dollars to credit-challenged borrowers without limiting its reach to underserved borrowers or borrowers in LMI locations (see Table 8).

Table 12. GGH Loans with Credit Enhancement Level Before and After Policy Change, by FICO Score

Loan Type	Percentage of GGH Loans (Before → After Policy Change)	FICO Credit Score (Before → After Policy Change)		
		580–700 (Fair- Good)	701–820 (Good/Very Good–Exceptional)	821+ (Exceptional)
Standard Loan	59% → 8%	7% → 8%	42% → <1%	10% → <1%
Standard-DER Loan	2%	2%	0%	0%
Microloans	89% → 88%	78% → 81%	10% → 6%	<1% → <1%

Source: CAEATFA tracking data.
Note: Standard loans for DERs were mostly financed after the policy change.

Similarly, Table 13 shows that, before the policy change, 35% of standard loan borrowers received a 20% credit enhancement, which was typically considered risky by lenders (DTI ratio below 35%). After the policy change, loans receiving credit enhancement became more aligned with borrowers' aggregate risk profiles. As shown in Table 8 and Appendix C, this policy change did not reduce borrower participation in LMI or DAC census tracts. In fact, after the change, the program saw a marginal increase in borrowers in LMI census tracts while reducing credit enhancement solely based on LMI census tract habitation, even when the borrower did not exhibit signs of increased risk to lenders. This did not make the program riskier for participating lenders and reserved program funding for borrowers who need it.

The one upshot of this change is that 4% of standard loans issued to borrowers with risky DTI ratios (more than 35%) did not receive credit enhancements. Given the significant difference between the default rate (5%) and the proportion of LLR claims to loan principals (0.7% of the loan principal), this may not be a cause for concern. However, the implementer can consider instituting credit enhancement based on DTI ratios to further reduce risk.

Table 13. GGH Loans with Credit Enhancement Level Before and After Policy Change, by DTI Ratio

Loan Type	Percentage of GGH Loans (Before → After Policy Change)	DTI Ratio (Before → After Policy Change)			
		Under 25% (Less Risk)	25%–35% (Some Risk)	36%–45% (More Risk)	46%–55% (Most Risk)
Standard Loan	59% → 8%	18% → 2%	17% → 3%	16% → 2%	9% → 2%
Standard-DER Loan	2%	0%	0%	0%	0%

Source: CAEATFA tracking data.

4.4 SOURCES AND UTILIZATION OF LLR FUNDING CONTRIBUTION

During this evaluation period, CAEATFA used non-IOU funding to facilitate loans for EEEM upgrades. In September 2023, CAEATFA signed an agreement with the CPAU to provide funding for GGH credit enhancements, enabling them to leverage GGH credit enhancements for their customers. In 2023, TECH Clean CA Initiative announced that the program would no longer be reviewing funding to provide credit enhancements for heat pump technology loans for customers of publicly owned utilities (like CPAU) through the GGH Program. Program staff bridged the funding gap through an agreement in September 2024 with the California Energy Commission's Equitable Building Decarbonization (EBD) program, utilizing $30 million from the California Climate Investment Funds to support financing for measures in POU service areas and for interest rate buy-downs (IRBD) for low-income households. Table 14 shows existing LLR funding sources across GGH loans in the evaluation period and how many loans were facilitated by each combination of funding sources. While most of the LLR contribution comes from IOU ratepayers (90%), 8% of projects were fully funded through TECH and EBD funds, and 2% were funded through a mix of sources.

Table 14. Mix of LLR Funding Sources

LLR Funding Source Mix	Number of Loans	Percent of Loans
Only IOU Ratepayer Funds	8,652	89%
Only TECH Funds	481	5%
Only EBD Funds	314	3%
IOU Ratepayer Funds and TECH Funds	131	1%
IOU Ratepayer Funds and EBD Funds	83	<1%

Source: CAEATFA tracking data.

Table 15 shows the percentage of LLR funding and its individual sources during the evaluation period, as well as the total contribution amount in dollars. Similar to loan distribution, IOU ratepayer funds finance the majority of the total LLR; TECH Energy Solutions funds 9%; EBD funds 3%; and CPAU has yet to contribute to the LLR during the evaluation period.

Table 15. Percent and Volume of LLR Funding across Sources

LLR Funding Source	Percent of LLR Funding	Total LLR Contribution Amount
IOU Ratepayer Funds	87%	$12,572,577
TECH Energy Solutions	7%	$985,708
TECH Energy Solutions (for Heat Pump Measures)	2%	$309,231
Equitable Building Decarbonization Program (EBD)	3%	$501,614
City of Palo Alto Utilities (CPAU)	0%	N/A

Source: CAEATFA tracking data.

LLR FUNDING UTILIZATION

The program's financial structure allows LLR funds to accrue interest while limiting drawdowns to instances of borrower default that require payments to participating lenders. Assessing interest earnings relative to default-related payouts provides insight into the financial performance of the LLR fund. Over the evaluation period, interest earnings were insufficient to fully offset default-related payouts, resulting in a net LLR expenditure of $438,974.[29] Cumulatively, across the full program lifespan, the LLR fund recorded a net expenditure of $697,807.[30] Importantly, these figures do not account for interest earned in TECH, City of Palo Alto, and EDB program accounts.

Separate from LLR activity, the program also incurs implementation-related expenses. Due to data limitations, administrative and marketing expenditures are reported at the CHEEF level rather than attributed specifically to GGH. Over the full program lifespan, CHEEF reported $17.7 million in administrative costs and $9.4 million in marketing, education, and outreach expenditures. During the current evaluation period, CHEEF incurred $7.7 million in administrative costs and $3.1 million in marketing, education, and outreach expenses. When viewed alongside LLR interest earnings, these figures indicate that current administrative and ME&O expenditures substantially exceed interest earned on LLR funds, though this comparison should be interpreted cautiously given that administrative expenditure is reported at the CHEEF level.

4.5 PARTICIPATING FINANCIAL INSTITUTIONS

Table 16 shows each lender's date of first loan as well as the total number of loans they have issued. Over the evaluation period, ten participating lenders distributed 9,661 GGH Program loans (6,911 standard loans, 869 standard-DER loans, 1,881 microloans) to borrowers across the state. California Coast Credit Union, Matadors Community Credit Union, Valley Oak Credit Union, and Desert Valleys Federal Credit Union are legacy lenders, having enrolled during the REEL pilot. Of the remaining lenders, four distributed their first loan through the program between July 2018 and June 2023 (the previous evaluation period), and two (Diablo Valley Federal Credit Union and Self Help Federal Credit Union) in this evaluation period (June 2023–July 2025). Of the active lenders, nine offer standard loans. Lewis and Clark Bank is the sole provider of microloans. Six of the standard loan lenders in this evaluation period are regional lenders, while three are statewide lenders.[31] Lewis and Clark Bank, the microloan lender, also operates statewide.

[29] During the evaluation period, GGH accrued $1,493,620 in interest and LLR fund usage of $1,932,595. Subtracting net CE usage from interest accrued is our estimate of net LLR expenditure.

[30] Over the program's lifetime, GGH accrued $6,457 in interest while funds were held at U.S. Bank, then transitioned to Zions Bank on 1/1/2021 and accrued an additional $1,738,665 in interest. Over the full program lifespan, GGH default related payouts were $2,442,929.

[31] Statewide lenders primarily target borrowers across the state, while regional lenders target borrowers in a specific geographic area, providing localized financial services.

Table 16. Lender Participation Characteristics

Lender	Type	Date of First Loan (Month-Year)		# of Loans since July 2023	
		Standard	Standard-DER	Standard	Standard-DER
Travis Credit Union	Regional	May-21	Jun-24	3,758	360
California Coast Credit Union*	Statewide	Jan-17	Jan-24	1,788	315
First US Community Credit Union	Regional	Sep-18	Sep-24	938	15
Matadors Community Credit Union*	Statewide	Jul-16	Jan-25	302	3
Self Help Federal Credit Union	Statewide	Aug-24	Jul-24	43	154
Valley Oak Credit Union*	Regional	Nov-16	Sep-24	12	21
Desert Valleys Federal Credit Union*	Regional	Sep-17	May-25	36	1
Diablo Valley Federal Credit Union	Regional	Jan-24	N/A	33	0
Pasadena Service Federal Credit Union	Regional	Sep-18	N/A	1	0
Totals				**6,911**	**869**
Micro					
Lewis And Clark Bank - Enervee Marketplace	Statewide	Jun-23		1,881	
Total All Loans					**9,661**

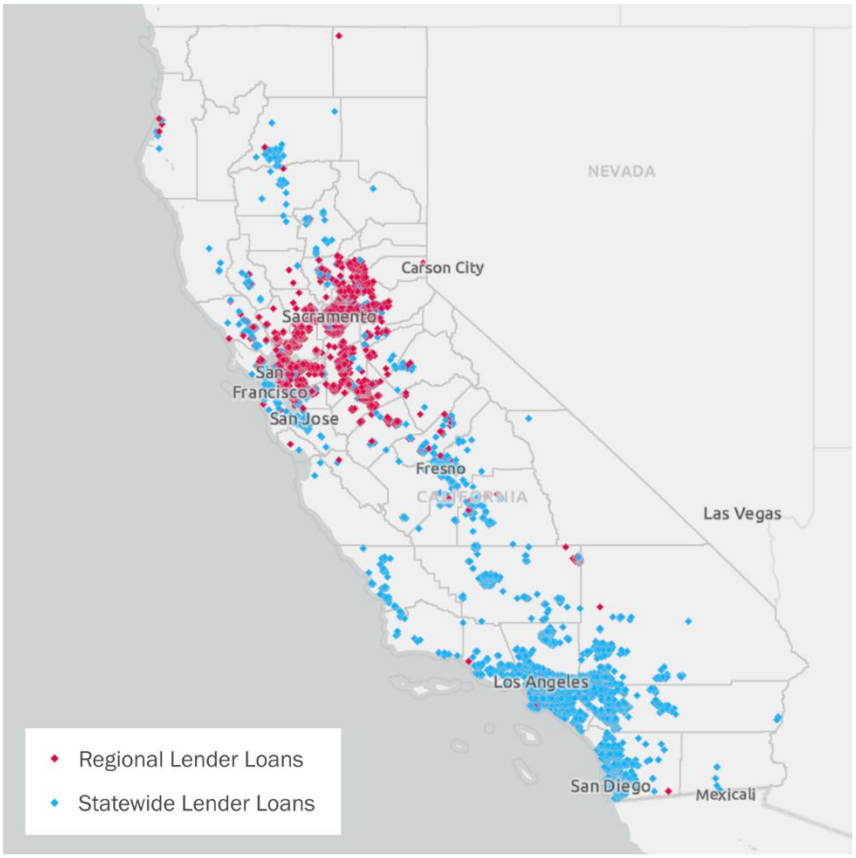
Source: CAEATFA tracking data
*Legacy lenders that enrolled in the REEL pilot

Since the inclusion of DER measures into the approved EEM list, all active lenders that issued standard loans have offered loans for DER measures, except for Diablo Valley Federal Credit Union and Pasadena Service Federal Credit Union. The entirety of the loans provided are fixed-term; most are unsecured (6,291 vs. 167 secured through UCC-1).[32] Eight of the loans taken out during the evaluation period also employed IRBDs, seven of which reduced their interest rates to 0%. All loans utilizing IRBDs were obtained through California Coast Credit Union, and only one borrower was classified as credit challenged.

Figure 10 below depicts the distribution of loans across the state by lender type. Notably, microloans are dispersed through Lewis and Clark Bank via the Enervee, SCE, and SoCal Gas marketplaces. As such, they are included in this figure as statewide loans. Most regional loans were dispersed in the Bay Area and the Sacramento area, with some scattered throughout the Central Valley and Northern California, and very few in Southern California.

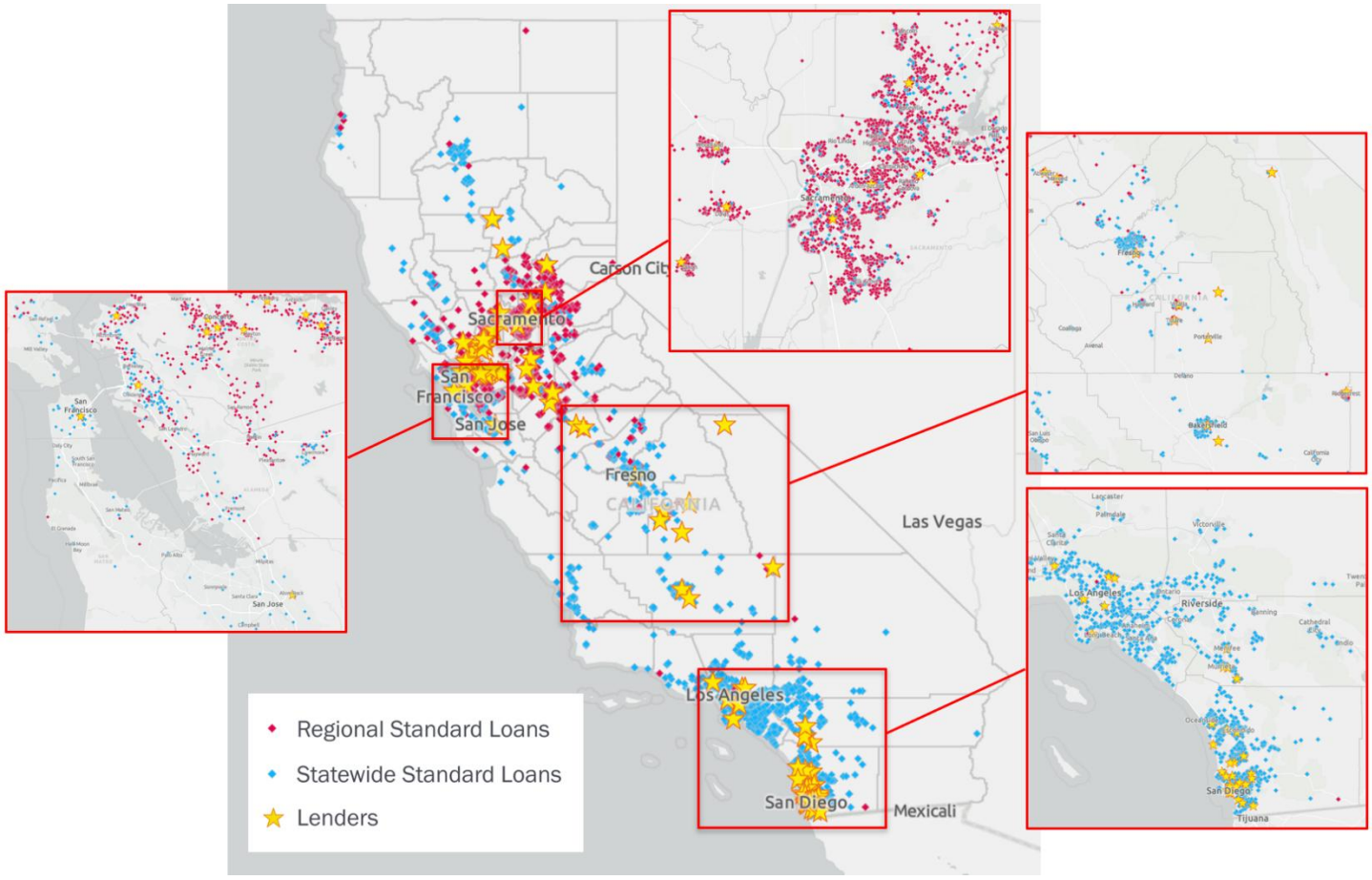
[32] Unsecured loans are credits not backed by collateral. They are higher-risk for lenders, but borrowers face no risk of losing assets in a default.

Figure 10. Geographic Distribution of Loans by Lender Type



Next, we analyze whether the presence of lender branches is a crucial driver of the geographic reach of the program. Figure 11 shows the geographic distribution of standard loans by lender type, along with the lender branch locations for each lender. Since microloans are exclusively distributed through Lewis and Clark Bank via online marketplaces, this analysis focuses only on standard loans. As shown, most lenders have locations in the Bay Area, Sacramento area, and Los Angeles-San Diego area, where most program participation is concentrated. Especially evident in the Sacramento and Los Angeles-San Diego areas, participation is abundant around the locations of participating lenders. In the Central Valley, participation is also concentrated near the branch locations of participating lenders, but to a lesser degree. In addition, two striking patterns emerge: first, many standard loans are provided to borrowers far from any participating bank branches; lenders do not consider geography in their loan risk assessment. Second, multiple areas of Northern California, the Central Coast, the Eastern Sierra, and Eastern Southern California lack significant bank lender presence; however, the Central Coast has a cluster of borrowers facilitated through the program. The lack of participating bank branches may not be a primary driver of the lack of overall program participation in Northern California, the Eastern Sierra, and Eastern Southern California.

Figure 11. Geographic Distribution of Standard Loans by Lender Type



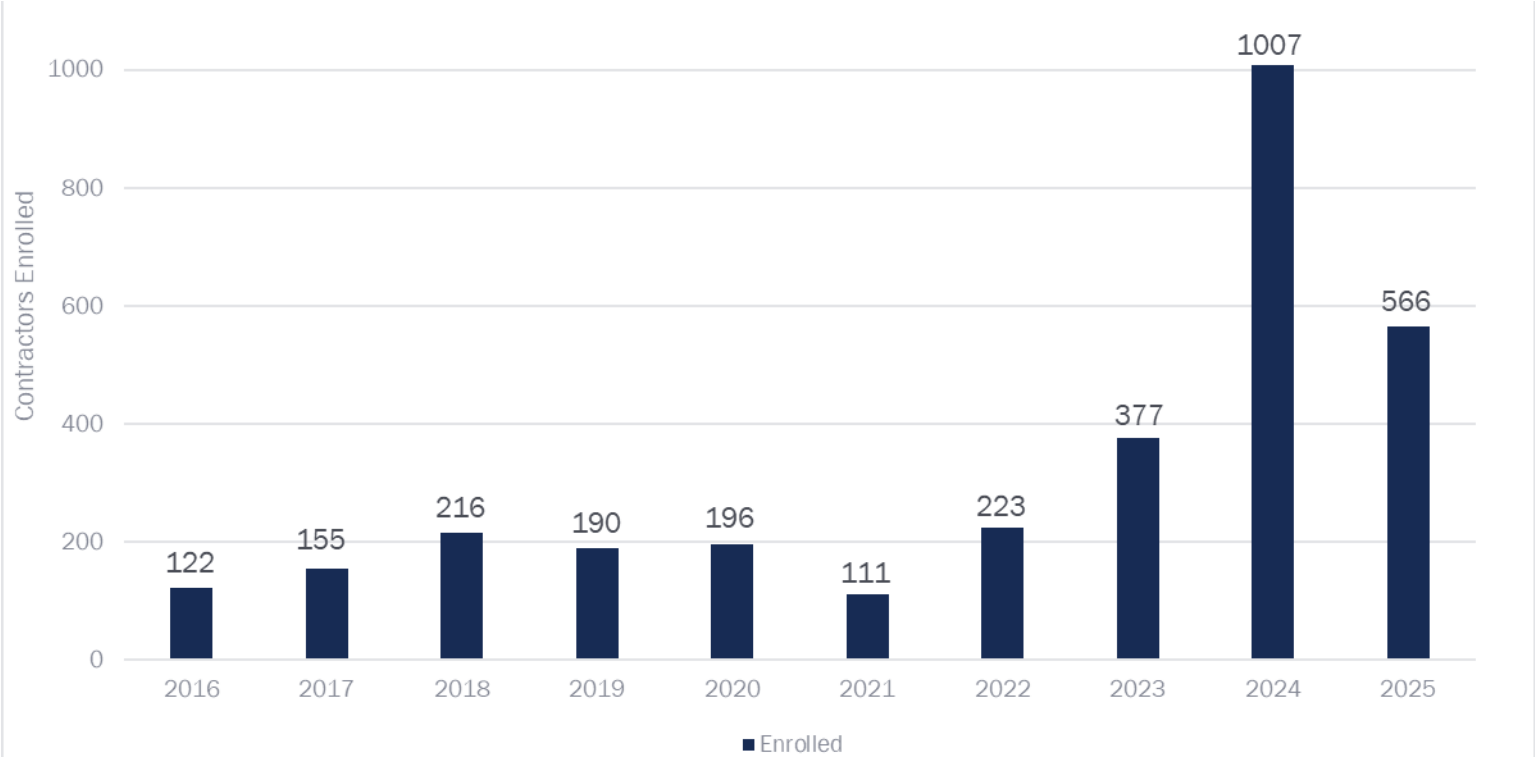
4.6 CONTRACTORS IN THE PROGRAM

The evaluation team reviewed program tracking data[33] provided by CAEATFA to analyze contractor participation in the GGH Program. Figure 12 shows that contractor enrollment has grown consistently since 2016, aside from a dip in enrollment in 2021 and a high peak in 2024. The 2024 peak followed the introduction of the National Green Energy Network (NGEN) online platform for GoGreen financing contractors, creating a consolidated virtual space for contractors to register with the program. In the spring of 2023, CAEATFA instituted a delisting process for inactive contractors; however, many inactive contractors requested to remain enrolled. Of the 1,823 contractors in the dataset, 1,340 were still enrolled as of June 2025, 392 were removed, and 90 were suspended.[34] Contractors were systematically removed and suspended each year, though the number of removals and suspensions decreased in 2024 and 2025. While there were a significant number of enrollments in 2024 and 2025, 583 of these new contractors did not complete a single GGH-financed project.

[33] "Tracking data" refers to the program-level data collected and maintained by administrators to monitor participation, implemented measures, and project characteristics over time.

[34] Notably, the CAEATFA contractor tracking data covers when the first contractor was approved as a GGH Program contractor (i.e., April 2016) through to June 2023 and includes all contractors regardless of whether they were removed or suspended from the Program. the dataset also does not break down the number of projects in different timeframes. Therefore, project counts do not align with the number of loans distributed during the evaluation period.

Figure 12. Contractor Enrollment Over Time (April 2016–June 2025)



Source: CAEATFA tracking data

As shown in Table 17, since the inception of the program, about 54% of contractors approved as GGH Program Contractors (regardless of their current enrollment status) had not yet completed a GGH-financed project, and 39% had only completed between one and ten projects through the Program. Notably, the 710 contractors who did 1 to 10 projects accounted for 16% less of the proportion of total projects than the 15 contractors who did more than 100 projects each. These contractors accounted for 38% of all projects.

Table 17. Number of Projects by Enrolled Contractors (2016 Onwards)

	Contractors		Projects	
Number of Projects (Range)	Count	Percent	Count	Percent
None	980	54%	0	0%
1 to 10	710	39%	2,010	22%
11 to 30	74	4%	1,294	14%
31 to 60	33	2%	1,425	16%
61 to 100	**11**	**1%**	**847**	**9%**
More than 100	**15**	**1%**	**3,480**	**38%**
Total	**1,823**	**100%**	**9,056**	**100%**

Source: CAEATFA tracking data

Table 18 describes contractor engagement in installing DER and non-DER standard loans in this evaluation period. About 9% of contractors worked on both DER and non-DER projects. Fifteen percent of contractors worked exclusively on DER projects, while 77% worked exclusively on non-DER projects.

Table 18. DER and Non-DER Standard Loan Installation by contractors (July 2023-June 2025)

Types of Projects Completed	Number of Contractors
DER and Non-DER Projects	60
DER Projects	103
Non-DER Projects	532

Source: CAEATFA tracking data

Contractors who completed both types of projects (regardless of the total number of projects they completed) mostly completed non-DER projects. Table 19 describes the proportion of Non-DER and DER projects completed by contractors who completed both, differentiated by the total number of projects each contractor completed. Active contractors who completed both types of projects completed more non-DER projects than DER projects on average. In interviews, two contractors who regularly complete both project types suggested that non-DER projects, particularly HVAC, tend to be completed more quickly. In contrast, DER projects often involve longer permitting and approval timelines, which may delay payment and increase the contractor's financial risk.

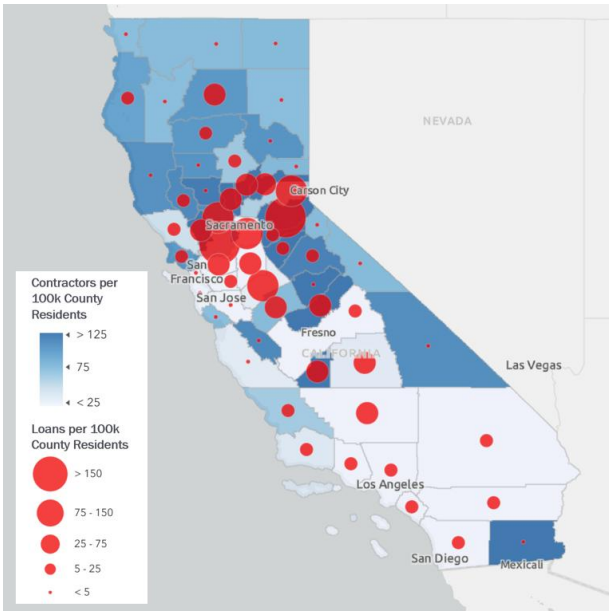
Table 19. Proportion of DER and Non-DER Projects for Contractors With Both Project Types (July 2023-July 2025)

Number of Projects (Range)	Number of Contractors	Total Number of Projects	Proportion of Non-DER Projects	Proportion of DER Projects
1 to 10	32	150	57%	43%
11 to 30	11	228	49%	51%
31 to 60	3	132	67%	33%
61 to 100	4	325	77%	23%
More than 100	10	2,429	79%	21%

Source: CAEATFA tracking data

Figure 13 illustrates the number of enrolled and listed contractors relative to the number of loans dispersed, normalized by county population. As shown, some counties, such as Inyo, Imperial, Mariposa, and Colusa, have a larger proportion of enrolled and listed contractors relative to their population but a smaller proportion of loans dispersed.

Figure 13 Geographic Distribution of Enrolled and Listed Contractors and Loan Density



The contractor interviews provided some insights into barriers within GGH that may influence overall participation, as well as participation by project type. Of the 20 interviewed contractors, five (25%) had not completed a project through GGH, and eight (40%) had completed only one to ten projects during their participation in the Program.

One of the most frequently cited barriers to participation was the speed and predictability of loan approvals. Eight contractors highlighted challenges with loan approval times, sharing that the Program process is significantly slower and less predictable than other financing options. While competing lenders often deliver decisions within seconds or minutes, contractors reported that GGH approvals can take anywhere from several days to multiple weeks, depending on the specific lender. Contractors emphasized that delays are difficult to manage because they have no visibility into where an application stands or whether required documents are missing. Three contractors said they liked everything else about GGH, but the long approval times drove them to use other lenders instead.

We had been recommending GoGreen because it had the lowest interest rates, but now we've been going to another finance company because they're a lot quicker with approvals. We had a GoGreen job that took two or three weeks for them to approve, whereas the competitor approves everything within five minutes.

Thirteen of the 20 contractor interviewees also reported limited visibility into the loan approval and funding process, which leaves them unable to track customer progress or proactively resolve delays. Nine contractors noted that this visibility varied dramatically depending on the specific lender involved. Many described having limited or no visibility into loan status, such as whether customers were pre-approved, whether documents were missing, or why approvals were delayed, which could stall project progress for weeks. While some lenders were repeatedly praised for being responsive, issuing clear milestone updates, and processing approvals quickly, others were described as slow, unresponsive, or difficult for both contractors and customers to reach.

To address these issues, ten contractors recommended that GoGreen implement standardized notifications for both contractors and customers, such as status updates, missing documentation alerts, expiration warnings, and payment confirmations, and allow contractors to add multiple contacts to ensure messages reach the appropriate staff.

Beyond the administrative processes involved in loan approval and funding, contractors also highlighted financial risks associated with GGH's pay-at-completion structure. Thirteen contractors (65%) reported that this payment model creates meaningful operational and financial challenges. Ten of these thirteen contractors frequently completed solar+battery projects, and all seven low-volume contractors (zero to three projects) reported this issue, highlighting its potential impact on participation. Many explained that because GGH pays only after a project is fully completed and the homeowner signs off, contractors are required to front 100% of project costs, including equipment, labor, subcontractors, permitting, design, and troubleshooting. One contractor said this is exacerbated for solar+battery projects because they are more "equipment heavy" *[in terms of cost]* and take longer to complete. This can create substantial cash-flow strains, especially for smaller contractor companies that may not have the credit or cash available to cover these costs.

These challenges are compounded by delays that contractors cannot control. Nine contractors reported that utility approval timelines (particularly for solar installations), inspection issues, or product availability routinely extend projects and delay payment. Seven contractors raised concerns about payments depending on homeowners submitting their paperwork promptly. Of those seven, three specifically worried about situations in which customers could refuse to approve a project if they were dissatisfied, even after the contractor had completed the agreed-upon work.

> *If there was another lender with the same low rate, I would never use GoGreen because we have to wait for the entire project to be installed and inspected in order to get paid. And not only installed and inspected, but the customer doesn't even sign the loan documents until they're installed and inspected. That makes me a little uneasy because what if the customer decides they're unhappy about something, even if we did everything right?*

Given these challenges, eleven contractors expressed clear interest in moving to a milestone-based payment structure. Of these contractors, seven primarily did solar & battery projects. Many of these contractors favored receiving a portion of the project cost upfront, such as a deposit at contract signing or payment for equipment procurement. Others recommended mid-project installments after installation or after inspection, with the remainder paid at final approval. Several noted that even a single milestone payment, such as 50% at the start of installation, would "help dramatically" and make GGH more competitive with other financing options.

Despite common frustrations with loan processing speed and the pay-at-completion structure, 12 contractors (60%) described themselves as satisfied or gave the program a rating of 7/10 or higher. Six contractors said that GoGreen is beneficial for their customers, noting that the program's competitive financing often enables homeowners to move forward with projects they otherwise could not afford. Contractors also valued the ease of use, supportive staff, and responsiveness of the Program. Eight contractors highlighted that the portal is intuitive or easy to navigate, and several described the process as "smooth," "streamlined," or "straightforward."

> *I give the program three thumbs up. Anything to get me away from those dirty large finance companies that just want to make money and be greedy. It's a saving grace to be able to go to that website and show somebody that California State seal on there and explain why this program exists. Yeah, streamlining the communication process could be touched up, but it's still a 10 out of 10.*

5. PROGRAM ENERGY AND GHG IMPACTS

The GGH Program facilitated financing of natural gas and electricity savings measures, electrification measures, and clean energy generation measures. Since we expect reductions in gas consumption and both increases and decreases in electricity consumption due to the program's measure mix, the key metric of program impact is emissions reduction. Table 20 summarizes the estimated energy and emissions impacts of the GGH Program for microloans and standard loans. The program reduced emissions by 2,368 tCO_2. Standard-loan projects accounted for 96.5% of the reductions. Of the total emissions reductions, approximately 47.6% were attributable to natural gas savings from EE measures (1,085 tCO_2) and 52.4% to net electricity savings from EE and DER measures (1,197 tCO_2). Natural gas consumption reductions total 218,035 therms, with approximately 95% attributable to standard loans. Electricity consumption reductions total 15,044 MWh. Clean energy impacts total 6,209 MWh.

Table 20. Summary of Energy and Emissions Impact

	Standard-Loans	Microloans	Total
Natural Gas Consumption Reductions (therms)	206,418	11,617	218,035
Electricity Consumption Reductions (MWh)	5,846	9,198	15,044
Clean Energy Impact (MWh)	6,209		6,209
Emissions Reductions (tCO_2)	2,284	84.5	2,368

5.1 ENERGY IMPACTS

5.1.1 STANDARD LOAN ENERGY IMPACTS

Energy impacts were estimated separately for electricity and natural gas using statistical modeling techniques tailored to each fuel type (detailed methodology is provided in Appendix E). The electric impact of program participation is expected to go in the opposite direction based on whether fuel switching occurs. Similarly, fuel-switching is expected to achieve much deeper gas savings. As such, separate models were developed for projects identified in CAEATFA tracking data as fuel-switching and non-fuel-switching. In addition, electric energy impacts were modeled separately for customers with on-site solar (net metering) and those without solar, reflecting the distinct consumption patterns associated with projects in sites with existing solar generation. Participants who financed DERs were also modeled separately, given the expected variation in energy impact compared to the rest of the measure installation.

The impacts were modeled on a subset of participants with available electric or gas consumption data; however, overall savings were extrapolated to the full population of program participants. Unless specifically indicated, all impacts reflect weather-normalized impacts.[35] Throughout this section, positive energy impact values represent energy savings, while negative energy impact values represent increases in energy consumption.

Table 21 summarizes the gas and electric energy impacts achieved during the evaluation period. The following subsections provide additional insight into gas and electric impacts. Between July 2023 and June 2025, 7,159 participants with electric projects and 4,438 participants with gas projects financed through the standard loans collectively realized an estimated 5,846 MWh of electricity savings and 206,418 therms of natural gas savings. This equates to 817 kWh in electric savings and 47 therms in gas savings per participant per year.

[35] Energy impacts were normalized using CZ2025 weather normal data.

Table 21. Summary of Standard Loan Electric and Gas Impacts

Metric	Result
Electric Impacts	
Participant Count	7,159
Average per participant annual energy impact (kWh)	817
Total energy impacts (MWh)	5,846
Gas Savings	
Participant Count	4,438
Average per participant annual energy impact (therms)	47
Total energy impacts (therms)	206,418

Note: Electric impacts include impacts from non-DER and DER projects

ELECTRIC IMPACTS

Electric energy impacts were strongly influenced by fuel switching, the presence of on-site solar (net metering), and the specific measures installed. Based on CAEATFA's fuel-switching indicator in the program tracking data, 21% of participants were identified as having installed known fuel-switching measures, such as heat pumps or heat pump water heaters. As expected, these participants experienced increases in electricity consumption, reflecting the intentional shift from fossil fuel to electric end uses. Among fuel switchers, annual electric consumption increased by 976 kWh for participants with solar (32% of baseline) and 1,106 kWh for participants without solar (13% of baseline).

In contrast, 13% of participants financed DER projects, primarily solar installations or solar expansions. These participants saw the largest reductions in consumption, averaging 7,212 kWh per year, a 55% decrease relative to baseline usage.

Among standard loan participants without DERs or fuel-switching measures, electric savings appear modest overall. Non-solar participants achieved 149 kWh in annual savings (approximately 2%), while participants with existing solar exhibited no statistically detectable savings. Several factors contribute to these modest impact results:

- **Presence of unobserved fuel switching within the "non-fuel-switching" cohort**. While the CAEATFA's flag reasonably identifies known fuel-switching measures, it may not fully capture all instances in which customers financed measures through the program that resulted in switching from fossil fuel to electric end uses. See Appendix D for details. As a result, some participants classified as standard loan participants without fuel switching may, in fact, have increased electric consumption due to the electrification of major end uses. Detecting these shifts using whole-home electric meter data is inherently challenging, and load disaggregation was not pursued as part of this analysis. We explored identifying potential fuel switching by screening for wintertime increases in electric consumption consistent with HVAC electrification but were unable to reliably distinguish additional fuel-switching participants using this approach. However, complementary gas impact analysis, where gas consumption is more directly tied to space heating end uses, suggests that fuel switching is likely present within this cohort, partially offsetting observed electric savings. The results of the gas analysis are presented in the section below.
- **Measure mix with limited electric savings outside of HVAC upgrades**. Deeper analysis of measure-specific energy impacts (see discussion surrounding results in Table 26) confirmed that electric energy impacts were pronounced and statistically significant for HVAC measures (6% of baseline). In contrast, impacts associated with other measure types, such as cool roofs, windows, and doors, were not statistically detectable. These non-HVAC measures comprise a meaningful share of total projects in the participant population (31%), which dilutes the aggregate electric savings signal when evaluating standard loan participants without DERs or flagged fuel-

switching measures. As a result, even where meaningful impacts occur for specific measure categories, the overall cohort-level electric impacts appear modest.

Taken together, these dynamics—increased electric load from known (and some unflagged) fuel switchers, large reductions from DER adopters, and small detectable savings from conventional non-fuel-switching energy efficiency projects—help explain why aggregate electric savings across the program appear modest, even though substantial energy impacts are occurring within specific segments. Table 22 presents per-participant electric impact results.

Table 22. Electric Energy Impacts by Fuel Switching Status, Solar, and Presence of DER Measures

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts % of Baseline	Stat. Sig
						Lower (kWh)	Upper (kWh)		
Fuel Switching	**1,458**	**1,110**	**5,940**	**-1,048**	**-1,527,344**	**-1,264**	**-831**	**-18%**	**Yes**
Net Metering	655	499	3,058	-976	-639,475	-1,347	-605	-32%	Yes
No Net Metering	803	611	8,295	-1,106	-887,869	-1,357	-856	-13%	Yes
No Fuel Switching	**4,840**	**3,534**	**6,823**	**105**	**507,685**	**29**	**269**	**2%**	**Yes**
Net Metering	1,431	1,045	3,304	*	*	*	*	*	No
No Net Metering	3,409	2,489	8,300	149	507,685	29	269	2%	Yes
DERs	**861**	**701**	**13,210**	**7,212**	**6,209,419**	**6,025**	**8,398**	**55%**	**Yes**
Total		**5,345**	**7,477**	**817**	**5,845,615**	**604**	**1,029**	**11%**	**Yes**

Note: Net-metering participant population counts were estimated using proportional distributions from the modeled participant population, as net-metering status is not included in program tracking data and had to be inferred from consumption patterns.

* Energy impact estimates are not statistically significant.

Electric Impacts by Key Sub-Groups

We estimated impacts by participants' utility and LMI status to explore drivers of electric impacts. For each LMI status and utility, energy impacts were estimated separately by fuel-switching status per CAEATFA flag and for DER projects. This is because the electric effect of program participation is expected to go in the opposite direction based on fuel switching, and the magnitudes of DER impacts are expected to be large.[36] Table 23 presents energy impacts for participants flagged as fuel switchers, by LMI status and by utility. Participants residing in LMI communities represent 61% of all program participants and 58% of participants with fuel switching measures. Estimated electric consumption for fuel switchers in LMI communities is similar to that observed among non-LMI participants (1,004 kWh versus 1,053 kWh, respectively).

The increase in electric consumption from fuel switching is much lower for PG&E than for SMUD on an absolute basis, but similar on a relative basis when expressed as a percentage of baseline consumption. This reflects substantially higher baseline electricity consumption among SMUD fuel-switching participants compared to PG&E participants (8,585 kWh per year versus 5,081 kWh per year). Estimated fuel switching energy impacts for SCE and SDG&E are not statistically different from zero, likely due to small sample sizes.

Table 23. Electric Impacts by Utility and LMI Status – Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts as % of Baseline kWh	Stat. Sig.
						Lower (kWh)	Upper (KWh)		
LMI Status									
LMI	841	640	5,538	-1,004	-844,127	-1,271	-736	-18%	Yes

[36] Separation by net-metering status to better control for weather-consumption patterns was not possible due to small sample sizes.

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts as % of Baseline kWh	Stat. Sig.
						Lower (kWh)	Upper (KWh)		
Non-LMI	617	470	6,319	-1,053	-649,450	-1,409	-696	-17%	Yes
Utility									
PG&E	875	748	5,081	-997	-872,466	-1,260	-735	-20%	Yes
SCE	103	56	*	*	*	*	*	*	No
SDG&E	45	31	*	*	*	*	*	*	No
SMUD	317	275	8,585	-1,533	-485,964	-1,974	-1,092	-18%	Yes

* Energy savings estimates are not statistically significant.

Table 24 presents electric energy impacts by LMI status and utility for participants not flagged as having fuel-switching measures, based on CAEATFA's fuel-switching indicator. Energy impacts for non-fuel-switching LMI participants are statistically significant but modest, averaging 256 kWh (4% of baseline) in annual electric savings. Non-LMI savings for this group are not statistically different from zero. Estimated utility-level impacts for non-fuel-switching participants are not statistically significant for all utilities except PG&E. For PG&E, baseline electricity consumption averages 6,694 kWh per year, and estimated savings are modest at 149 kWh per year, or approximately 2% of baseline consumption.

Table 24. Electric Impacts by Utility and LMI Status – No Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts as % of Baseline kWh	Stat. Sig.
						Lower (kWh)	Upper (KWh)		
LMI Status									
LMI	3,004	2,276	6,834	256	768,112	118	393	4%	Yes
Non-LMI	1,836	1,258	*	*	*	*	*	*	No
Utility									
PG&E	2,457	2,023	6,094	149	367,294	- 2	297	2%	Yes
SCE	421	288	*	*	*	*	*	*	No
SDG&E	264	180	*	*	*	*	*	*	No
SMUD	1,167	1,043	*	*	*	*	*	*	No

*Energy savings estimates are not statistically significant.

Finally, Table 25 details DER energy impacts by participant LMI status and utility. Participants residing in LMI communities and those in non-LMI communities experienced similar reductions in annual net electricity consumption relative to their respective baselines. On average, LMI participants realized approximately 6,921 kWh in annual reductions, representing 55% of baseline consumption, while non-LMI participants achieved 7,594 kWh, also 55% of their baseline usage. These results indicate that DER installations, primarily rooftop solar with batteries, deliver comparable proportional benefits across LMI and non-LMI communities.

At the utility level, DER impacts were broadly consistent across PG&E and SDG&E customers, with annual reductions of approximately 7,822 kWh and 5,376 kWh, respectively, representing 54% and 58% savings compared to the baseline. Higher savings for PG&E are likely due to a higher baseline. In contrast, SCE participants exhibited considerably lower modeled savings of 3,185 kWh, or 22% of baseline usage, despite SCE's participants' baseline usage being similar to PG&E's participants. This difference could be driven in part by a higher proportion of SCE participants financing batteries without solar. Batteries are a load-shifting technology and do not directly result in energy savings despite other benefits.

Table 25. Electric Energy Impacts for DERs by LMI Status and Utility

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts as % of Baseline kWh	Stat. Sig.
						Lower (kWh)	Upper (KWh)		
LMI Status									
LMI	433	355	12,678	6,921	2,996,671	6,072	7,770	55%	Yes
No LMI	428	346	13,868	7,594	3,250,407	5,428	9,761	55%	Yes
Utility									
PG&E	540	488	14,400	7,822	4,223,858	6,387	9,257	54%	Yes
SCE	92	43	14,467	3,185	293,045	1,168	5,203	22%	Yes
SDG&E	218	161	9,228	5,376	1,171,985	4,101	6,651	58%	Yes
SMUD	9	9	*	*	*	*	*	*	No

*Energy savings estimates are not statistically significant.

Electric Impacts by Key Energy Efficiency Measures

The most common measures financed by standard loans include heat pumps, solar and/or batteries, HVAC upgrades, cool roofs, windows, and doors. Qualitative performance assessment of heat pump and solar and/or battery impacts can be inferred from fuel-switching and DER impacts. We provide additional insights into measure-specific drivers of program impacts by estimating the impacts of HVAC, cool roofs, and windows and doors. Table 26 summarizes our estimates. HVAC upgrade projects, consisting of Central Heating (Furnace) and Air Conditioning Systems, were the only measure category with statistically significant impacts among non-fuel-switching projects in net-metered homes. On average, participants achieved 381 kWh of energy savings per year, or 6% of their baseline consumption, through HVAC projects. In contrast, savings from cool roofs and window or door improvements could not be statistically detected using whole-home consumption models. Nearly 40.1% of the net-metered projects were not HVAC projects, which may explain why the non-fuel-switching net-metered participants did not produce statistically discernible electric impacts.

Table 26. Electric Energy Impacts for Top Three Enduses – No Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline kWh	Per-Part. Annual kWh Impacts	Total Annual kWh Impacts	90% Confidence		Energy Impacts as % of Baseline kWh	Stat. Sig.
						Lower (kWh)	Upper (KWh)		
HVAC	2,327	1,424	6,863	381	885,569	208	553	6%	Yes
Cool Roofs	1,116	809	*	*	*	*	*	*	No
Windows and Doors	668	367	*	*	*	*	*	*	No

*Energy savings estimates are not statistically significant.

Note: End-use–specific energy impacts were estimated using projects that installed only the measure of interest, while participant counts reflect all customers who installed that measure, including those who installed additional measures.

GAS IMPACTS

Participants in the program have financed gas-saving measures such as HVAC upgrades or weatherization improvements on existing gas systems through the GGH program, or they may have electrified their homes by removing gas systems or substantially reducing gas use for space heating and water heating. Across the population of 4,438 participants with gas service, 426 participants (10%) were flagged by CAEATFA as having undertaken fuel-switching measures, while the remaining participants were not marked as such. Across both groups combined, the average participant achieved gas savings of 47 therms per year (see Table 27). As expected, participants identified as fuel switchers experienced much higher gas savings, averaging 217 therms annually. In contrast, non-fuel-switching

participants saved about 28 therms per year, making the savings nearly eight times greater. The baseline energy consumption was similar between the two groups. Consistent with these results, fuel-switching participants reduced gas consumption by an average of 51%, compared with a 7% reduction in the baseline among participants not marked as fuel-switching.

Table 27. Gas Energy Impacts by Fuel Switching Status

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline Therms	Per-Part. Annual Therm Impacts	Total Annual Therm Impacts	90% Confidence		Energy Impacts % of Baseline Therm	Stat. Sig.
						Lower (Therms)	Upper (Therms)		
Fuel Switching	426	379	428	217	92,458	195	239	51%	Yes
No Fuel Switching	4,012	3,553	433	28	113,625	22	34	7%	Yes
Total	4,438	3,932	433	47	206,418	41	52	11%	Yes

Similar to electric energy impacts, we estimated gas savings by participant LMI status and utility. As with the electric analysis, gas impacts were estimated separately for participants flagged as fuel switchers versus non-fuel switchers, based on CAEATFA's fuel switching flag. Table 28 presents gas energy impacts for participants identified as fuel switchers, by LMI status and by utility. Among fuel switchers, estimated gas savings are similar for LMI and non-LMI participants on a relative basis, at approximately 51% of baseline consumption for both groups. Baseline gas consumption among LMI participants is lower than among non-LMI participants (397 therms versus 482 therms per year), resulting in lower absolute gas savings for LMI participants (202 therms per year) compared to non-LMI participants (247 therms per year).

Due to a very small sample size, gas savings for fuel switchers served by SDG&E could not be estimated. Gas savings for fuel switchers served by PG&E and SCG are statistically significant and observable. Gas savings are considerably higher among PG&E participants, potentially reflecting substantially higher baseline gas consumption. For PG&E, estimated gas savings average 230 therms per year, corresponding to 53% of baseline consumption, compared to 130 therms per year, or 38% of baseline consumption, for SCG.

Table 28. Gas Impacts by Utility and LMI Status – Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline Therms	Per-Part. Annual Therm Impacts	Total Annual Therm Impacts	90% Confidence		Energy Impacts as % of Baseline Therm	Stat. Sig.
						Lower (Therm)	Upper (Therm)		
LMI Status									
LMI	264	230	397	202	53,244	174	229	51%	Yes
Non-LMI	162	149	482	247	39,939	283	210	51%	Yes
Utility									
PG&E	371	330	431	230	85,148	206	253	53%	Yes
SCG	40	38	345	130	5,187	53	207	38%	Yes
SDG&E	14	11	*	*	*	*	*	*	No

*Energy savings estimates are not statistically significant.

Table 29 resents estimated natural gas impacts for participants not flagged as fuel switchers based on CAEATFA's fuel switching indicator. As shown in the table, gas energy impacts for non-fuel-switching participants are considerably lower among participants residing in LMI communities, averaging 14 therms per year, compared to 55 therms per year for non-LMI participants. These impacts correspond to 3% and 12% of baseline gas consumption for LMI and non-LMI

participants, respectively. Baseline gas consumption among LMI participants is lower than among non-LMI participants (409 therms versus 477 therms per year). However, this difference in baseline consumption alone does not fully explain the observed differences in both absolute and relative gas savings between LMI and non-LMI participants.

Gas impacts for non-fuel-switching participants are not statistically significant for any utility except PG&E. For PG&E, non-fuel-switching gas savings average 33 therms per year, representing 7% of baseline gas consumption.

Table 29. Gas Impacts by Utility and LMI Status – No Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline Therm	Per-Part. Annual Therm Impacts	Total Annual Therm Impacts	90% Confidence		Energy Impacts as % of Baseline Therm	Stat. Sig.
						Lower (Therm)	Upper (Therm)		
LMI Status									
LMI	2,568	2,266	409	14	34,800	6	21	3%	Yes
Non-LMI	1,444	1,287	477	55	79,387	44	66	12%	Yes
Utility									
PG&E	3,351	3,013	443	33	109,343	206	253	7%	Yes
SCG	446	392	*	*	*	*	*	*	No
SDG&E	186	148	*	*	*	*	*	*	No

*Energy savings estimates are not statistically significant.

Similar to electric savings estimation, we estimate the gas savings of installing non-fuel switching HVAC, cool roofs, and windows and doors (Table 26). Also similar to the electric savings, among these non-fuel-switching participants, HVAC upgrades were the primary driver of detectable gas savings and were the only end use with statistically significant impacts. On average, participants achieved 27 therms per year in energy savings, or 6% of their baseline consumption. In contrast, savings from cool roofs and window or door improvements did not yield statistically discernible electric impacts.

Table 30. Gas Energy Impacts for Top Three Enduses – No Fuel Switching

Participant Segment	Part. Count	Modeled Part. Count	Per-Part. Annual Baseline Therm	Per-Part. Annual Therm Impacts	Total Annual Therm Impacts	90% Confidence		Energy Impacts as % of Baseline Therm	Stat. Sig.
						Lower (Therm)	Upper (Therm)		
HVAC	2,100	1,617	433	27	55,958	17	36	6%	Yes
Cool roofs	961	783	*	*	*	*	*	*	No
Windows and Doors	604	418	*	*	*	*	*	*	No

DER EXPLORATION

DER measures were introduced through the program during this evaluation period. A total of 861 participants financed newly introduced DER measures, including new installations and expansion of solar, batteries, and a small number of EV chargers. Some participants financed the expansion of pre-existing solar systems. In all cases, batteries were present in conjunction with solar, whether financed through the GGH program or pre-existing. These measures have a very different impact profile compared to previously financed EEEMs. As such, we conducted a descriptive analysis of changes in hourly energy consumption.

Second, it is apparent that participants installing batteries programmed them to sponge solar during the day and dispatch during evening hours, likely for time-of-use (TOU) arbitrage purposes. This is evidenced through an increase in

net energy usage during the morning hours in the post-period as compared to the pre-period, which is indicative of the batteries charging, and a dip in the post-period during evening hours, which is indicative of batteries discharging, likely in response to higher TOU prices.

The use of batteries, as observed in the load shapes, is corroborated by survey responses. More specifically, 45% of participants who financed batteries through the program reported charging the batteries when energy rates are low and discharging when they are high. An additional 36% reported charging in order to store solar energy for future use. Only 10% of participants with batteries use their batteries for backup power during outages. A third of participants with batteries (33%) reported enrolling their batteries in a battery management program, naming the Self-Generation Incentive Program (SGIP), Demand Side Grid Support (DSGS), and Automated Response Technology (ART) programs, among others. Collectively, these programs provide financial incentives and performance-based payments to encourage customers to install and dispatch battery storage to reduce peak demand, enhance grid reliability, and support broader decarbonization objectives across California. Most participants (88%) reported being very or somewhat familiar with battery systems, and a majority (81%) indicated they were very or somewhat involved in managing their battery systems.

Figure 14 presents load shape analysis for participants who financed batteries and solar, as well as those who financed only batteries, shown overall and separately for summer and winter seasons. The first notable finding is that, in addition to the total energy generation impacts described above, DERs also reduced participants' peak load impact after program participation. Additionally, winter load shapes for solar-only and solar-plus-battery participants are noticeably flatter than those observed in the summer months. This pattern is expected, given the substantially lower levels of solar irradiance during the winter. As a result, photovoltaic generation is both reduced in magnitude and more evenly distributed throughout the day, leading to less pronounced midday net-load depressions and a flatter overall net energy consumption profile. In contrast, during the summer months, higher solar irradiance and longer daylight hours produce more concentrated midday generation, resulting in the characteristic midday dip in net load for solar and solar-plus-battery customers. Thus, not only is there peak grid-load reduction, but the impact is greater during summer, when peaks are typically higher in California.

Figure 14. DER Participant Load Shape Analysis

Note: Left side presents solar PV+Battery, Right side presents battery-only projects

5.1.2 MICROLOAN ENERGY IMPACTS

The GGH Program facilitates microloans for household appliances, including clothes washers, clothes dryers, dishwashers, ovens, ranges, refrigerators, freezers, air purifiers, and smart thermostats. The program also provides microloans to participants for more expensive equipment such as heat pump water heaters, tankless water heaters, ductless heat pumps, and air conditioners.

Savings contributions vary across measures, with the largest kWh reductions driven primarily by refrigerators (42,454 kWh), clothes washers (30,111 kWh), and electric clothes dryers (12,364 kWh), reflecting both high participation volumes and meaningful per-unit savings. Gas savings are largely attributable to tankless water heaters (5,791 therms), clothes washers (4,878 therms), and gas clothes dryers (1,056 therms). In contrast, measures such as mini-split ductless systems, induction cooktops, and convection ovens contributed smaller overall impacts due to lower participation counts. The table also shows increased consumption for certain measures, indicating instances where modeled electricity or gas consumption increased relative to baseline conditions. These increases are consistent with fuel-switching or electrification measures, such as heat pump water heaters and induction cooktops, which may reduce natural gas consumption while increasing electricity use.

Table 31 summarizes the total energy savings for each measure, showing the program saved 91,938 kWh, 9.12 kW, and 11,617 therms for the 2,308 measures purchased using microloans. Appendix E includes more detail related to the deemed savings application and methodology.

Table 31. Microloan Total Energy Savings

Measure	Units	Total Participants	Program Gross Savings		
			kWh	kW	Therms
Refrigerator	Refrigerators	793	42,454	<0.01	-480
Clothes washer	Washers	612	30,111	4.73	4,878
Clothes dryer (electric)	Dryers	214	12,364	2.96	-80
Dishwasher	Dishwashers	174	4,168	0.97	90
Air purifier	Purifiers	61	2,428	0.36	-32
Smart thermostat	Thermostats	22	1,819	N/A	122
Freezer	Freezers	28	1,152	0.17	-12
Mini split ductless ac	Systems	2	332	N/A	N/A
Clothes dryer (heat pump)	Dryers	2	315	N/A	-2
Mini split ductless heat pump	Systems	1	32	0.04	17
Clothes dryer (gas)	Dryers	314	-297	N/A	1,056
Tankless water heater (gas)	Water Heaters	72	-726	-0.12	5,791
Heat pump water heater	Water Heaters	1	-1,103	0.01	162
Induction cooktop	Cooktops	14	-1,109	<0.01	108
Convection oven (electric)[a]	Ovens	1	N/A	N/A	N/A
Total			**91,938**	**9.12**	**11,617**

Note: The deemed savings are multiplied by the total measure quantity from the program tracking data. The deemed savings reference the California Electronic Technical Reference Manual (eTRM).

[a] Electric convection ovens are not an energy-efficient measure and therefore do not contribute to program savings.

5.2 EMISSIONS REDUCTIONS

The evaluation team used the CPUC Refrigerant Avoided Cost Calculator (RACC) and Fuel Substitution Calculator (FSC) to quantify the emission reductions achieved from electricity and gas savings during program years 2023–2025. We estimated the emissions reductions from electricity savings by applying the annual conversion factors (tCO_2/MWh) to each year of energy savings. These annual conversion factors are developed from long-run emissions inputs from the *2022 ACC Electrical Model v1b – IRP 2021 Reference System Plan*. For emissions reductions from gas savings, a single conversion factor, the carbon content of a single unit of natural gas (tCO_2/therms), is applied to the total gas savings.

Before arriving at the total emissions reductions, two methane leakage percentages are applied to each fuel-specific emissions reduction quantity: one for upstream methane leakage from power plants (which adds about 5% to emissions reductions) and one for residential behind-the-meter leakage (which adds about 4% to emissions reductions). The sum of the resulting emissions reductions after applying the methane leakage percentages is the total emissions reduction in metric tons of CO2. Further detailed emission reduction calculation methodology and assumptions are in Appendix E.

CO2 emission reductions associated with first-year annual energy savings are presented in Table 32. EEEMs installed using standard loans accounted for most of the emissions reductions, as these represent larger projects than microloans typically do. Gas savings associated with the program (including those associated with fuel switching) achieved much deeper emissions reductions as a result of the higher carbon density of natural gas than grid-delivered electricity. Gas savings associated with EEEMs installed using standard loans accounted for 79% of the emission reductions achieved through the GGH Program.

As seen in Table 32, total emissions reductions in the current evaluation cycle reflect the program's portfolio composition, with standard-loan projects accounting for the majority of impacts. Electric-side emission reductions are driven primarily by DER measures installed during this period, which achieved substantial decreases in electricity consumption and therefore contributed meaningfully to overall tCO_2 reductions. Gas also generated significant emissions reductions.

Table 32. Emission Reduction from Energy Savings

EEMs Installed	tCO_2 Reductions from Gas Savings	tCO_2 Reductions from Electric Savings	Total
Standard loans	1,197.89	1,085.98	2,283.87
Microloans	67.41	17.08	84.49
Total	**1,265.31**	**1,103.06**	**2,368.36**

When comparing emissions reductions on a per-participant basis across evaluation periods (Table 33), emissions reductions per participant increased in the current cycle. Standard-loan projects achieved 0.32 tCO_2 per participant, up from 0.17 tCO_2 in the prior evaluation, an increase of 0.15 tCO_2 per participant. Microloan projects also showed a modest increase, from 0.03 to 0.04 tCO_2 per participant.

Table 33. Per Participant Emission Reductions by Evaluation Periods

EEMs Installed	tCO_2 Per Participant Total Reductions (July 2023–June 2025)	tCO_2 Per Participant Total Reductions (July 2018–June 2023)	tCO_2 Per Participant Difference
Standard loans	0.32	0.17	0.15
Microloans	0.04	0.03	0.01

6. USE OF PROGRAM FINANCING SUPPORT

In this section, we analyze the financial institution and individual borrower engagement in the program.

6.1 THE ROLE OF FINANCIAL INSTITUTIONS

Ten lenders were active lenders during the evaluation period (July 2023–June 2025) and provided 9,661 GGH loans. Table 34 presents the number of loans, average number of loans per month, and average loan size during the evaluation period. Of the 9,661 total loans distributed over the evaluation period, 72% were standard loans for traditional EEEMs. Following the availability of financing for DER measures in August 2023, 869 standard-DER loans were provided. Despite a downward trend in the number of microloans over the evaluation period, the overall number more than doubled since the last evaluation, accounting for 19% of all loans in this evaluation period.

Across the entire evaluation period, standard loans distributed per month averaged 230, a notable increase from the 66 per month during the last evaluation period (June 2018–June 2023). The number of standard-DER loans averaged 40 per month.

The average standard loan size was $18,253 in the last evaluation period and $20,637 in this evaluation period, representing an increase in loan amount by 12%. Construction costs increased by 7% in California between June 2023 and June 2025, indicating that standard loan project sizes still experienced a modest increase of at least 5% in real terms.[37] Standard-DER loans averaged $40,245 due to the higher expense of DER measures like the installation of solar PV, battery storage expansion, and electric vehicle chargers.

The average microloan size during the last evaluation period was $1,498, while the average microloan size in this evaluation period was $1,644, representing a nominal increase of 9.7%. Household appliance prices increased nationwide by 3.7% between June 2023 and June 2025%, indicating that microloan project sizes experienced a (6%) real increase.[38]

Table 34. Number of Loans and Average Loan Size

Loan Category	Standard	Standard-DER	Microloans
Number of Loans	6,911	869	1,881
Average Number of Loans per Month	230	58	72
Average Loan Size	$20,637	$40,245	$1,644

Source: CAEATFA tracking data

Table 35 shows the total financing for each loan type, the cost of EEEMs, the LLR contribution, and the proportion of EEM costs to total project costs. The 9,661 GGH Program loans distributed to borrowers during the evaluation period totaled $180.7 million ($142.6 million in standard loans, $35 million in standard-DER loans, $3.1 million in microloans), representing private capital lending. This is a nearly threefold increase from the 3,320 loans amounting to $61.4 million in the last evaluation period.

[37] CA DGS. *DGS California Construction Cost Index* (2025). Accessed here.
[38] FRED. *Producer Price Index* (2025). Accessed here.

Table 35. Total Loan Amounts, LLR Contribution and Contribution of Capital

Loan Type	Loan Amount	Cost of EEEMs	LLR Contribution	Share of Total Loaned Amount
Standard	$142,622,247	$145,090,312	$11,940,169	79%
Standard-DER	$34,972,795	$35,226,357	$1,854,818	19%
Microloans	$3,093,115	$3,093,115	$574,142	2%
Total	**$180,688,157**	**$183,409,785**	**$14,369,129**	**100%**

Source: CAEATFA tracking data
Note: The rightmost column presents the average proportion of EEM costs to total project costs by project type

Table 36 shows the amount of private financing, the ratepayer LLR contribution for each lender, and the proportion of GGH program private capital from the ten lenders between July 2023 and June 2025. The dominance of credit unions (CU) continued. During this evaluation period, there were nine regional standard loan lenders, four of which accounted for 1% or less of the Program's private capital. However, First US Community CU and Self Help Federal CU accounted for 9% and 4%, respectively. The one microloan provider (Lewis and Clark Bank – Enervee Marketplace) accounted for 2% of the Program's private capital.

Approximately 53% of GGH financing came from the Program's largest private capital lender, Travis CU, up from 15% in the previous evaluation. California Coast CU, the second largest lender, accounted for 26% of the GGH Program's private capital generation in this evaluation period, compared to 43% in the last evaluation period.

Table 36. Private Capital and LLR Contribution by Lender

Lender	Original Loan Amount (Private Capital) from July 2023		LLR Contribution from July 2023		Proportion of Total Private Capital by Lender
	Standard	Standard-DER	Standard	Standard-DER	
Travis Credit Union (CU)	$80,173,380	$16,670,078	$6,527,259	$883,243	54%
California Coast CU	$36,719,743	$10,659,307	$2,998,018	$538,825	26%
First US Community CU	$16,362,555	$629,811	$1,486,674	$31,491	9%
Matadors Community CU	$6,575,114	$126,069	$734,198	$12,672	4%
Self Help Federal CU	$935,134	$5,870,608	$61,137	$337,810	4%
Valley Oak CU	$229,957	$973,921	$15,405	$48,627	1%
Desert Valleys Federal CU	$776,899	$43,000	$64,373	$2,150	0%
Diablo Valley Federal CU	$833,592	$ -	$51,358	$ -	0%
Pasadena Service Federal CU	$15,873	$ -	$1,746	$ -	0%
	Microloans		Microloans		Microloans
Lewis And Clark Bank	$3,093,115		$574,142		2%
Totals	**$180,688,157**		**$14,369,129**		**100%**

Source: CAEATFA tracking data

Lender interviews provided context for understanding the concentration of participation in the GGH Program. Participant lenders indicate that involvement is notably higher among credit unions that treat GGH as a dedicated line of business, since the program is more complex than traditional retail loans and requires staff with utility-specific and technical expertise. Having a dedicated team on staff at the lender improves consistency and speeds loan processing for borrowers and contractors. Smaller or newer credit unions reported difficulty competing, citing transaction costs that make it challenging to offer ultra-low interest rates and fees or deliver a similarly streamlined experience. Larger, more established lenders are often better positioned to absorb these costs, have digitized systems and expertise that increase processing speed, and offer more competitive terms, which they often believe is borrowers' top priority. While the ongoing entry of new lenders increases competitive pressure, credit union geography and member loyalty limit

competition to some extent, and at least one less active lender noted that breaking even under the current program design is difficult.

Moreover, lenders with strong relationships with contractors tend to participate more actively. These relationships are cultivated by helping contractors close projects quickly and reliably. Contractor feedback highlights significant variance in the quality of relationships with lenders, with some lenders more responsive than others, which can be a major barrier to effective collaboration. These contractor relationships play a vital role in generating leads for lenders, as most borrowers follow the financing recommendations of their contractors. Finally, some credit unions focus on specific geographic regions, which can inherently limit their Program participation. As a result, their involvement may be better assessed in relation to the populations they serve rather than through direct comparisons with statewide credit unions.

6.1.1 LOAN PERFORMANCE

Although most standard loan and microloan borrowers were up to date or ahead on loan payments at the end of the evaluation period, loan performance was better among standard loan borrowers than microloan borrowers. Table 37 depicts the distribution of all standard loans (including DER measures) by payment status as of the end of the evaluation period (June 30, 2025), while Table 38 depicts the distribution of microloans by payment status in the same time frame.

Ninety-nine percent of standard loans are current or paid in full (99%), compared to 76% of microloans. By the end of the evaluation period, a larger percentage of microloans than of either type of standard loan had defaulted (16% vs. 1%). Default rates for microloans and standard loans were 16% and 1%, respectively, in our previous evaluation. These defaults amounted to charge-offs (i.e., written off as bad loans) of $1.3 million (0.7% of loan principal). The charge-off rate for microloans (19%) is much higher than that for standard loans (0.4%). The outstanding loan amount at the time of default was 7% for standard loans and 3% for microloans, implying that the majority of the principal is repaid before default. Similarly, a larger percentage of microloan payments were past due relative to standard loan payments (21% vs. <1%). Notably, the higher rate of default and outstanding amounts among microloans relative to both types of standard loans may reflect microloans reaching a larger proportion of underserved borrowers than all standard loans, a main objective of the Program.[39] The relatively high default rate observed among micro-loans also stands out when compared with other common private financing options used for appliance purchases, including buy-now-pay-later (BNPL) products and credit cards. At the end of 2025, the delinquency rate for credit cards was 2.9%; however, credit card holders generally have stronger credit histories and higher incomes than micro-loan borrowers, who are primarily underserved Californians. Similarly, BNPL providers such as Affirm and Klarna report default rates of approximately 2%, which a recent Consumer Financial Protection Bureau report[40] attributes in part to the use of required automatic payments. It is important to note that BNPL transactions are typically much smaller than micro-loans, with an average purchase amount of roughly $142 compared to approximately $1,600 for micro-loans, though BNPL providers also target consumers with lower or underserved credit scores. While neither credit cards nor BNPL products are perfect comparison points, together they provide useful context, highlighting that micro-loan default rates are notably higher than those observed in comparable consumer financing options.

Table 37. Standard Loan Performance

Loan Payment Status	# of Loans	Original Loan Amount	Outstanding Loan Amount	Amount Defaulted
Paid in Full	699	$13,561,777	$ -	$ -
Current	7,027	$162,878,087	$144,875,968	$ -

[39] Details of the reach and need for micro-loans and both types of standard loans to underserved borrowers are discussed in subsections 4.3 and 6.1.2 and section 7.

[40] Consumer Use of Buy Now, Pay Later and Other Unsecured Debt

30 Days Past Due	19	$407,161	$385,237	$ -
60 Days Past Due	9	$177,853	$169,746	$ -
90 Days Past Due	3	$67,732	$65,586	$ -
120 Days Past Due	5	$143,835	$141,316	$ -
Defaulted	37	$771,481	$52,942	$743,701
Grand Total	**7,799**	**$178,007,926**	**$145,690,795**	**$743,701**

Source: CAEATFA tracking data

Table 38. Microloan Performance

Loan Payment Status	# of Loans	Original Loan Amount	Outstanding Loan Amount	Amount Defaulted
Paid in Full	149	$210,445	$ -	$ -
Current	1,278	$2,100,345	$1,548,633	$ -
30 days past due	39	$73,218	$58,336	$ -
60 days past due	24	$35,168	$29,084	$ -
90 days past due	0	$ -	$ -	$ -
120 days past due	1	$1,012	$955	$ -
Defaulted	390	$672,927	$22,436	$588,536
Grand Total	**1,881**	**$3,093,115**	**$1,659,443**	**$588,536**

Source: CAEATFA tracking data

From a lender performance perspective, higher default and delinquency rates are only one dimension of microloan outcomes. Through interviews, lenders reported that microloans are difficult to offer at scale because transaction, underwriting, and servicing costs are high relative to the small loan amounts, while lower average credit scores further increase risk. Enervee stands out as an exception, as microloans are its core product and are promoted through industry partnerships, appliance purchase pathways, and utility-branded channels that reduce borrower confusion and drive higher engagement than more indirect approaches. Even so, Enervee noted that deeper integration could further improve visibility and trust, and that the economics of offering microloans remain challenging under the current program design. As a result, lenders indicated that microloans generally require higher interest rates than standard GoGreen loans to achieve acceptable risk-adjusted returns, which may limit lender participation and overall volume.

Barriers identified by lenders may further influence microloan and even standard loan performance. Chief among these is the high cost of home electrification in California. While GGH financing helps reduce this barrier by improving access to credit and lowering borrowing costs, lenders noted that financing alone cannot fully offset these costs. They also cautioned that demand for solar+battery may soften following the expiration of federal tax credits beginning in 2026, which could reduce overall participation and affect future loan performance.

The GGH Program requires loans for solar to include battery storage as well; but there is concern that the battery-pairing requirement may reduce future demand for DER projects. Contractors indicated that most participants are primarily interested in solar PV, while batteries are viewed as a costly add-on. The federal tax incentive made paired projects financially attractive, but without it, demand may decline unless the battery requirement is removed or substantial battery-specific incentives are introduced. Lenders noted that customers largely accepted the battery only because the overall solar economics were compelling.

A final aspect of loan performance relates to participating lender satisfaction. Participating lenders report strong satisfaction with GGH, noting that the program has generated substantial new business with minimal losses and is viewed as financially attractive and relatively low risk from a lender perspective. Some also cited broader institutional benefits, including improved overall profitability, greater visibility within local communities, and the ability to attract new

members and new business. Several lenders reported that program demand has been sufficiently strong to train internal capacity, underscoring the program's appeal among participating institutions.

6.1.2 COMPARISON OF GGH WITH LENDER'S SIGNATURE LOANS

Each of the participating standard loan lenders had "signature" loan products for residential borrowers outside of the GGH Program that were unsecured (i.e., required no collateral from the borrower), but most were not specifically focused on energy efficiency. For each standard loan borrower, lenders provided CAEATFA with a comparative estimate of the terms of an alternative signature loan without the GGH Program. A comparison of the features of the GGH Program loans with the signature loans is presented in Table 39. Lenders' average standard loan interest rates were up to 11.2 percentage points lower than their average signature loan interest rates, averaging 3.7 percentage points lower across lenders. Lenders' average GGH payback periods were also longer than those for their signature loans. Lenders' average standard loan payback periods were up to 102 months longer than their average signature loan payback periods, with a 25-month average across lenders. Almost all standard loans had a lower calculated monthly payment than comparable signature loans. Lenders' average calculated monthly payments for GGH loans were up to $1,212 lower than their average signature monthly payments, averaging $71 lower across lenders.

Table 39. Signature Loans

Credit Union	# of Standard Loans	Interest Rate			Loan Payback Term (Months)			Monthly Payment		
		GGH	Signature Loan	Difference	GGH	Signature Loan	Difference	GGH	Signature Loan	Difference
Travis CU	4,118	6.2%	7.5%	-1.3%	149	145	4	$245	$249	-$4
California Coast CU	2,103	5.4%	12.0%	-6.6%	97	54	43	$385	$520	-$135
First US Community CU	953	5.4%	10.6%	-5.1%	90	54	37	$303	$423	-$120
Matadors Community CU	305	6.3%	11.4%	-5.1%	127	59	67	$269	$483	-$214
Self Help Federal CU	197	5.9%	13.3%	-7.4%	194	60	134	$285	$496	-$210
Desert Valleys Federal CU	37	6.3%	13.0%	-6.6%	77	59	18	$366	$504	-$137
Diablo Valley Federal CU	33	4.4%	15.6%	-11.2%	96	59	37	$335	$616	-$281
Valley Oak CU	33	5.8%	9.8%	-4.0%	157	56	102	$333	$1,545	-$1,212
Pasadena Service Federal CU	1	5.0%	7.0%	-2.0%	60	60	0	$299	$314	-$15
Overall	**7,780**	**5.9%**	**9.6%**	**-3.7%**	**127**	**103**	**25**	**$293**	**$364**	**-$71**

Source: CAEATFA tracking data

These differences in loan terms reflect the role of the LLR in shaping lender behavior and product design. In interviews, participating lenders consistently emphasized the LLR as a core strength of GGH, noting that it enables them to offer unsecured home energy financing with terms that would not be feasible under standard risk and compliance frameworks. While the LLR comes with program requirements—such as interest rate caps and defined underwriting criteria—lenders generally view these conditions as reasonable given what the credit enhancement makes possible: higher loan volumes, lower risk exposure, and the ability to offer a product that is more competitive than signature loans, home equity line of credit (HELOCs), and other common financing alternatives.

Data on signature loans is not available for microloans. The Lewis and Clark Bank (the current microloan lender) standard loan term is five years (for both GGH program loans and signature loans). The interest rate for Lewis and Clark Bank's signature microloans in the tracking data was the lowest rate offered through the Eco Financing product of the channel partner.

6.2 THE PROGRAM FROM THE BORROWER'S PERSPECTIVE

As part of the evaluation, we conducted two surveys of GGH participants, sampling from microloan participants and from participants in both types of standard loans. Participants were asked about their motivations for completing an upgrade through GGH, the role financing played in their decision-making, and their satisfaction with different aspects of the program. Results from these surveys are presented below.

6.2.1 MOTIVATIONS FOR PROGRAM PARTICIPATION AND UPGRADES

Survey results indicate that participants' decisions to pursue home upgrades were primarily driven by practical and economic considerations. As shown in Table 40, across both standard- and microloan participants, saving money on energy bills and reducing energy use were the most frequently cited motivations, with more than 90% of respondents in each group indicating these factors were important.

Differences in motivation patterns between loan types further reflect the distinct roles of standard loans and microloans. Microloan participants and non-DER standard loan participants were substantially more likely to report replacing broken or inefficient equipment as an important motivation, consistent with the program's focus on equipment replacement and the greater urgency of these projects. In contrast, standard loan participants financing DER projects were markedly less motivated by these two factors. Both DER and non-DER standard loan participants more frequently cited longer-term considerations such as investing in their property or adopting newer technology. Motivations related to structural repairs or comfort improvements were less commonly cited across all three loan types.

Table 40. Proportion of Survey Respondents who Indicate Factor Was Important for their Upgrade

Motivation	Standard Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
Reduce energy use	98%	94%	93%
Save Money on Energy Bills	97%	99%	91%
Replace with more Efficient Equipment	94%	35%	87%
Invest in Property	85%	93%	45%
Have the Latest Technology	81%	76%	63%
Replace broken equipment	77%	8%	73%
Property was Uncomfortable	73%	35%	44%
Repair home structure	49%	31%	32%

Source: Participant Surveys

Note: Percentages reflect respondents indicating the motivation was very or somewhat important. Multiple responses allowed.

Question: How important were each of the following factors in deciding to complete your home upgrade project?

After identifying their motivations for undertaking a home upgrade, respondents were asked why they chose to use financing rather than another payment method. As shown in Table 41, across both standard loan and microloan participants, affordability was the most frequently cited reason for using financing. Approximately two-thirds of microloan (67%) and DER standard loan participants (69%), and over three-quarters of non-DER standard loan participants (81%), reported that they could not have afforded the upgrade without financing. In addition to affordability, approximately half of standard loan respondents cited features of the GGH loan itself, including ease of process (53% non-DER standard loan participants; 49% DER standard loan participants), favorable loan terms (53% non-DER standard loan participants; 51% DER standard loan participants), and low interest rates (49% non-DER standard loan participants; 47% DER standard loan participants). A substantial share of respondents also reported choosing financing

in order to avoid using credit cards. However, only 12% of microloan participants list favorable loan terms as a reason for choosing GGH, and only 20% indicated they used GGH to avoid credit cards. Together, these findings suggest that both standard loan and microloan participants actively selected GGH financing based on necessity, but standard loan participants were much more likely to be motivated by the loan design itself and by the desire to avoid using credit cards. In other words, the standard loan offers an effective alternative to higher-cost or less accessible forms of credit. Microloans, by contrast, helped participants address immediate upgrade needs but are not widely viewed as an effective alternative to other higher-cost credit sources.

Table 41. Reasons for Choosing Financing, by Loan Type

Reason	Standard Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
Could not afford without financing	81%	69%	67%
Process was easy	53%	49%	37%
Favorable loan terms	53%	51%	12%
Interest rate was low	49%	47%	28%
Avoided using credit cards	47%	38%	20%

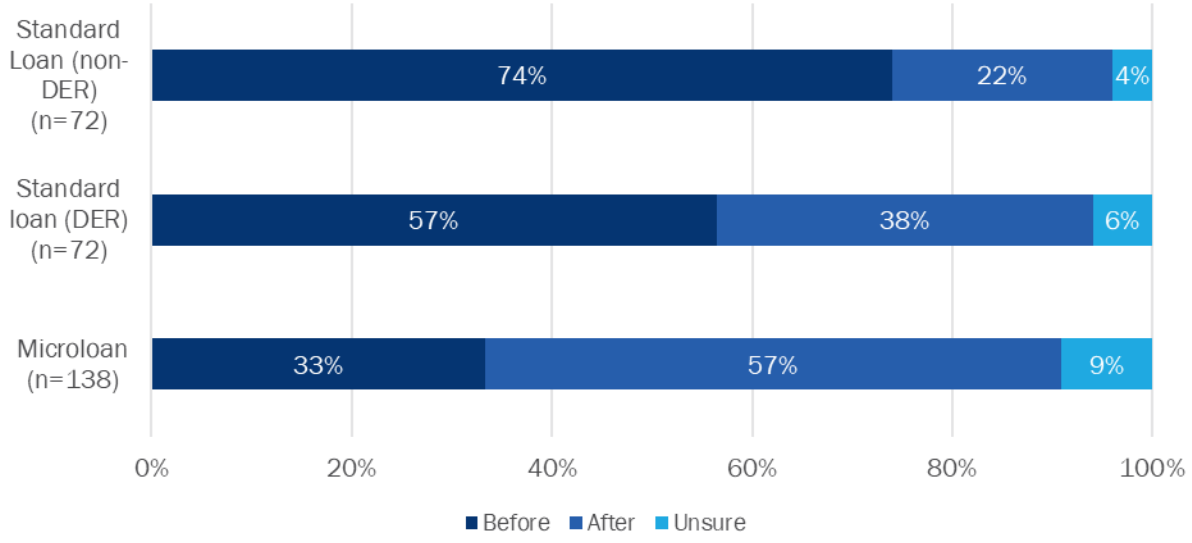
Source: Participant Surveys

Note: Respondents could select multiple reasons; percentages do not sum to 100%

Question: Overall, why did you choose to use financing to pay for your purchase of energy-saving products? Select all that apply.

Respondents were also asked whether they had decided to undertake their home upgrade before or after learning about the availability of GGH financing. As shown in Figure 15, among standard loan participants, 74% reported that they had decided to pursue an upgrade before becoming aware of financing. In comparison, 22% indicated that the decision was made after learning about financing, and 4% were unsure. Among standard DER loan participants, 57% reported planning an upgrade before discovering financing options, 38% indicated the decision was made after learning about financing, and 6% were unsure. The opposite pattern occurs among microloan participants: 57% had decided to upgrade after learning about financing, 33% before becoming aware of financing, and 9% are unsure about the timing.

Figure 15. Upgrade Decision Before or After Learning about Financing



Survey respondents were asked how they first learned about the GGH Program to better understand how financing influences participants' decision-making. Responses indicate that discovery pathways differ by loan type and are closely tied to the timing and nature of upgrade decisions. Among standard loan participants, the most common entry point was through contractors, with 71% reporting that they first learned about the program during contractor engagement. Smaller shares reported learning about the program through lenders (11%), independent research (14%), or other sources. This contractor-driven discovery pattern is consistent with earlier findings showing that most standard loan participants had already decided to pursue an upgrade before becoming aware of financing.

The contractors' central role in program awareness aligns with findings from the contractor and lender interviews, which suggest that discussing GGH with customers is standard practice. While only three contractors, in interviews, said they market GGH using social media, their website, or handouts, most contractors (15 of 20; 70%) reported that they typically discuss GGH as part of the broader sales conversation with customers, often during or immediately after presenting a project proposal. Interviewed contractors noted that, aside from one or two exceptions, customers almost never come in asking about GGH on their own, so the contractor is usually the one introducing the program.

> *I'd say only about 1 or 2% of potential customers already know about GoGreen. Usually, they go through the process because they've heard about it from [the contractor]. We try to coordinate with the banks and have handouts in our showrooms…It's not a full-blown marketing effort, but we definitely put it out there and try to make it be known we offer financing through GoGreen.*

When contractors discuss GGH with customers, they most often emphasize low interest rates (10 of 20), the absence of dealer or contractor fees (7 of 20), and the credibility of the local credit-union partner (5 of 20). On the lender side, most indicated they do not market the program heavily and instead rely on the program itself and borrower- and contractor-driven demand to build their pipeline.

While most contractors discuss GGH with customers, it is commonly presented alongside other financing options. Eight of the 20 interviewed contractors reported that they promote only GGH loans, citing transparency, competitive rates, and a straightforward process as key reasons for not offering alternatives. For some contractors (7 of 20; 35%), GGH is viewed as a more transparent and ethical alternative to what they described as "dirty," or opaque, financing practices common in the solar and battery markets. Contractors reported that some mainstream solar lenders charge high dealer fees, which can add 20–50% to project costs. Five contractors described these practices as unethical or misleading, noting that contractors are prohibited from disclosing some of these fees, and customers are frequently unaware of the hidden costs embedded in their financing.

In contrast, microloan participants overwhelmingly reported learning about the program through the Enervee or SoCalGas Marketplace website, which accounted for 80% of responses. Smaller shares cited independent research, digital marketing, or other websites, while very few reported learning about the program through contractors or lenders, which makes sense as most microloan purchases do not require a contractor for installation. This marketplace-based discovery aligns with earlier findings that a majority of microloan participants decided to purchase energy-saving equipment after learning about financing. For these participants, awareness of financing often appears to precede and catalyze the decision to upgrade, particularly in the context of urgent equipment replacement needs.

Survey respondents were also asked about their familiarity with other financing products that could be used to pay for home upgrades, as shown in Table 42. Reported awareness varied substantially by loan type and by financing product. Standard loan participants, whether DER or not, reported higher familiarity with traditional credit products such as

mortgage refinancing and HELOCs. Meanwhile, microloan participants consistently reported low familiarity with most alternative financing options, including credit union "green" loans and contractor financing.

Table 42. Proportion of Respondents Familiar with Alternative Financing Options

Alternative Financing Options	Standard Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
Mortgage refinancing options (i.e., increasing the size of your mortgage)	77%	75%	39%
Home equity loan or HELOC	73%	74%	43%
Credit union "green" home-improvement loans	60%	64%	17%
Bank home-improvement loan	59%	53%	36%
Financing through contractor	47%	50%	29%
HERO financing	39%	19%	18%
Property Assessed Clean Energy (PACE) financing	20%	15%	22%

Source: Participant Surveys
Note: Proportions represent the percentage of respondents who indicated they were somewhat familiar or very familiar with the financing option. Multiple responses allowed.
Question: How familiar are you with the following ways to finance home energy upgrades in California?

6.2.2 PROGRAM INFLUENCE ON DECISION-MAKING

To understand the influence of the GGH Program on participants' decision-making related to home upgrades, the survey asked respondents to assess the extent to which the availability of GGH financing influenced several aspects of their decisions, including the type of equipment installed, the timing of installation, the use of alternative payment options, and overall decision-making. Our evaluation measured whether the program is influential across multiple stages of participants' decision-making processes.

As an initial step in assessing how the availability of GGH financing influences decision-making, we examined whether financing makes home upgrade projects more feasible for participants to complete. Among standard loan projects, respondents indicated that financing availability played a substantial role in enabling project completion. As shown in Table 43, 66% of DER standard loan respondents reported that, in the absence of financing, their project would have been unlikely to occur. In contrast, fewer than one in four non-DER respondents indicated that their project would have been very likely without financing. Non-DER standard loan participants report less influence of loans, with 57% of these respondents indicating their project would have been at least somewhat likely without financing. Similarly, survey responses indicate microloans have played an important role in accelerating the market adoption of energy-efficient equipment.

Table 43. Likelihood of Completing Project in Absence of Financing

Response	Standard non-DER Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
Very likely	24%	15%	22%
Somewhat likely	33%	18%	22%
Not too likely	31%	44%	22%
Not at all likely	13%	22%	34%

Source: Standard Loan Participant Surveys, Microloan Participant Surveys
Question: Standard Loan Survey: Without financing, how likely would you have been to undertake your home upgrade project; Microloan Survey: Without financing, how likely would you be to purchase energy-saving products instead of non-energy saving/traditional appliances.

The survey asked respondents to estimate how the timing of their home upgrade project would have changed if GGH financing had not been available. Across both standard loan and microloan participants, many respondents reported that the program enabled them to complete projects substantially sooner than they otherwise would have.

As shown in Table 44, among standard loan respondents, only a third (33%) of participants indicated that they would have completed their projects at approximately the same time even without financing. Forty-seven percent of standard loan non-DER respondents and over 60% of standard loan DER respondents indicated that their projects would have been completed more than one year later in the absence of financing. Among microloan participants, 49% reported that their upgrade would have been delayed by over a year or may not have occurred at all without access to financing.

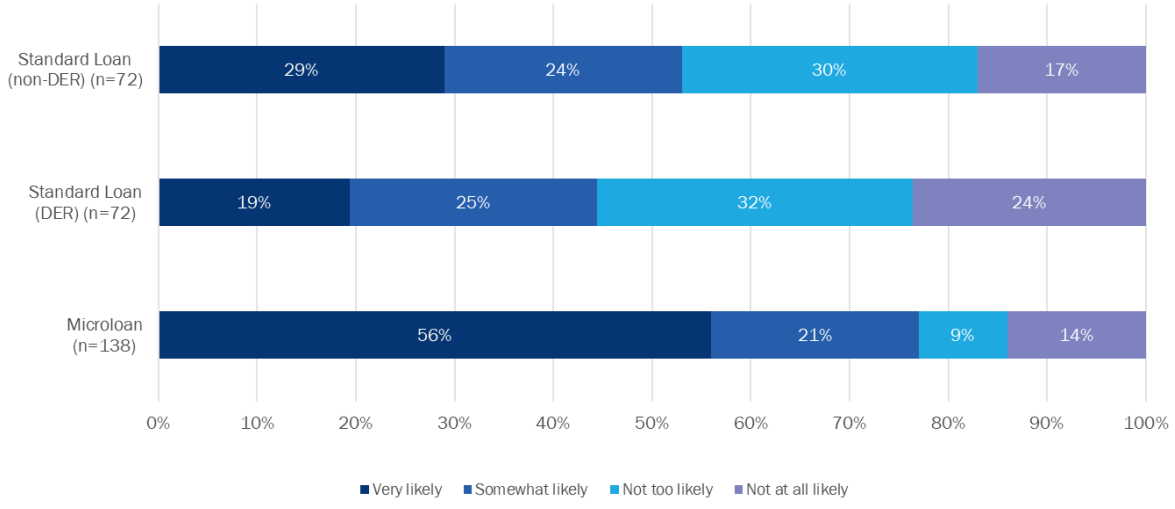
Table 44.Upgrade Timing Without GGH

Response	Standard Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
At the same time or sooner	33%	22%	17%
Within six months	8%	7%	12%
Within a year	11%	8%	21%
Within a year and a half	1%	6%	6%
Within two years	7%	15%	12%
Two years or longer	33%	32%	16%
Never	6%	10%	15%

Source: Standard Loan Participant Surveys, Microloan Participant Surveys
Question: Standard Loan Survey: Without financing, WHEN would you have undertaken this project (compared to when you actually undertook this project with financing)?; Microloan Survey: Without any financing, WHEN would you have purchased the energy savings products (compared to when you actually purchased the equipment with financing)?

We also assessed whether the GGH Program enables participants to increase the scale of their home upgrade projects. As shown in Figure 16, among standard loan participants, approximately half (53% non-DER participants and 44% DER participants) reported that they likely would have completed a less expensive project in the absence of financing. In comparison, 77% of microloan participants indicated they would have installed less expensive equipment without the loan.

Figure 16. Likelihood of Installing a Less Expensive Project



Survey results indicate that while some participants combine GGH financing with other payment sources, the loan itself typically serves as the primary funding mechanism for home upgrade projects. As shown in Table 45, among standard loan participants, 43% reported using no additional payment source beyond the GGH loan. For those who supplemented the loan, the most common sources were utility rebates or incentives, as well as cash or debit payments, with fewer respondents relying on credit cards or other financing products. Among microloan participants, over half (54%) did not seek additional payment sources, and the only supplement for most of the rest is cash or debit payments (Table 45). For those who utilized supplemental funding, the average contribution outside of GGH was modest: approximately $9,400 (median $5,000) for non-DER standard loan participants, about $11,063 (median $5,000) for DER standard loan participants, and around $286 (median $88) for microloan participants.

Table 45. Payment Methods Other than GGH

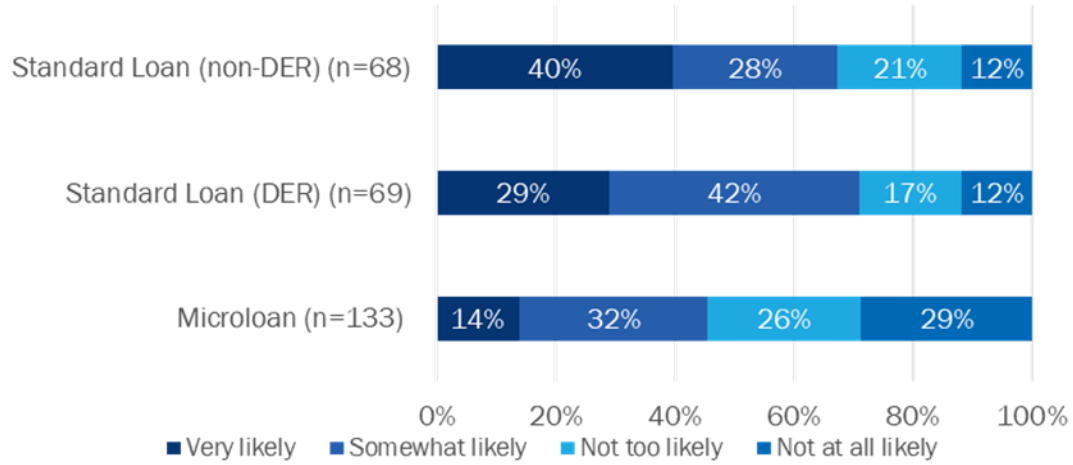
Payment Methods Other than GGH Loan	Standard Loan (n=72)	Standard-DER Loan (n=72)	Microloan (n=138)
Nothing Else	43%	35%	54%
Utility Rebate/Incentive	21%	31%	9%
Cash/Debit	25%	26%	33%
Other Rebates/Incentives	10%	11%	1%
Credit Card	6%	13%	7%
Other Financing	6%	4%	4%

Source: Participant Surveys
Note: Multiple responses allowed.
Question: "In addition to the GoGreen Home loan, did you use any of the following ways to pay for your project?"

Respondents who relied exclusively on GGH financing and were generally aware of other options most frequently cited the program's low interest rate (48% non-DER standard loan participants; 50% DER standard loan participants; 58% microloan participants), an easy process (13% non-DER standard loan participants; 17% DER standard loan participants; 63% microloan participant), and convenience (11% non-DER standard loan participants; 13% DER standard loan participants; 46% microloan participants) as reasons for not pursuing other financing options.

As shown in Table 45, only a small number of participants reported using another loan product in addition to GGH (6% of non-DER standard loan participants; 4% of DER standard loan participants; 4% of microloan participants). Among the standard loan respondents who used another financing, most indicated that they would have increased their use of alternative financing in the absence of the GGH loans, suggesting that GGH financing displaced use of higher-cost or less favorable credit options for these participants. Quite the opposite, for microloan participants who used other types of financing in addition to microloans, the majority are unlikely to increase additional alternative financing absent a microloan (Figure 17).

Figure 17. Likelihood of Using Another Loan Without GGH



As shown in Table 46, among respondents who used both the GGH loan and rebates/incentives, over half reported that they needed both the loan and the rebate or incentive in order to complete their project. Fewer respondents indicated that either the loan or the rebate alone would have been sufficient. Further, we asked the same subset of respondents to assess the relative importance of rebates and the GGH loan. Only 5% rated the loan as less important than the rebate, and 45% said the loan was significantly more important than the rebate.

Table 46. Importance of Loan vs. Rebate

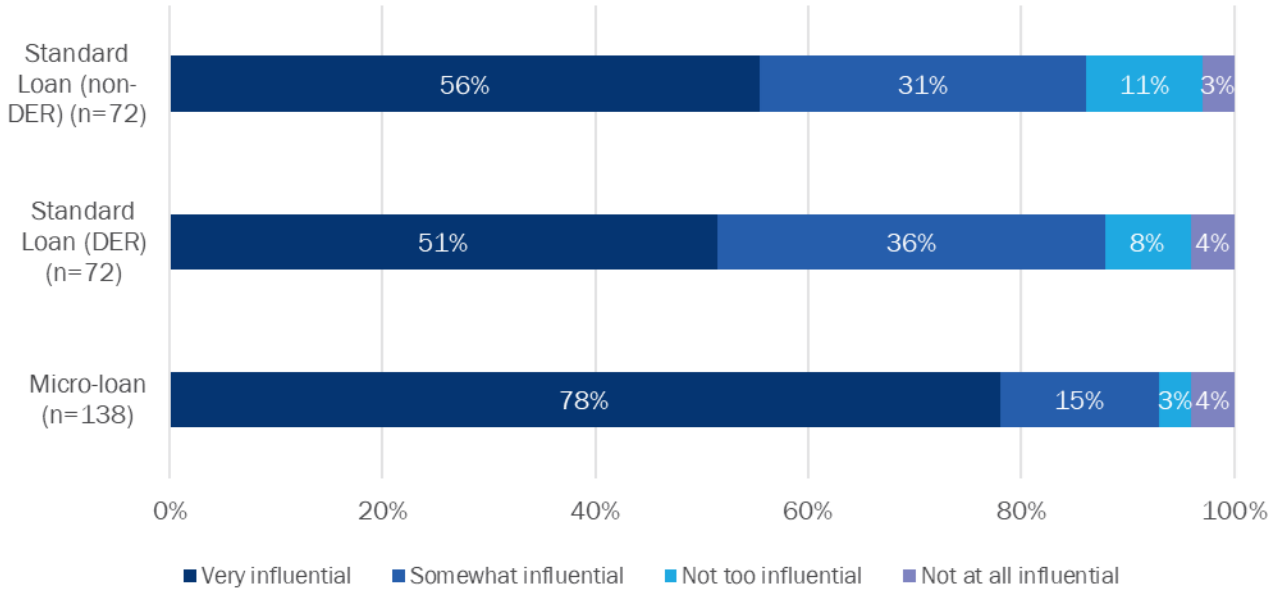
	Standard Loan (n=20)	Standard-DER Loan (n=25)	Microloan (n=13)
The loan was SIGNIFICANTLY MORE important than the rebate/incentive.	45%	20%	54%
The loan was SOMEWHAT MORE important than the rebate/incentive.	10%	8%	0%
The loan and rebate/incentive were EQUALLY important.	30%	60%	38%
The loan was SOMEWHAT LESS important than the rebate/incentive.	10%	4%	0%
The loan was SIGNIFICANTLY LESS important than the rebate/incentive.	5%	8%	8%

Source: Participant Surveys

Question: In terms of my decision to complete a home upgrade project

Finally, respondents were asked to assess the overall influence of financing availability on their decision-making. Across all loan types, as shown in Figure 18, participants reported that the GGH loan was influential in their decision to undertake their projects.

Figure 18. GGH Influence on Project Decisions



6.2.3 PARTICIPANT EXPERIENCE WITH PROGRAM

Overall, survey results indicate very high satisfaction with GGH loans. As shown in Figure 19, across standard loans and microloans, more than 75% of respondents were very satisfied with loan terms, the application process, and the overall loan offering. DER standard participants reported similar satisfaction, with 69% very satisfied with loan terms, 71% with the application process, and 76% with the overall offering. Interest rates were the lowest-rated aspect, though satisfaction remained strong: 53% of standard loan participants and 47% of DER standard participants were very satisfied with interest rates, while approximately 92% and 85%, respectively, were at least somewhat satisfied. Among microloan participants, 62% were very satisfied with interest rates, and approximately 90% reported at least some level of satisfaction.

Figure 19. Participant Satisfaction with Loans

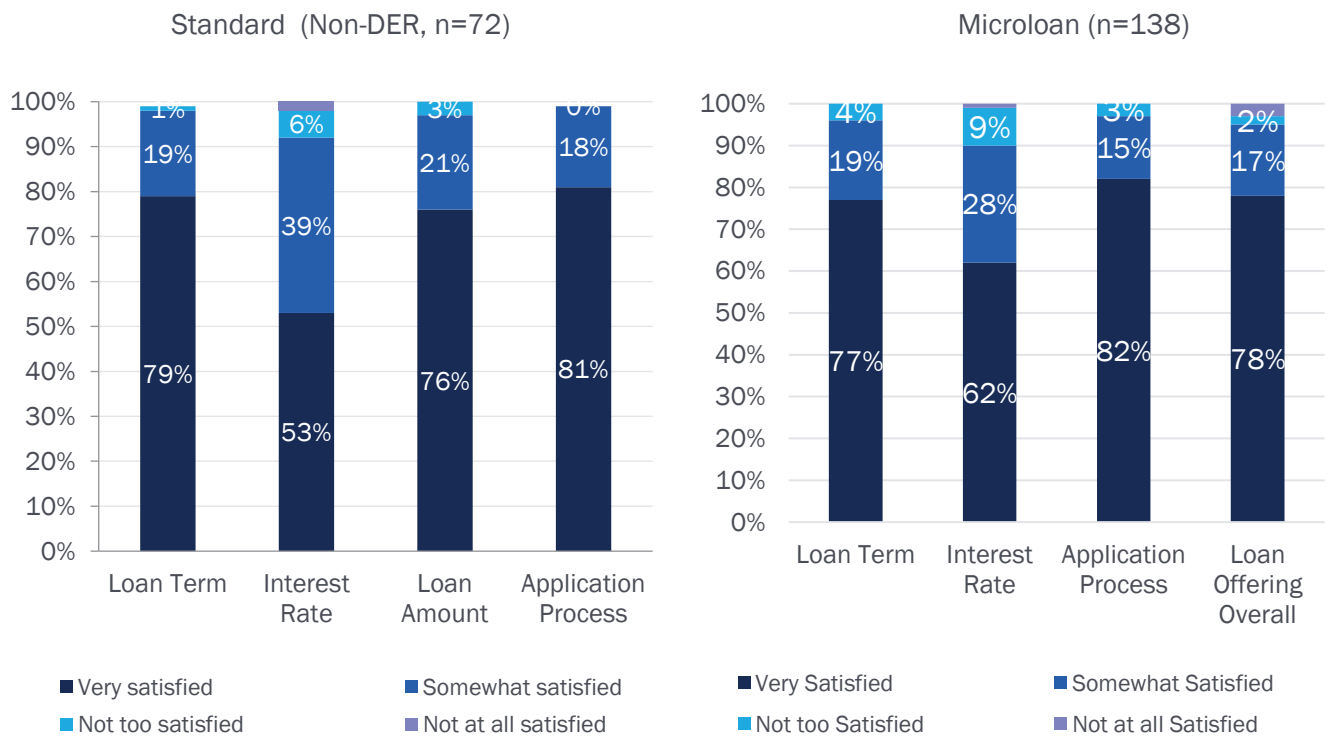
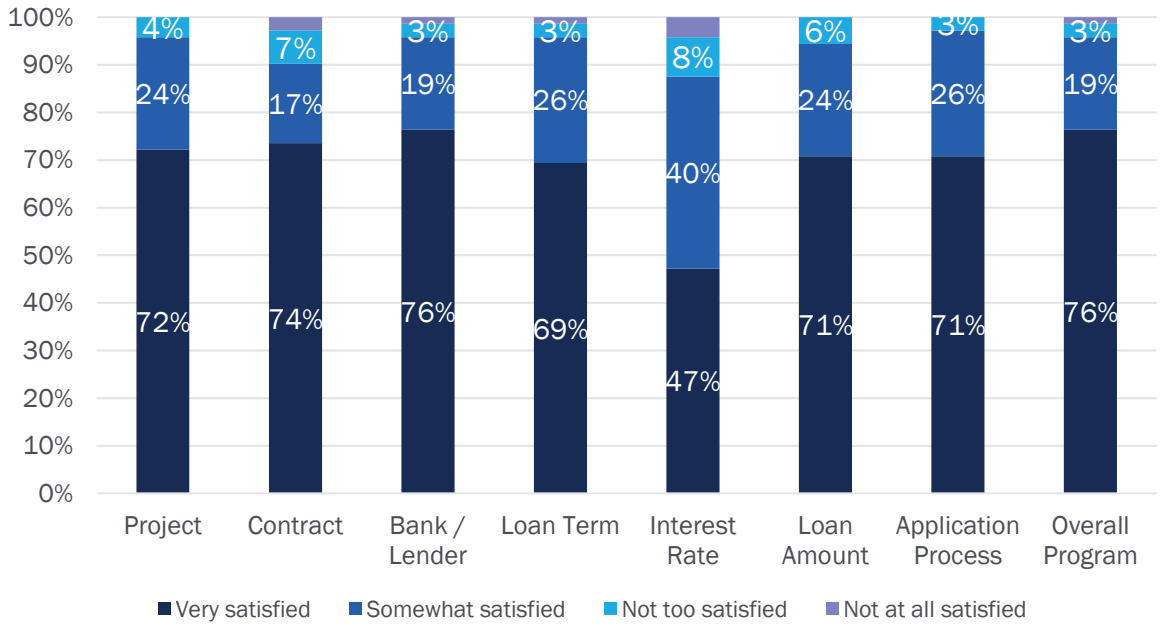


Figure 20. Participant Satisfaction with Loan Product (DER, n=72)



While interest rates were the least highly rated aspect of the loan experience in the participant surveys, interviewed contractors indicated that low interest rates were the most important aspect of the GGH program for customers' decision-making around financing (16 of 20 contractors). Four contractors also reported that the monthly payment was an important factor for customers.

> *[Customers are most interested] in the lowest APR and longest terms…Some customers want shorter terms because of the lower rates. The thing is, depending on the size of the project, the payments will be high. So then sometimes they're a bit hard on cash flow, so they look at the longest term. So it's all part of the conversation. It can't just be the APR or the monthly payment or the terms. But I would say the interest rate will be the decisive point, this is the point they will make the decision on.*

High satisfaction levels extend beyond the loan product itself to include program implementers and partners. Among microloan respondents, 69% reported being very satisfied with their lender, while 80% of standard and 76% of DER respondents reported being very satisfied with their lender (Table 47). For standard loan participants who worked with a contractor, 75% indicated being very satisfied with the contractor who completed their project, while 74% of DER participants were very satisfied with their contractor. Satisfaction with project outcomes was similarly high: 99% of standard non-DER and 96% of standard DER respondents reported being at least somewhat satisfied with their completed project, and 97% of microloan respondents reported being at least somewhat satisfied with the installed equipment. In both cases, the most common response was "very satisfied." Across satisfaction measures, including lender, contractor, project, and equipment, responses of "not too satisfied" or "not at all satisfied" accounted for no more than 12% of respondents.

Table 47. Program Ally and Project Satisfaction for Participants

	Standard Loan (n=72)		Standard Loan-DER (n=72)		Microloan (n=138)	
	Very Satisfied	Very Satisfied	Very Satisfied	Somewhat Satisfied	Very Satisfied	Somewhat Satisfied
Project/Product Overall	80%	18%	72%	24%	77%	20%
Contractor	77%	19%	74%	17%	NA	NA
Bank/Lender	76%	29%	76%	19%	69%	22%
Program Overall	79%	19%	76%	19%	78%	17%

Source: Participant Surveys
Question: "Thinking about your GoGreen Home loan experience, how satisfied are you with the following: "

Nearly three-quarters (71%) of DER respondents indicated they were very satisfied with the loan amount. About two-thirds of interviewed contractors (13 of 20; 65%) indicated that current caps match market reality for most standard residential projects, but approximately one-third (7 of 20; 35%) highlighted a consistent gap for larger multi-measure home upgrades or comprehensive solar+battery projects. These contractors report that the $50k home-energy cap and $75k solar/battery cap are sufficient for roughly 80–90% of projects, especially single-measure HVAC or typical solar-plus-battery installations. However, project costs rise substantially when customers bundle multiple upgrades (e.g., solar + batteries + roof + HVAC + windows), when roofs or trenching are involved, or when systems are designed for full home electrification or energy independence.

When we do HVAC, we do solar. So we'll sell these big package deals. A big solar system alone can be 50 grand, 60 grand. You add a roof to it, there's another 20 or 30. If you sell HVAC, there's another 20. So you're way over the 75 cap. It's pretty rare that you run into a $50,000 HVAC job. But the 75 with solar and battery, I think it should be at least 100. You know, you should double it, you know, if we're going to sell all that.

In these cases, contractors either split financing across programs, require customers to pay out of pocket, or lose them to other lenders. Many contractors said $75,000 is workable but tight, while several recommended raising caps to $100,000, and a few suggested $120,000–$130,000 to accommodate complex projects without forcing workaround financing. In short, caps work for the majority but are too low for higher-cost, multi-measure electrification projects, which are becoming more common and strategically important.

Finally, we also asked survey respondents how likely they would be to recommend the GGH Program to a friend or family member, a commonly used measure of overall satisfaction and program advocacy. As shown in Table 48, respondents are overwhelmingly willing to recommend this program to someone they know, with 81% of standard loan, 75% of standard loan-DER, and 78% of microloan participants indicating they would be very likely to recommend the program.

Table 48. Likelihood to Recommend Program to Friend/Colleague

	Standard Loan (n=72)	Standard Loan-DER (n=72)	Microloan (n=138)
Very likely	81%	75%	78%
Somewhat likely	13%	19%	16%
Not too likely	6%	4%	4%
Not at all likely	1%	1%	3%

Source: Participant Surveys
Note: Standard Loan n=72, Microloan n=138; DER n=72
Question: "How likely are you to recommend GoGreen Home financing to others in the future?"

7. RESIDENTIAL CLEAN ENERGY FINANCING IN CALIFORNIA

This section situates the GGH Program within California's broader energy efficiency financing market. We first compare GGH's terms and rates with those of alternative loan offerings to assess its competitiveness and how market changes may affect its future growth and scalability. We then conduct a conjoint analysis with nonparticipants that varies key loan attributes, including interest rate, term, out-of-pocket costs, contractor endorsement, and financier type, to estimate consumer preferences and the relative importance of each feature. These results allow us to benchmark GGH against market alternatives and assess how potential program changes could influence demand.

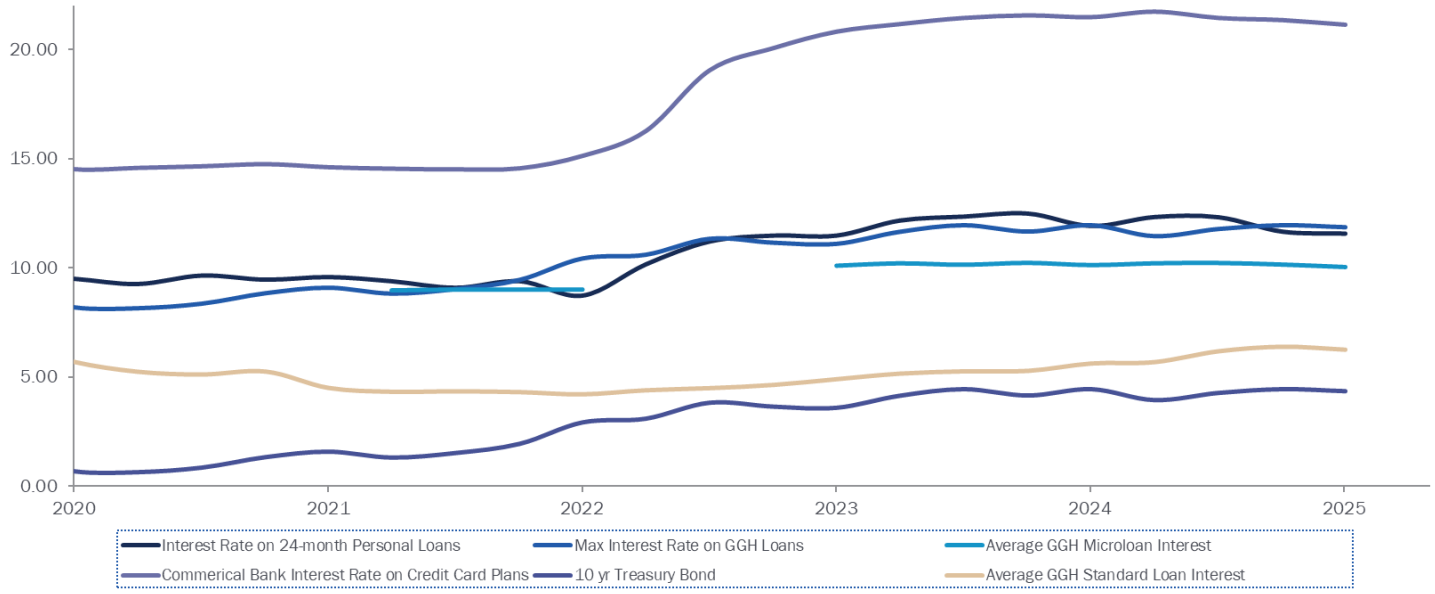
7.1 OVERALL LANDSCAPE

7.1.1 FINANCE MARKET CONDITIONS

To better understand the economic context of the GGH Program, the evaluation team analyzed loan terms, borrower credit profiles, and overall financing conditions both in national markets and within California. Figure 21 presents interest rates on GGH microloans and standard loans and compares it against 10-year treasury bonds, used as a proxy

for interest rate on new 10-year Treasury bonds; maximum interest rate on GGH loans, which is estimated as 750 basis points added to 10-year treasury bonds,[41] and interest rates on credit cards and 24-month personal loans; two market alternatives to GGH loans.[42]

Figure 21. GGH Interest Rates Compared to Other Selected Market Interest Rates



Source: CAEATFA tracking data. Series DGS10, TERMCBPER24NS, and TERMCBCCALLNS from Federal Reserve Economic Data, Federal Reserve Bank of St. Louis. Retrieved from https://fred.stlouisfed.org, February 2026.

Note: Quarterly GGH interest rates are the average interest rates for loans in the quarter, based on the LLR funding date.

The evaluation period saw a trend of rising interest rates. In particular, our proxy for the reference interest rate on new 10-year Treasury bonds (i.e., the yield on 10-year Treasury bonds) has steadily increased until the first quarter of 2024, then plateaued at a higher level. Interest rates on Treasury bonds are considered a proxy for broader interest conditions in the market. In that light, the increase in interest rates on personal and credit card loans is unsurprising. Interestingly, the increase in credit card interest rates appears sharper, likely due to a larger increase in credit card charge-off rates.[43]

Mechanically, the maximum chargeable interest rate also increased due to an increase in the 10-year Treasury bond rate. Despite this, the interest rates on GGH Program–supported standard loans have been well below the maximum allowed rate. On the other hand, the microloan interest rate has hovered very close to the maximum allowed rate per CAEATFA regulations. As discussed in subsections 4.3, 0, and 6.1.2, microloans are (1) the Program's primary loan for underserved borrowers; (2) riskier, and (3) provided by one lender specializing in microloans. Compared to credit card loans, the GGH microloans operating near the maximum allowable under GGH regulations still offer a drastically better option.

[41] The interest rate cap is new 10-year Treasury bonds plus seven hundred fifty (750) basis points as of the first business day of the applicable calendar quarter per California Code of Regulations. 2025. "Title 4, Division 13, Article 5: GoGreen Home Energy Financing Program." California Alternative Energy and Advanced Transportation Financing Authority Regulations implementing the Residential Energy Efficiency Loan Assistance Program (effective June 20, 2024). https://www.treasurer.ca.gov/caeatfa/cheef/reel/regulations/current.pdf

[42] GGH loans are typically longer than 24-month in term. Comparison with personal loans of 24-months are made due to data limitations.

[43] Based on series CORCCACBS and CORCACBS from Federal Reserve Economic Data, Federal Reserve Bank of St. Louis. Retrieved from https://fred.stlouisfed.org, on February 2026

7.1.2 ALTERNATIVE FINANCING TERMS AND ELIGIBILITY

The evaluation team examined available EE- and clean energy–specific financing options in California and identified a significant lack of private, unsecured EE standard loans outside the GGH Program. A primary alternative to GGH is California's PACE programs. Unlike GGH, PACE loans are secured by land, enabling participants to finance up to 100% of their initial clean energy project costs. Borrowers repay these loans through their property tax bills. The loans cover improvements such as solar installations, HVAC upgrades, and insulation, with the obligation tied to the property rather than the individual. However, a key distinction between the two programs lies in eligibility and accessibility: GGH loans are available to both homeowners and renters, whereas PACE programs are only accessible to homeowners.

Figure 22 compares the GGH Program with two PACE Programs in California across five key loan terms: type (secured/unsecured), payback period, interest rate, DTI ratio eligibility, and credit score eligibility. Unlike the GGH Program, the PACE programs do not require credit scores for eligibility. Despite this, data indicate that California property owners who use PACE loans generally have high FICO scores, typically 700 to 720.[44] PACE programs typically offer flexible terms ranging from 5 to 30 years, and interest rates are usually 5%–10%. The PACE programs do not specify a maximum DTI. Since GGH programs are not secured, lenders use the borrower's DTI ratio and credit score to determine creditworthiness. Regardless, GGH standard loan interest rates are comparable to the interest rates offered by the secured PACE Programs.

Figure 22. Loan Terms of GGH Compared to PACE Programs

GGH Standard Loan	Home Energy Renovation Opportunity (HERO) Loan	CaliforniaFIRST Loan
• **Type:** Unsecured • **Payback Period:** 1 to 15 years • **Interest Rate:** 3.5% to 10% • **DTI Ratio:** 55% or less • **Credit Score:** 580 or greater	• **Type:** Secured • **Payback Period:** 5 to 25 years • **Interest Rate:** 5.95% to 8.35% • **DTI Ratio:** No maximum specified, lender typically hesitant if in excess of 40% • **Credit Score:** Not an eligibility criterion	• **Type:** Secured • **Payback Period:** 5 to 30 years • **Interest Rate:** 6.75% to 8.49% • **DTI Ratio:** No maximum specified, lender typically hesitant if in excess of 40% • **Credit Score:** Not an eligibility criterion

Although participating lenders' signature loans provide a comparison to standard loans, as previously stated, some non-participating credit unions offer comparable loans for DER projects. As shown in Table 49, both Star One and Self-Help Federal Credit Union offer borrowers loans of up to $100,000 to finance a new solar system or refinance an existing one, with repayment terms of 15 to 20 years. Interest rates vary for Star One Credit Union, ranging from 6.25% to 8%, and for Self-Help Federal Credit Union, ranging from 5.50% to 13.75%. The average interest rate for GGH standard DER loans (6.29%) is lower than or near the bottom of the range for alternative DER financing loans.

[44] American Council for an Energy-Efficient Economy. 2017. "Property Assessed Clean Energy (PACE)." https://www.aceee.org/toolkit/2017/01/property-assessed-clean-energy-pace

Table 49. Characteristics of alternative DER financing options

Loan Terms	Star One Credit Union	Self-help Federal Credit Union	FrontWave Credit Union
Type:	Unsecured Personal	Unsecured Personal	Unsecured Personal
Payback Period:	5–15 years	Max of 20 years	Up to 20 years
Interest Rate	6.25%–8%	5.50%–13.75%	7.49%–9.24%
DTI Ratio	Not specified	Not specified	Not specified
Credit Score	Ranges and the score affect the interest rate.	Not specified	Not specified

Alternative options to microloans include credit cards and general personal loans that are not specifically aimed at energy efficiency. Many home improvement stores, such as Lowe's or Home Depot, offer promotional financing for equipment with interest-free loans if the loan is repaid within the promotional period. While credit cards are convenient for short-term small projects, unpaid balances after the promotional period can attract high interest rates of 20-30%. Personal loans may also be used and are typically available to borrowers with a minimum FICO score of 600. A DTI below 36% is preferred, but approval also depends on other factors, and the process is typically more cumbersome than GGH microloan processes, which are automatic at the point of sale through the Enervee, SCE, and SoCalGas marketplaces.

AWARENESS OF ALTERNATIVE PROGRAMS

The evaluation's participant surveys included questions assessing respondents' familiarity with selected federal and state programs, including:

- ***Energy Efficient Home Improvement Credit:*** A federal tax credit administered by the Internal Revenue Service that allows homeowners to claim a percentage of eligible energy efficiency upgrade costs, subject to annual caps and specific equipment requirements.
- ***Golden State Rebate Program:*** A California state rebate initiative that reduces upfront costs for high-efficiency appliances and home upgrades through point-of-sale or post-purchase incentives, with eligible measures determined by state policy.
- ***Home Electrification and Appliance Rebates (HEEHRA):*** A federally funded, income-qualified rebate program established under the Inflation Reduction Act and administered in California by the California Energy Commission that provides point-of-sale incentives for electric appliances and home electrification upgrades.
- **Low Income Home Energy Assistance Program (LIHEAP):** A federally funded program overseen by the U.S. Department of Health and Human Services that provides income-eligible households with bill payment and crisis assistance to help manage heating and cooling costs.
- ***Weatherization Assistance Program (WAP):*** A federal program administered by the U.S. Department of Energy that funds no-cost energy efficiency and health and safety improvements for low-income households through local service providers.
- ***Energy Savings Assistance Program (ESA)*:** A California utility ratepayer-funded program overseen by the California Public Utilities Commission that provides no-cost energy efficiency upgrades to income-qualified customers of investor-owned utilities.

As shown in Table 50, a relatively small share of participants reported being very or somewhat familiar with these programs. Among microloan participants, the most well-known programs were income-eligible programs such as LIHEAP and ESA, with over half of respondents reporting at least some familiarity with them. Given that the majority of

microloan recipients were from lower-income households (with over 50% earning less than $75,000 annually), their greater familiarity with income-qualified programs is consistent with expectations.

In contrast, more than 74% of standard loan participants, regardless of DER participation, reported being not too or not at all familiar with any of the programs (Table 50). Even for programs with higher awareness, in-depth knowledge remained limited. Only 26% of microloan participants reported being very familiar with LIHEAP, and 21% reported being very familiar with ESA (Figure 38).

Table 50. Proportion of Standard Loan Participants Familiar with Alternative Programs

Program	Standard Loan (n=72)	Standard Loan-DER (n=72)	Microloan (n=138)
Energy Efficient Home Improvement Credit	13%	26%	33%
Golden State Rebate Program	20%	17%	23%
Home Electrification and Appliance Rebates (HEEHRA)	13%	17%	23%
Energy Savings Assistance Program	26%	13%	57%
Low Income Home Energy Assistance Program	15%	14%	38%
Weatherization Assistance Program	16%	17%	50%

Source: Participant Surveys
Note: These are the sum of respondents indicating they are very or somewhat familiar with alternatives.
Question: How familiar are you with the following programs that offer incentives for home energy upgrades in California?

Among microloan participants, who generally reported higher awareness of other programs than standard loan participants, open-ended responses provide additional context for why these programs were not pursued. Respondents frequently cited eligibility constraints, such as renter status or income thresholds, as well as program scope limitations that did not align with equipment-only needs. Others noted administrative barriers, including funding availability, long or uncertain application processes, or the need for rapid equipment replacement. Several respondents indicated that once they encountered the GGH option, the relative simplicity and clarity of the process reduced the need to continue searching for alternative programs.

Nearly all interviewed contractors (19 of 20) said that they present other rebate programs and incentives to customers when discussing project costs and financing. The most common program contractors mentioned (10 of 20) was the federal Residential Clean Energy Credit, which allowed homeowners to claim a tax credit for up to 30% of the costs of a new clean energy project, including solar panels and battery storage technology. Contractors expressed significant concern about the expiration of this credit in December 2025, noting that without the credit, residential solar and battery projects will have longer payback periods and be less financially attractive, potentially leading to a sharp decline in installations. Most contractors (15 of 20) felt that the availability of rebates and incentives was equally as important to customers as financing, but two contractors felt that incentives/rebates were more important because they “feel like they are getting a deal.” This aligns with survey results, in which respondents typically rate financing as at least as important as rebates and incentives, and rarely indicate that financing is less important than rebates and incentives.

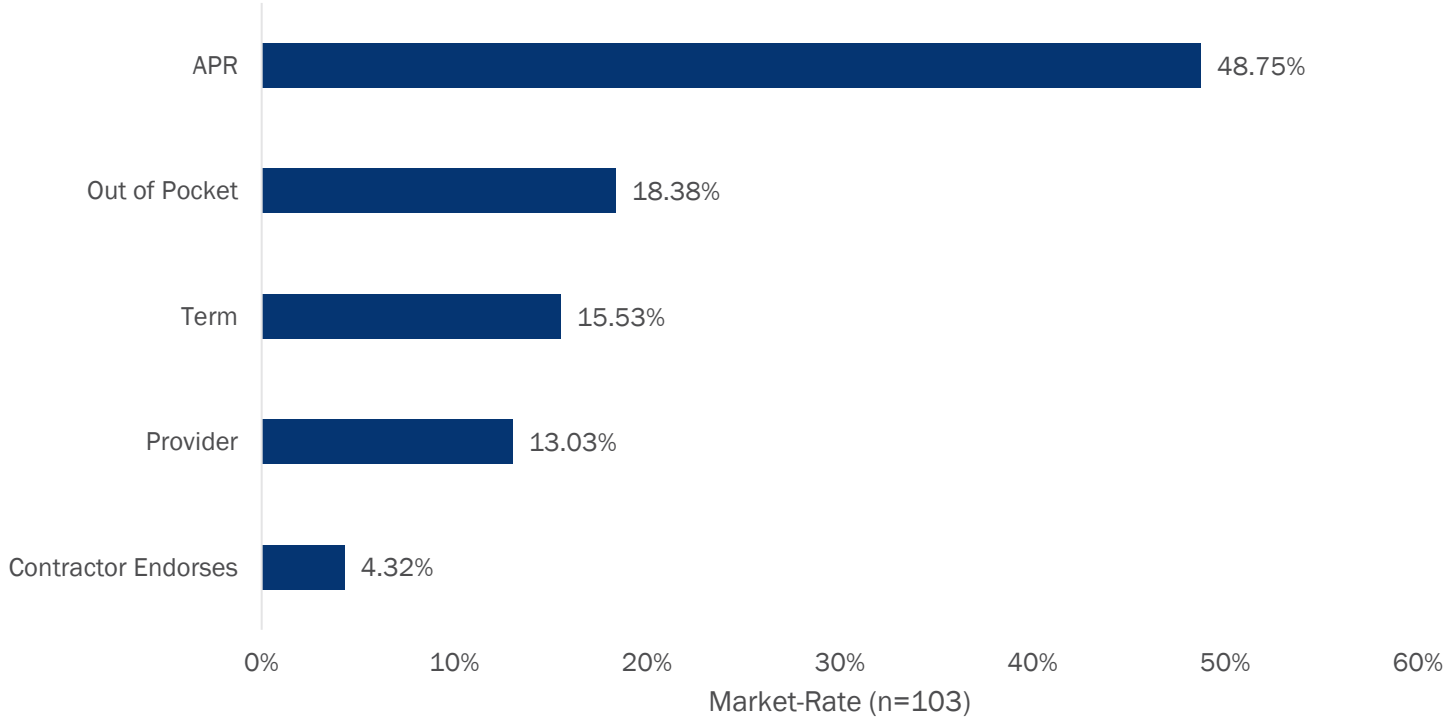
Nearly all interviewed contractors (19 of 20) said that they present other rebate programs and incentives to customers when discussing project costs and financing. The most common program contractors mentioned (10 of 20) was the federal Residential Clean Energy Credit, which allowed homeowners to claim a tax credit for up to 30% of the costs of a new clean energy project, including solar panels and battery storage technology. Contractors expressed significant concern about the expiration of this credit in December 2025, noting that without the credit, residential solar and battery projects will have longer payback periods and be less financially attractive, potentially leading to a sharp decline in installations. Most contractors (15 of 20) felt that the availability of rebates and incentives was equally as important to customers as financing, but two contractors felt that incentives/rebates were more important because they “feel like they are getting a deal.”

7.2 CALIFORNIANS' PREFERENCES FOR FINANCING

To help the implementer and CPUC fine-tune loan parameters, we conducted a conjoint experiment in which key loan features were randomly varied and presented to Californians who had not participated in GGH (nonparticipants). Survey respondents selected from a set of four loan options (or chose none of the above) to estimate their preferences. Based on respondents' selections across multiple scenarios, we estimate relative preference for different attribute levels and use this to assess market demand, the relative importance of loan attributes for loan uptake, and sensitivity to changes in individual attributes.[45]

We first estimate the relative importance of each attribute to identify which loan features most strongly influence decision-making. These relative importance scores represent each attribute's contribution to customer decision-making as a percentage, reflecting the extent to which a given attribute drives loan selection. Relative importance scores are estimated separately for underserved and market-rate customer segments.[46].

Figure 23. Conjoint Attribute Relative Importance - Market-Rate Respondents (n=103)



As shown in Figure 23 and Figure 26, across both market-rate and underserved respondents, interest rate is by far the most important attribute influencing loan selection. Importantly, looking at the relative importance of interest rates (the first bar) across both figures, interest rates are more important for market-rate respondents than for underserved respondents (49% vs. 39%). This difference should not be interpreted as underserved households caring less about interest rates overall. Rather, underserved respondents appear relatively more sensitive to features that affect immediate affordability, such as out-of-pocket costs and loan terms, both of which determine the proportion of available funds or expected income required for debt servicing. In contrast, market-rate respondents place relatively more weight

[45] For this analysis, "provider" refers to the entity providing the loan (e.g., Credit Unions, Large Banks, Contractor). "Out of Pocket" expense refers to the amount of money a respondent must pay upfront before installation and without financing.

[46] For this analysis, underserved participants are defined as respondents enrolled in CARE or FERA, while market-rate participants are those not enrolled in either program.

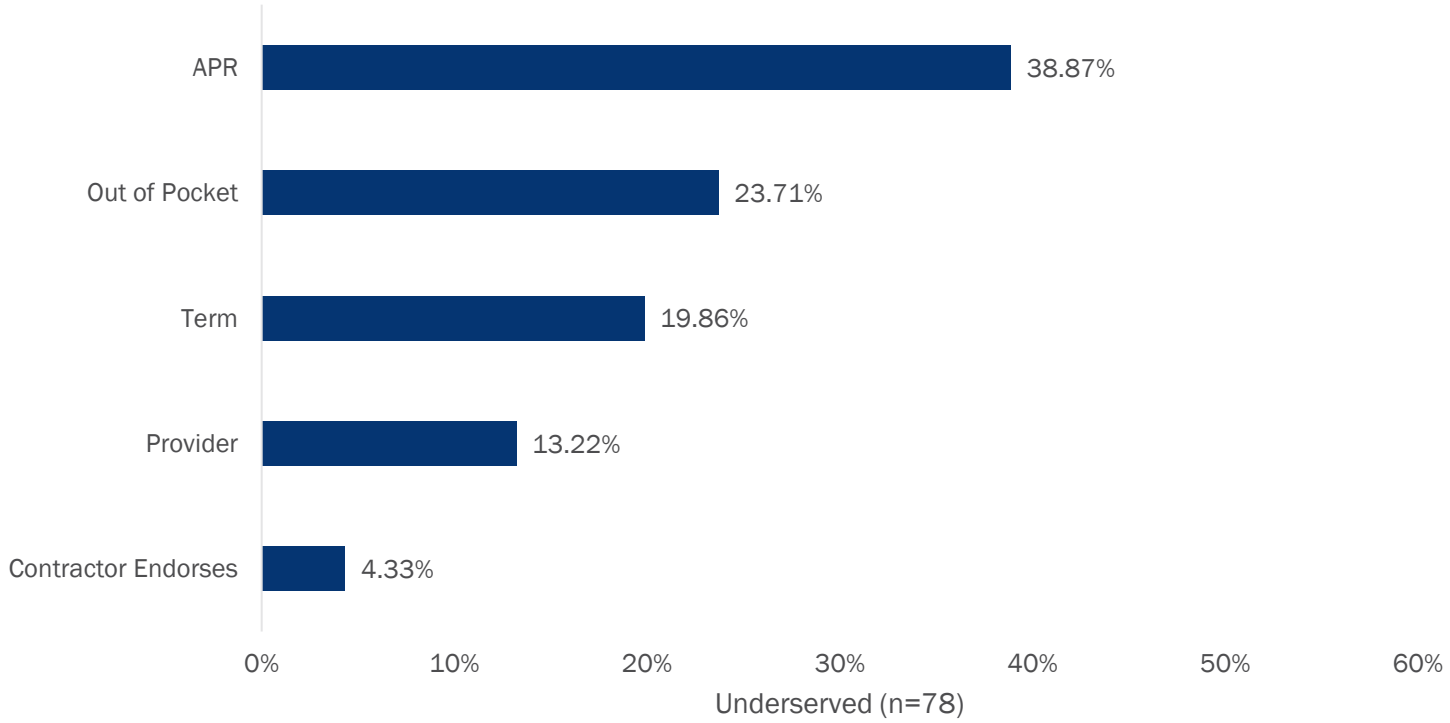
on interest rates, consistent with a stronger emphasis on minimizing total interest paid over the life of the loan. These results reflect relative trade-offs across attributes, suggesting that underserved households are more cash-constrained and therefore more focused on upfront and monthly payment burdens, while market-rate households are comparatively more focused on securing the lowest overall borrowing cost.

As part of the conjoint exercise, we also estimate respondent preferences at various levels of our randomized features. We identify key patterns in respondents' preferences across market segments. Underserved respondents exhibit consistent declines in the program's usefulness as out-of-pocket expenses increase, and show increasing program usefulness with longer loan terms, which reduce monthly payments. In contrast, market-rate respondents derive greater utility from shorter loan terms, with utility decreasing as loan terms lengthen. This pattern suggests that market-rate respondents prioritize minimizing total interest paid while underserved respondents prioritize the lowest-cost payment structures.

As shown in both Figure 23 and Figure 24, out-of-pocket expense is the second most important attribute for both market-rate and underserved respondents. Loan term length ranks third in importance for both groups, with a level of influence similar to that of out-of-pocket costs.

One interesting finding is that loan providers are only somewhat important (the second least important) as a loan attribute. As such, borrower demand-side factors may not explain the dominance of credit unions in program participation.

Figure 24. Conjoint Attribute Relative Importance - Underserved Respondents (n=78)



STANDARD LOAN PREFERENCES

We used the conjoint results to model how borrowers would choose between GGH financing and other options under different scenarios. By adjusting loan attributes in these simulations, we show how changes to loan terms or program support could shift borrowers' preferences across financing options.[47] The key attributes are presented in Table 51.

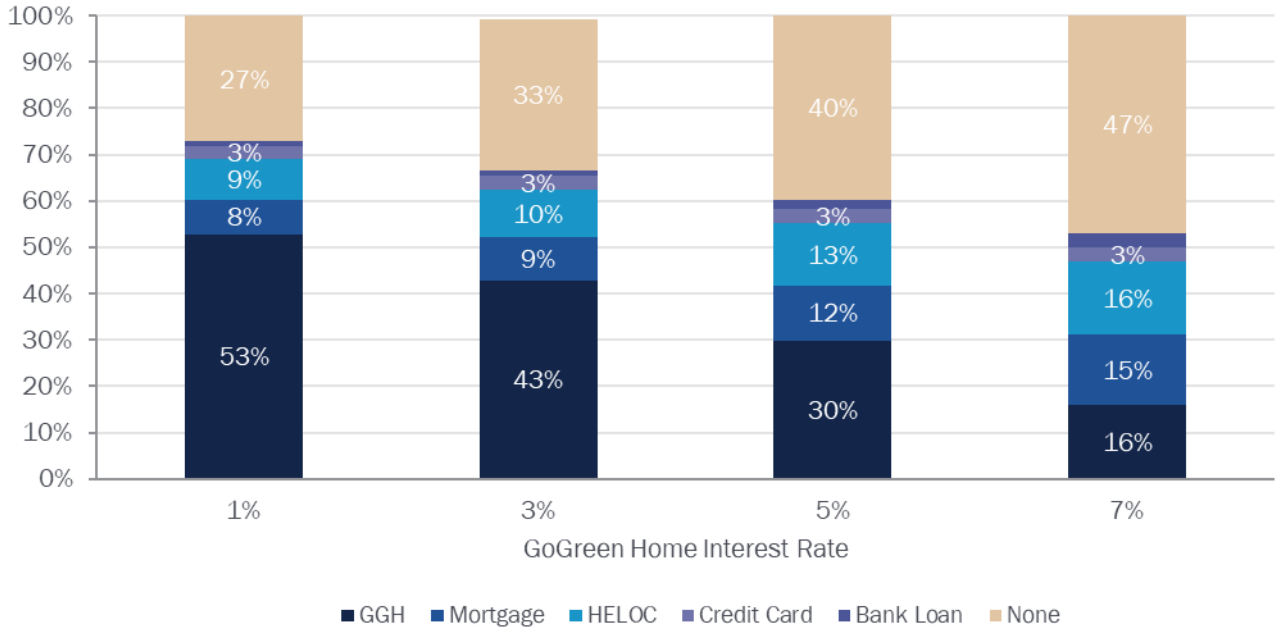
Table 51. Selected Attributes of Market Simulation: Effect of Interest Rates

Attribute	GGH	Mortgage Refinancing	Credit Card	Bank Loan	HELOC
Interest Rate	VARIES	6%	20%	11%	7.5%
Provider	Credit Union	Large Bank	Large Bank	Credit Union	Large Bank
Out-of-Pocket Expense	$2000	$6000	$0	$1000	$0

Note: Attribute level for alternative programs chosen to match US market averages in 2025. Attributes above reflect settings used for alternatives in simulation.

Figure 25 presents the results of this simulation exercise, showing simulated preference shares[48] across financing alternatives as GGH interest rates vary. Figure 26, presents results by market segment, including both market-rate and underserved respondents. Respondents are highly sensitive to changes in interest rates. This sensitivity is nonlinear, with larger changes in preference occurring at higher interest rate levels. For example, an increase from 1% to 3% is associated with a smaller reduction in simulated preference for GGH (10 percentage points) than an increase from 5% to 7% (14 percentage points). Given that current interest rates average approximately 6%, further increases may meaningfully affect program participation.

Figure 25. GGH vs. Other Financing with Varying Interest Rates (n=181)



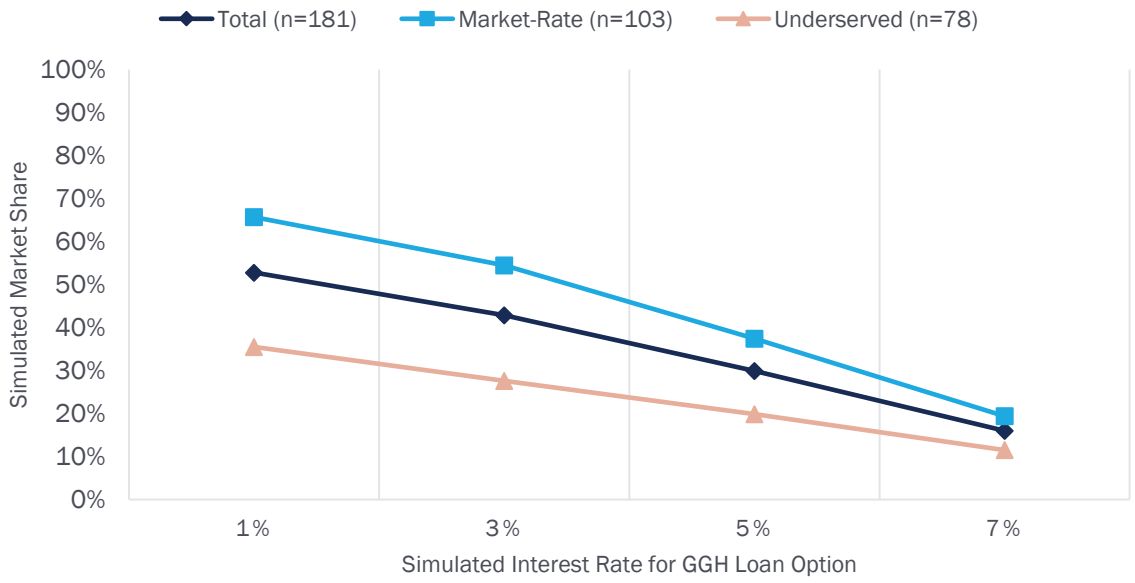
[47] An important caveat of this analysis is that the simulated shares of preference are based on hypothetical choice scenarios that do not involve actual financial commitments. While these results reflect Californians' relative preferences in this context, they may differ from real-world borrowing behavior observed when actual dollar amounts and financial risk are involved.

[48] Preference shares are model-estimated predicted choice shares derived from the hierarchical Bayes logit model, representing the proportion of respondents expected to select a given option or attribute level in a simulated choice scenario, holding other attributes constant as specified in the simulation design.

Another notable finding, shown in Figure 25, is that the most common choice, aside from GGH financing, is opting not to use financing at all. As GGH interest rates increase, much of the shift in simulated preferences reflects an increase in respondents rejecting financing rather than switching to other financing options included in the analysis. For example, when moving from an interest rate of 1% to 3%, the share of "none" increases by 6 percentage points, while the shares of the other options shift by only 1 percentage point each.

Results are further disaggregated by consumer segments to examine differences between market-rate and underserved respondents. As shown in Figure 26, while both groups exhibit similar overall trends, market-rate respondents show greater sensitivity to changes in interest rates, consistent with earlier relative importance results indicating that the interest rate accounts for a larger share of their decision-making.

Figure 26. Segmented Market Share by Interest Rate



The final simulation varies the out-of-pocket cost, the second most important determinant of loan selection. The attributes are in Table 52.

Table 52. Selected Attributes of Market Simulation: Out-of-Pocket Expense

Attribute	GGH	Mortgage Refinancing	Credit Card	Bank Loan	HELOC
Interest Rate	5%	6%	20%	11%	7.5%
Provider	Credit Union	Large Bank	Large Bank	Credit Union	Large Bank
Out-of-Pocket Expense	VARIES	$6000	$0	$1000	$0

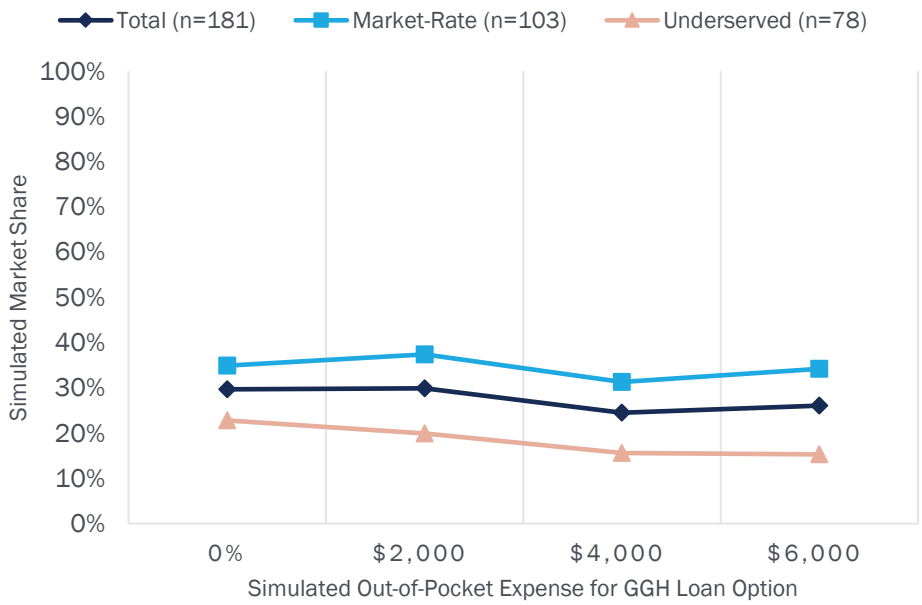
Note: Attribute level for alternative programs chosen to match market averages in the US in 2025. Attributes above reflect settings used for alternatives in simulation.

The results of the out-of-pocket expense simulation are presented in Figure 27, separated by consumer segment to highlight differences in how market-rate and underserved borrowers respond to changes in upfront costs. Two main patterns emerge from the results:

- The effect of out-of-pocket cost on simulated preferences is relatively modest, particularly when compared to the effect of the interest rate.

- While increases in out-of-pocket cost are consistently associated with declines in simulated preference among underserved respondents, the response among market-rate respondents is less consistent, with effect directions that vary across scenarios.

Figure 27. Segmented Market Share with Varying Out-of-Pocket Expense



As noted previously, a key finding from the conjoint analysis is that a sizable portion of respondents consistently preferred the "none" option over any financing alternative. To better understand these respondents' preferences, we analyzed open-ended responses from individuals who selected "none" in more than 50% of the choice scenarios presented. Approximately 37% of respondents met this criterion. These responses were reviewed and coded using a thematic analysis approach to identify common reasons for rejecting financing and to assess differences by market segment.

As shown in Table 53, among underserved respondents, the most frequently cited reasons for consistently rejecting financing included high interest rates, concerns about affordability or monthly payments, and the length of loan terms. Among market-rate respondents, the most common reasons cited were aversion to debt or financing, a preference to pay with cash, and high interest rates. These findings are consistent with earlier conjoint results, which showed that interest rates play a central role in loan acceptance across both segments.

Table 53. Emergent Themes from Open-Ended Responses by Market Segment

Topic	Market Rate Count (n=42)	Underserved Count (n=29)
High interest rate	13	14
Debt aversion/Avoid financing	15	8
Loan term too long	10	9
Preference to Pay Cash	14	5
High monthly payments/Affordability	6	11
High upfront cost	7	7

Source: Conjoint Survey
Question: In the choice tasks you just completed, you indicated that none of the options were a good fit for you in several scenarios. What aspects of the options led you to feel that way?

Beyond the conjoint study, we included a brief section in the nonparticipant survey to gather information on preferences, knowledge, and exposure to energy efficiency financing among a nonparticipant group. These survey responses help evaluate how Californians understand the energy efficiency financing landscape and identify their general preferences for energy efficiency loans.

We asked respondents to rank a variety of loan features by importance. As shown in Table 54, for both market-rate and underserved participants, the most important feature was a low interest rate, which aligns closely with the conjoint analysis results.

Table 54. Rank of Loan Features by Importance. Median Ranking by Segment

Loan Feature	Market-Rate (n=103)	Underserved (n=78)
Low interest rate	2	3.5
No upfront payment required	10	5
Fixed interest rate for the life of the loan	4	5.5
Option to pay off the loan early with no fees or penalties	5	6
Monthly payment amount	6	6
Automatic eligibility (instead of the traditional credit score eligibility process)	9	6
No lien/upfront collateral required	6	7
Loan offered directly through a channel you trust (e.g., utility, credit union, state-supported program)	7	7
Forgiveness of the remaining loan balance in certain cases (for example, if you sell your home or cannot continue payments due to hardship)	8	7
Quick and simple application process (minimal paperwork)	5	7.5
Being able to pay for the loan over a longer time to keep monthly payments low	9	8
Option for automatic payments	8	8.5

Source: Conjoint Survey
Note: Financing options differ. Please rank the importance of the following elements when considering financing options to help offset the cost of energy-saving home improvements. The table is ordered from lowest to highest based on the underserved median rankings.

The largest difference in median rankings between the two groups concerns the requirement of upfront payments. Underserved respondents ranked avoiding upfront payments as the second most important feature (median rank of 5), whereas market-rate respondents ranked it among the least important features (median rank of 10) (Table 54). This heightened importance of upfront costs for underserved households suggests liquidity constraints, consistent with the conjoint analysis, which shows strong sensitivity to cash flow considerations among this group. Similarly, the importance placed on monthly payment amounts among underserved respondents further reinforces this interpretation and provides additional validation of the conjoint results.

Across both groups, respondents also placed high importance on features that reduce uncertainty in loan repayment. These include low interest rates, fixed interest rates, and the ability to pay off loans early without fees or penalties (Table 54). Together, these preferences indicate a strong desire to minimize financial risk and maintain flexibility, again mirroring the patterns observed in the conjoint analysis.

Overall, these stated preference rankings serve as an important form of verification for the conjoint results. The consistency between respondents' direct feature rankings and their revealed preferences in the conjoint analysis strengthens confidence in the robustness of the findings and suggests that the conjoint model is capturing meaningful and intuitive dimensions of borrower decision-making.

MICROLOAN PREFERENCES

We also asked nonparticipant respondents about their financing preferences using a short vignette describing a household's refrigerator failure that requires replacement. While the conjoint analysis was designed to reflect typical loan sizes for larger home upgrades, this vignette was intentionally chosen to approximate a smaller, microloan–sized decision context.

Most respondents indicated they would replace the refrigerator with a high-efficiency model rather than selecting the lowest-cost option or relying solely on a professional recommendation. Specifically, 69% of underserved respondents and 75% of market-rate respondents reported choosing a high-efficiency option. Among underserved respondents, 15% indicated they would select the lowest-cost option, while only 4% of market-rate respondents selected that option.

Respondents were then asked to rank a list of payment methods based on how likely they would be to use each method to pay for the refrigerator replacement. The top three payment methods were the same across both groups, with cash, rebates and incentives, and credit cards ranked highest. Low-interest loans for energy upgrades, such as GGH, were included as an option and ranked as the fourth most likely payment method (Table 55).

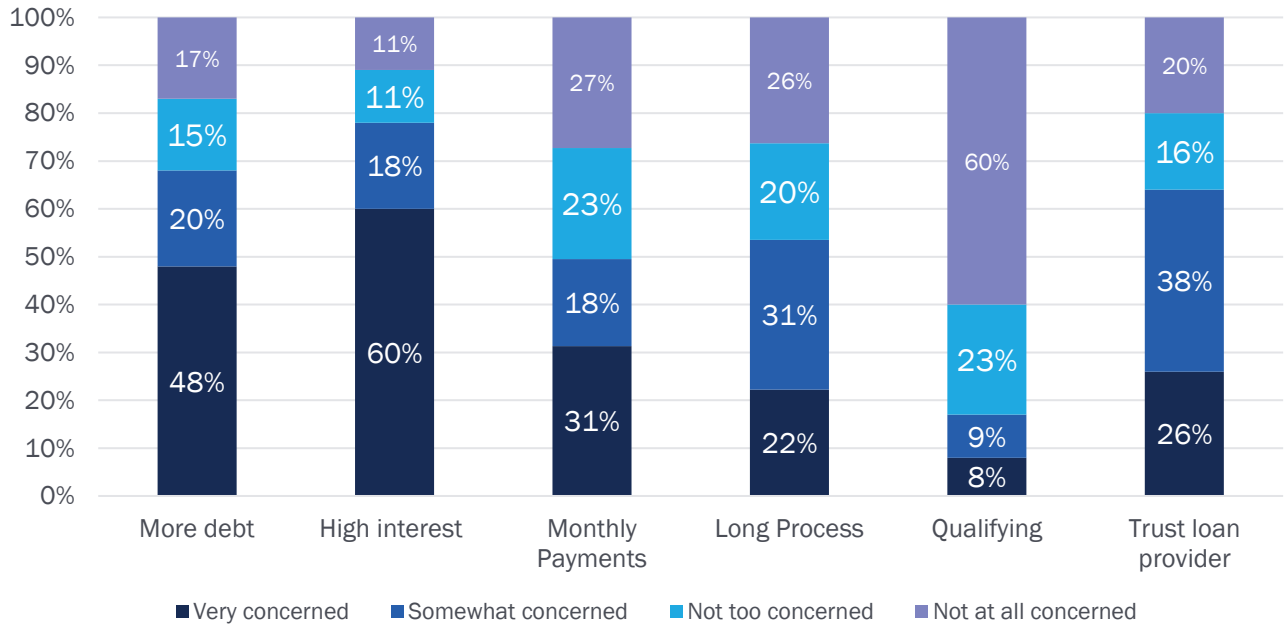
Table 55. Median Ranking of Payment Methods by Likelihood of Usage

Payment Method	Market Rate (n=103) Median Rank	Underserved (n=78) Median Rank
Paying with cash/savings	2	2
Credit card	2	3
Rebate or incentive that lowers the project cost	3	3
Low-interest loan for energy upgrades	4	4
Home equity loan/HELOC	5	6
Personal loan from a bank or credit union	6	5
Property tax-based financing	6	7
Loan from a friend or family member	7	5

Source: Conjoint Survey
Question: Please rank how likely you are to use the following options for paying for the replacement.

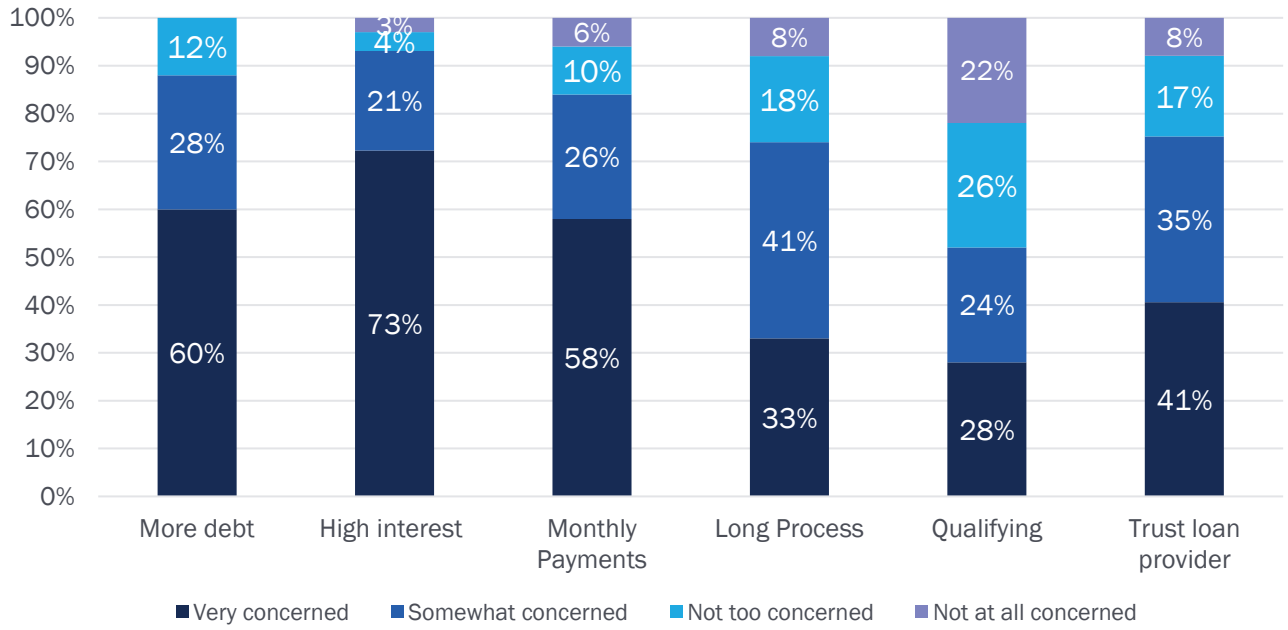
Next, the survey asked respondents to imagine a scenario in which they would consider financing the replacement of a refrigerator and to evaluate a set of common loan considerations based on their level of concern. As shown in Figure 28, among market-rate respondents, the most frequently cited concern was high interest rates, with 60% reporting being very concerned. The next most common concern was taking on additional debt, reinforcing the prominence of interest sensitivity and debt aversion observed across multiple analyses, particularly among market-rate respondents.

Figure 28. Level of Concern when Deciding Between Financing Options - Market Rate (n=103)



For underserved respondents, taking on additional debt is the greatest concern (88%), followed by high interest rates (84%). Distinct from market-rate borrowers, 58% of underserved respondents report being very concerned about monthly payments, and 84% report being at least somewhat concerned. This level of concern is substantially higher than among market-rate respondents and closely aligns with findings from the conjoint analysis, which show that underserved borrowers place particularly high importance on monthly payment amounts.

Figure 29. Level of Concern when Deciding Between Financing Options – Underserved (n=78)



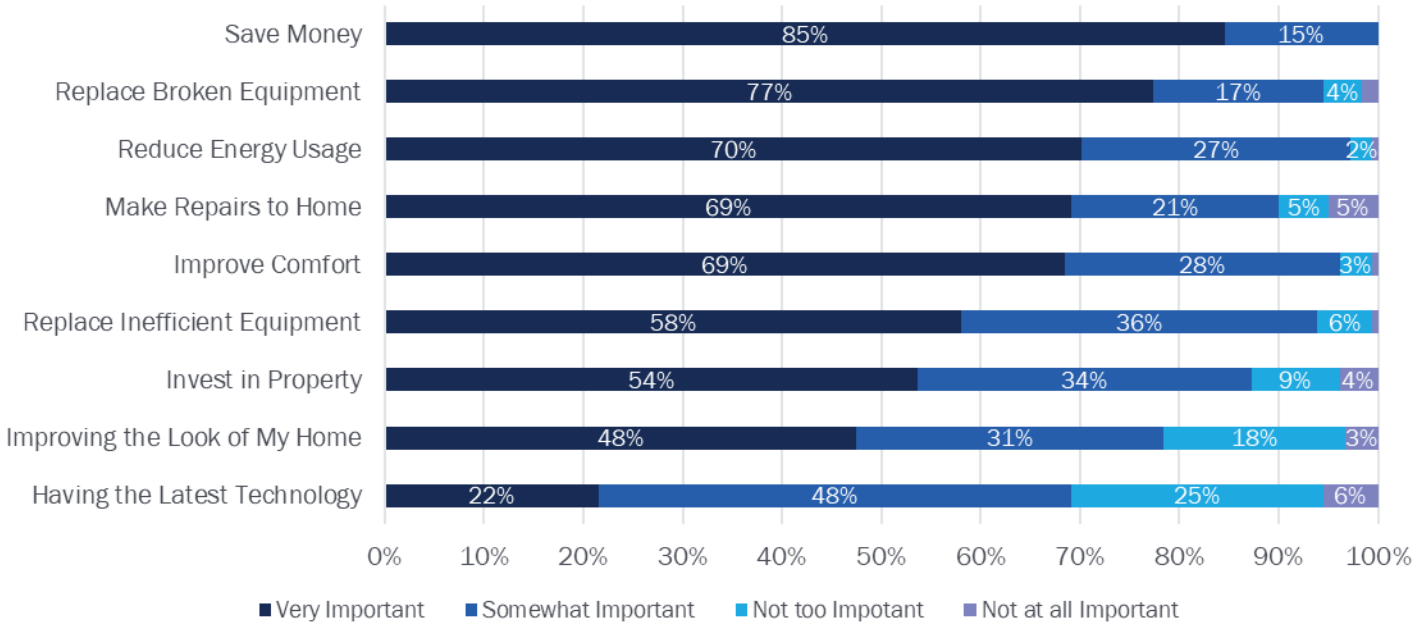
Finally, we asked respondents how influential the availability of financing would be in their decision to replace the home's refrigerator. We observe meaningful differences by market segment. Among underserved respondents, 31%

report that financing would be very influential in their decision, compared to only 12% of market-rate respondents. Overall, 73% of underserved respondents indicate that financing availability would be at least somewhat influential.

7.2.1 GGH PROGRAM AS A VEHICLE TO SUPPORT RESIDENTIAL CLEAN ENERGY FINANCING IN CALIFORNIA

The nonparticipant survey asked what factors were important when considering making home upgrades. As shown in Figure 30, saving money, cited as very important by 85% of respondents, and replacing broken equipment, cited as very important by 77%, were the most important factors when making home upgrades. The least important factor was having the latest technology, with only 21% of respondents indicating this was a very important factor in their decision-making. These factors do not differ meaningfully between market-rate and underserved nonparticipants.

Figure 30. Nonparticipant Decision-Making Factors for Home Upgrade (n=181)



We also asked about nonparticipants' familiarity with various dimensions of the energy efficiency financing space, including alternative programs, financing options, and energy-saving home improvements. Below, Table 56 summarizes familiarity with various home improvement projects currently covered by the GGH program. Overall familiarity with the home improvement options among nonparticipants is generally high, with the lowest awareness being among energy-efficient pool products (38%) and cool roofs (43% market rate, 46% underserved), indicating that the measures covered by GGH are generally known and popular.

Table 56. Proportion of Respondents Very or Somewhat Familiar with Home Improvement Options

Home Improvements	Market Rate (n=103)	Underserved (n=78)
Energy-efficient lighting (e.g., LED bulbs, fixtures, tape lighting)	91%	94%
Energy-efficient appliances (e.g., an energy-efficient refrigerator or dishwasher model, rather than non-efficient versions of the same appliances)	90%	90%
Windows & related upgrades (e.g., efficient windows, glass doors, coverings, window film, awnings)	87%	78%
Energy-efficient water heating (e.g., heat pump or tankless water heaters, water heater tank insulation, shower valves, aerators)	82%	74%
Energy-efficient heating, cooling & HVAC upgrades (e.g., heat pumps, central air conditioners, furnaces, smart thermostats)	78%	82%
Whole home insulation (e.g., attic, wall, floor, duct, pipe, radiant barrier, air sealing)	75%	72%
Clean energy systems (e.g., bundled solar + battery systems, battery storage for existing solar, solar hot water)	74%	65%
Electric Vehicle (EV) charging stations (Wi-Fi-enabled chargers)	72%	62%
Cool roof (a roof that reflects sunlight to stay cooler)	43%	46%
Energy-efficient pool products (e.g., efficient variable-speed pool pumps, pool covers)	38%	38%

Source: Conjoint Survey
Note: Ordered by market rate proportion
Question: How familiar are you with each of the following energy-saving home improvement options?

We also asked respondents how familiar they were with financing options available to Californians. Table 57 presents the proportion of respondents who indicate they are somewhat or very familiar with each financing option. Generally, we find that familiarity with financing options is low, and seemingly even lower than that of standard loan participants (Table 42). The most well-known options were mortgage refinancing options and HELOC loans. Importantly, GGH was essentially unknown to the nonparticipant population, with 92% of market-rate respondents reporting not too familiar or not at all familiar, and 85% of underserved respondents reporting unfamiliarity.

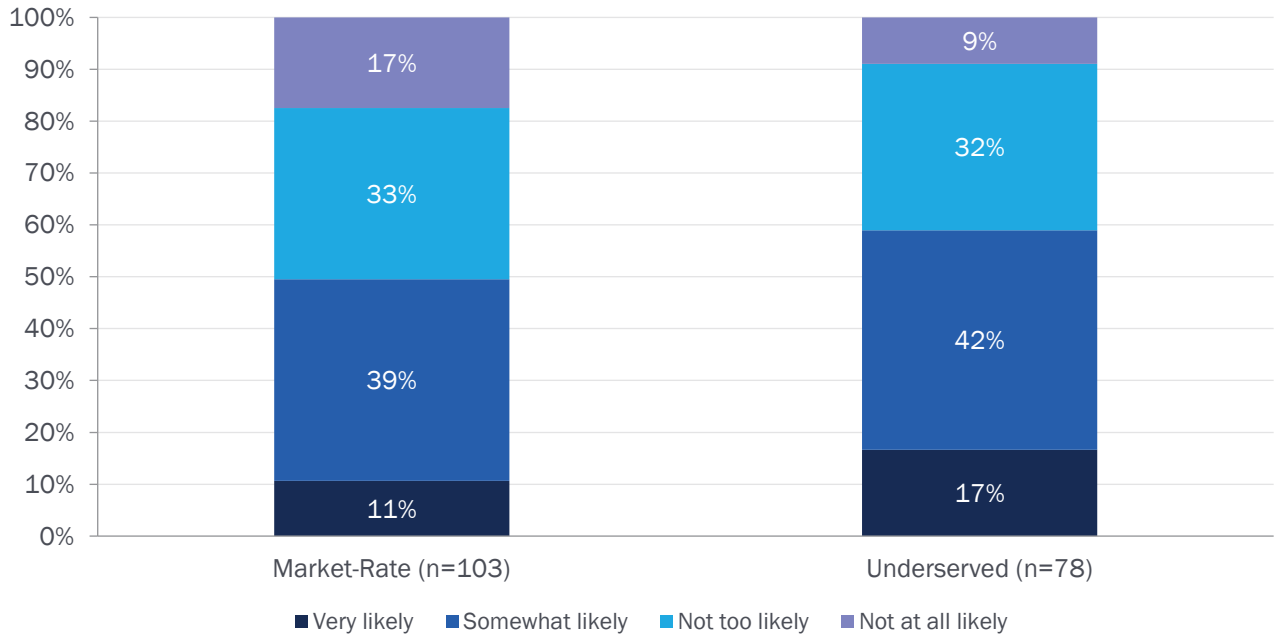
Table 57. Proportion of Nonparticipants Familiar with Financing Options

Finance Option	Market Rate (n=103)	Underserved (n=78)
Mortgage refinancing options (i.e., increasing the size of your mortgage to fund energy upgrades)	66%	37%
Home equity loan or HELOC	61%	45%
Bank home-improvement loan	58%	45%
HERO financing (Home Energy Retrofit Opportunity Program)	14%	15%
Credit union “green” home-improvement loan	11%	19%
PACE (Property Assessed Clean Energy) financing (paid through your property tax)	9%	19%
GoGreen Home Financing	8%	15%
Eco Financing through the Enervee or SoCalGas Marketplace website	7%	19%

Source: Conjoint Survey
Question: How familiar are you with the following financing options available to Californians for energy-saving home improvements?

We also asked respondents to rate how likely they would be to seek financing for future energy upgrades. As shown in Figure 31, large proportions of both groups appear unlikely to seek out financing for future upgrades. Approximately half of market-rate respondents and 41% of underserved respondents report that they are *not too likely* or *not at all likely* to seek out financing, while only 11% and 17%, respectively, report that they are *very likely* to do so.

Figure 31. Likelihood of Seeking Out Financing Options for Future Upgrades



As a follow-up, we asked respondents who indicated that they were unlikely to seek out financing to explain why (n=84). Among market-rate respondents, the most common reason was a dislike of taking on debt (71%), followed closely by a preference for paying cash. These findings closely mirror results from the open-ended conjoint responses, in which similar themes were cited as reasons for rarely using financing. Another major reason was a lack of confidence that home upgrades would generate sufficient savings to make the loan worthwhile (40%). Among underserved respondents, the most frequently cited reason was also a dislike of taking on debt (56%), followed by a preference for paying cash (28%) and a lack of confidence in projected savings (25%).

Overall, these findings suggest that GGH can play an important role as a vehicle for residential clean energy financing by helping to bridge the gap between consumer interest in energy-efficient upgrades and low engagement with financing markets. While nonparticipants express strong interest in cost-saving and practical home improvements and demonstrate broad familiarity with the technologies supported by the program, they exhibit limited awareness of clean energy financing options and a low propensity to seek out such information independently. Concerns about taking on debt, uncertainty around cost savings, and aversion to financial risk further constrain financing uptake. Taken together, the results indicate that GGH is likely to be most effective when financing is presented as a low-uncertainty option embedded within trusted contractor or lender interactions rather than as a product consumers actively search for on their own.

SUMMARY OF CALIFORNIANS' PREFERENCES FOR LOAN ATTRIBUTES

Taken together, the conjoint and stated preference results provide a consistent picture of how Californians evaluate residential clean energy financing programs such as GGH. Across both methods, interest rates are the most influential factor shaping financing decisions for both market-rate and underserved households. Market-rate respondents are especially sensitive to the interest rate, while underserved respondents place greater emphasis on monthly payments and upfront costs, reflecting stronger liquidity constraints and cash flow concerns.

Participant survey findings also suggest that a lack of interest in energy-efficient upgrades does not drive low financing uptake. Participants report using GGH for repairs and cost-saving improvements. Nonparticipants report high familiarity with the technologies supported by GGH. Instead, barriers to financing appear to stem from debt aversion, uncertainty

about affordability and savings, and limited engagement with financing markets. Many respondents prefer not to use financing at all, even under favorable terms, indicating structural limits to the reach of loan-based programs. 11% of market-rate respondents and 17% of underserved respondents say they are very likely to seek financing proactively.

Finally, the stated preference results highlight the importance of low-friction pathways for financing uptake. Households favor familiar, low-commitment payment methods and show only moderate inclination to proactively search for financing options, a pattern consistent with participant surveys showing that most borrowers learn about GGH through lender or contractor channels. Together, these results suggest that maintaining competitive interest rates and reducing monthly payment burdens for underserved households are likely to be the most effective strategies.

8. DETAILED CONCLUSIONS AND RECOMMENDATIONS

This section provides the conclusions and recommendations by research objective supported by the key findings reported above.

8.1.1 RESEARCH OBJECTIVE 1: ASSESS GGH SCALABILITY AND GROWTH

Conclusion 1: The Program has seen strong growth in both standard loan and microloan disbursement; in no small part due to the popularity of newly introduced DER measures.

Quarterly loan originations increased significantly amid a macroeconomic environment of rising interest rates during the evaluation period. For example, the number of loans went from fewer than 500 in the prior evaluation period to more than 1,600 by the second quarter of 2024. This growth was supported by the addition of DER eligibility and strong satisfaction among borrowers, contractors, and lenders—most of whom report they would continue participating in or recommending the program. Survey results further show that GGH financing played an influential role in enabling project completion for most participants, with more than half of standard-loan borrowers and over three-quarters of microloan borrowers stating the loan affected their project decision.

There are two broader economic and policy challenges to continued program growth. First, according to interviewed contractors, the expiration of the Federal Residential Clean Energy Credit, which allowed homeowners to claim a tax credit of up to 30% of the costs of a new clean energy project through 2026, may reduce growth in DER measure adoption. Second, according to data from the Federal Reserve,[49] increases in credit card charge-offs outside of the Program suggest an environment with rising economic stress for potential borrowers, particularly the underserved segment.

Conclusion 2: Satisfied contractors continue to play a crucial role in driving program growth. However, the larger scale of DER projects poses new process-related challenges for some contractors.

Continued growth in standard loan participation remains strongly dependent on contractor engagement. Seventy-one percent of non-DER standard loan participants and 69% of standard loan DER participants reported first learning about the program through a contractor. This pattern is consistent with survey findings showing limited awareness of alternative financing options and low propensity for borrowers to actively search for financing, underscoring the importance of intermediated delivery pathways. Contractor interviews indicate that certain operational barriers can discourage contractors from using GGH, including slow or unpredictable loan approvals, limited visibility into loan status, and cash-flow challenges associated with pay-at-completion structures, particularly for investment-intensive DER projects. In particular, the pay-at-completion structure can create cash-flow strain for contractors who must front project

[49] Based on series CORCCACBS and CORCACBS from Federal Reserve Economic Data, Federal Reserve Bank of St. Louis. Retrieved from https://fred.stlouisfed.org, on February 2026.

costs and wait for reimbursement, posing a meaningful barrier to participation, especially for larger DER projects. While many contractors find the process has some hurdles, lenders generally find the GGH process easy to use.

- **Recommendation:** To support continued growth in standard loans, the program could address contractor cash-flow and process transparency, particularly for DER projects. Introducing partial or milestone-based payments at defined project stages could reduce upfront financial burden, especially for smaller contractors (or those less active in the program), and encourage broader contractor participation. In parallel, implementing standardized status notifications, improving lender integration within the contractor portal, and setting expectations for lender responsiveness may improve predictability, reduce delays, and increase contractor willingness to recommend GGH.

Conclusion 3: Debt aversion and uncertainty of realizing actual cost savings imply a ceiling on the Program's reach. However, the rapid growth of the Program suggests that this ceiling is unlikely to affect scalability anytime soon.

By enabling energy savings or clean energy generation through financed projects, GGH touches California's affordability and decarbonization goals. Sixty-seven percent of microloan participants, 81% of standard loan participants, and 68% of DER participants report that they could not have afforded their home upgrade without financing.

Survey findings suggest that financing frequently determines whether a home upgrade project proceeds at all, particularly in urgent situations, such as equipment failures. GGH also affects the scope and quality of participant upgrades. Among micro-loan recipients, 77% report they would have installed a less expensive measure without GGH financing, and 56% indicate they would have selected non–energy-saving equipment. Similarly, 53% of standard loan recipients report they would have pursued a less expensive project, and 44% say they would have chosen non–energy-saving equipment.

However, a meaningful share of non-participants appear debt-averse. In the conjoint exercise, many respondents selected "none" when presented with financing options, and 60% of underserved nonparticipants report concern about taking on additional debt, and 28% preferred paying in cash. Additionally, 25% of underserved and 40% of market-rate borrowers were uncertain about realizing energy bill cost savings of a home upgrade project. A competitive financing product, alone, will not eliminate some Californians' reluctance to borrow. However, the recent (and substantial) growth in the Program, significant proportions of participants utilizing GGH for urgent needs, and the advent of clean energy financing from other private sources implies that the Program has room for further growth.

- **Recommendation:** The Program should continue supporting both standard loans and microloans as complementary products serving distinct borrower segments. Microloans should remain structured to minimize upfront and monthly burdens, to better align with the needs of debt-averse, cash-constrained households.

8.1.2 RESEARCH OBJECTIVE 2: ASSESS GGH LEVERAGE OF PRIVATE CAPITAL AND ON-THE-GROUND SUPPORT

Conclusion 4: GGH has expanded private capital and on-the-ground capacity, though delivery remains highly concentrated.

The Program has continued to expand both private capital participation and on-the-ground delivery capacity during the evaluation period. During this evaluation period, the program originated approximately $180 million in loans across 10 participating lenders, including six regional lenders and three statewide lenders. Since the prior evaluation, two additional lenders have joined the program, and all active lenders have begun offering loans for DER measures following their rollout. Contractor enrollment has also increased over time, with approximately 1,340 contractors

currently enrolled across most regions of the state, and 2024 marked the highest level of new contractor enrollments observed to date.

Despite this growth, loan origination and project delivery remain highly concentrated among a small subset of participating market actors. More than 50% of standard loans during the evaluation period were originated by a single lender, Travis Credit Union, while California Coast Credit Union accounted for 1,788 of the 6,911 standard loans originated. Contractor activity is also concentrated, with just 15 contractors responsible for approximately 38% of all completed projects. At the same time, more than half of all contractors ever enrolled in the program, approximately 980 contractors, have not completed a single project, and nearly 40% have completed only one to ten projects.

Taken together, these findings suggest that while GGH has successfully leveraged private capital and expanded contractor enrollment, program delivery remains reliant on a relatively small group of highly active lenders and contractors. This concentration may pose scalability risks, leaving many Californians unable to utilize GGH due to lack of program allies in their area. There are opportunities to increase program reach by activating a broader share of enrolled partners.

- **Recommendation a:** To reduce concentration in program delivery, the program should focus on activating enrolled contractors with little or no GGH activity across the portfolio. Potential actions include targeted outreach to inactive or low-volume contractors, brief re-engagement or refresh trainings, and enhanced onboarding support for contractors completing their first projects, such as checklists or dedicated assistance during initial applications. The program could also incorporate sales training, including scripts and guidance on how to discuss financing options with customers. Additionally, the program can provide guidance that helps contractors identify participating lenders by geography, specialization (e.g., DER vs. non-DER), and service performance, so contractors can more easily partner with lenders that meet their business needs. The Program can also test targeted incentives and operational improvements that reduce participation barriers for contractors (and lenders) with few completed projects.
- **Recommendation b:** There are non-participating credit unions that offer products similar to GGH standard DER loans; however, GGH rates are often more competitive than comparable private alternatives. Proactively engage credit unions that offer these DER loan products in the GGH program by emphasizing the benefits of the loan loss reserve and other risk-mitigation features. We also find that GGH's offering of unsecured DER loans of $75,000 are quite rare within the market, and many interviewed lenders indicated they would be unable to offer a product at that level without GGH support. As a result, GGH enables credit unions to provide loans of this size to members interested in installing clean energy measures. This expanded lending capacity is another benefit GGH can highlight to encourage new lender participation in light of the DER measure expansion.

Conclusion 5: Interest rates are the most important loan attribute for most potential borrowers. But monthly payment burden is also an important consideration for potential underserved borrowers.

Both survey and conjoint findings indicate that interest rates are the dominant driver of financing choice. In the conjoint exercise, interest rates was the most important determinant of loan selection for both market-rate and underserved respondents by a substantial margin. This suggests that maintaining interest rate competitiveness is central to sustaining demand.

Borrower responses also vary across segments. Underserved households report greater concern about debt and demonstrate stronger sensitivity to monthly payment burdens in the conjoint analysis. This pattern suggests they may be less likely to pursue larger, capital-intensive projects even when financing is available. Maintaining differentiated products, therefore, remains important. Standard loans appear well-suited to borrowers who are optimizing total borrowing costs and undertaking larger upgrades, while microloans are particularly important for risk-averse and cash-constrained households.

GGH loans appear generally more favorable than comparable unsecured signature loan products offered by participating lenders. Across lenders, standard GGH loan interest rates were up to 11.2 percentage points lower than comparable signature loans and averaged 3.7 percentage points lower. Repayment periods were up to 102 months longer, averaging 25 months longer, and almost all standard GGH loans had lower calculated monthly payments, averaging $71 less and up to $1,212 less in some cases. These patterns suggest that GGH offers more affordable terms than private alternatives available through participating lenders. GGH remains competitively positioned and continues to play a meaningful enabling role for many borrowers.

- **Recommendation:** Given the central importance of interest rates in borrower decision-making, the Program should prioritize strategies that preserve low interest rates, including continued optimization of risk mitigation tools such as the LLR. Preserving the program's low interest rates is especially important in the current high-rate environment, where borrowing costs remain elevated and future rate movements are uncertain.

8.1.3 RESEARCH OBJECTIVE 3: GAUGE GGH REACH OF UNDERSERVED CALIFORNIANS

Conclusion 6: Elevated risk with microloans may limit underserved borrower participation in the program overall.

Microloans exhibit a distinct participation pattern and a substantially different risk profile compared to standard loans. Microloans remain the program's primary mechanism for engaging underserved Californians. Microloan recipients have lower household incomes and credit scores, are more likely to live in lower- and middle-income areas, and are more dependent on GGH financing for project initiation and for undertaking EE projects. Moreover, appliance financing through microloans is the only proven way so far to reach renters.

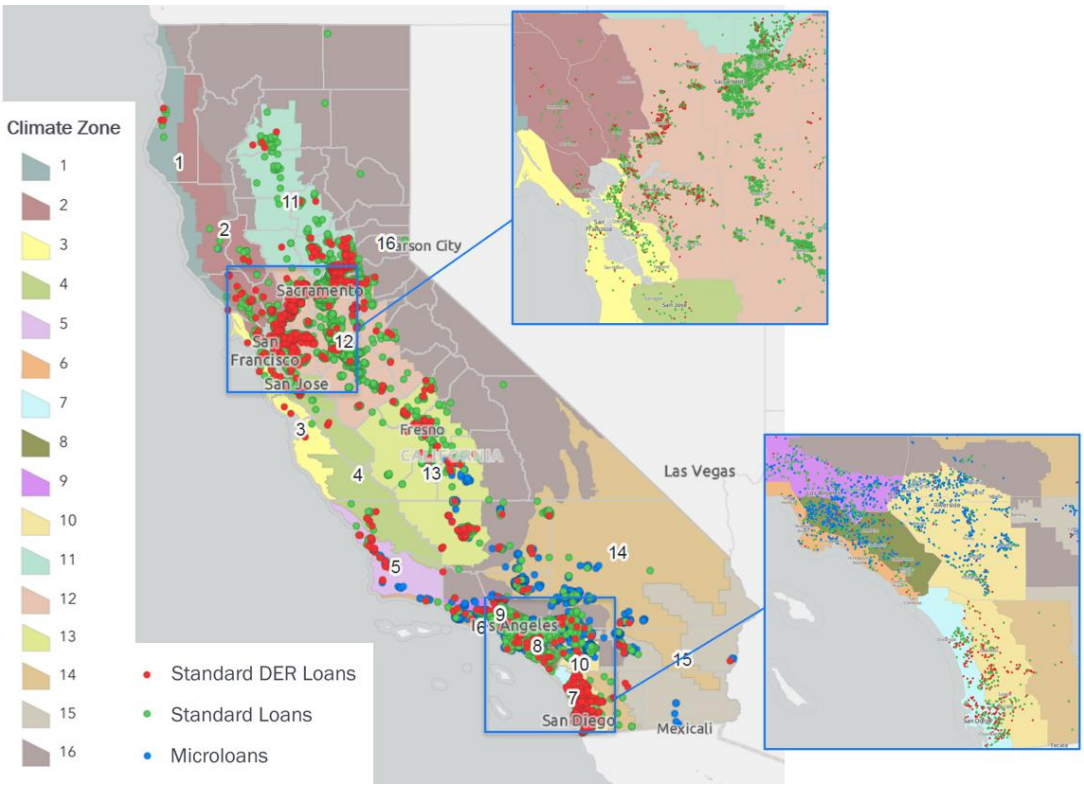
Lender interviews indicate potential constraints on the long-term viability of offering microloans under current program parameters. According to lenders, given prevailing financial market conditions, microloans may no longer be commercially viable to originate using the Program's current method for setting maximum allowable interest rates, given its default risk and loan sizes. Micro-loans also generate less revenue than standard loans, but many costs are fixed across both loan types further reducing profit margins for micro-loan lenders. The default rates among standard loans remain low, averaging approximately 1%; however, microloans experience a much higher default rate of approximately 16%. If default rates rise and trigger greater program payments to lenders, progress toward achieving a self-sustaining program is diminished.

- **Recommendation a:** The Program can increase LLR contributions for microloans, reflecting the higher risk. The drawback of this option is that it implies a larger role for ratepayer funds.
- **Recommendation b:** Under current GGH Program regulations, the interest rate cap is tied to the yield on new 10-year U.S. Treasury bonds plus 750 basis points. An additional risk premium allowance can further rationalize microloan interest rates. While this will increase direct costs for borrowers, it can reduce the likelihood of a decline in the creditworthiness of the same borrowers due to defaults.

Conclusion 7: While overall program participation has expanded, there remain underserved gaps in certain regions of California

Although the program has grown overall during the evaluation period, participation remains limited in several regions of the state. Participation is low in the central corridor, north, and north-east regions (see Figure 32). Participation patterns are shaped by factors such as the locations of enrolled lenders and contractors, IOU service territories, and regional market characteristics. In addition, some areas in the north and east may have lower participation due to lower population density.

Figure 32. Geographic Distribution of Loans by Loan Type



Note: The California Energy Commission established 16 climate zones for building energy-efficiency standards based on Heating Degree Days (HDD) and Cooling Degree Days (CDD), energy-use profiles, geographic boundaries, budgets, and more.[50] All areas within a zone share similar energy-relevant weather conditions.

Many low-participation regions include disadvantaged communities and areas with higher concentrations of underserved borrowers, suggesting an opportunity to increase participation while advancing equity goals. Except for the central corridor, these regions are not served by a regional lender. Evaluation findings indicate that contractors are present in some of these regions despite low program activity. Together, this suggests that contractor and lender enrollment alone does not necessarily translate into sustained participation. Contractors in these areas may choose not to offer GGH financing consistently due to factors such as limited customer demand, administrative considerations, or the availability of alternative financing options.

- **Recommendation a:** The program could explore low-cost, region-specific strategies to increase engagement among lenders and contractors already operating in low-participation areas, with a particular focus on contractors who are registered but have little or no recent GGH activity in those regions. Collaboration with the community choice aggregators and reginal energy networks in these areas, targeted communications, regionally tailored refresh trainings, or reminders of program benefits, may help determine whether low participation reflects limited awareness, local market conditions, or other region-specific barriers. The Program should also provide tailored education and resource materials to lenders and contractors on complementary programs available to eligible customers, including DER-focused initiatives for disadvantaged communities (e.g., DAC-SASH and similar offerings). This is especially important for contractors. While some lenders operate statewide and use standardized, professionalized lending processes, meaning a relatively small number of well-run lenders could potentially serve many regions, contractors are typically far more geographically constrained and ultimately drive most program participation.

[50] CEC. Climate Zone Tool, Maps, and Information (2025). Accessed here.

- **Recommendation b:** Before pursuing expansion in low-participation regions, the program could invest limited effort in understanding the operating conditions and needs of contractors in lower-density or rural markets. Targeted focus groups, interviews, or similar feedback mechanisms may help assess feasibility and identify potential program adjustments that could improve contractor participation in these areas.

Conclusion 8: Credit enhancements improved targeting of credit-challenged borrowers, though risks remain.

The 2024 credit enhancement policy change improved the targeting of LLR funds toward more credit-challenged borrowers without reducing participation among borrowers in low- and moderate-income (LMI) census tracts. Prior to the change, 52% of standard loans were classified as underserved and received credit enhancements despite being issued to borrowers with credit scores above 700. After the change, this share declined sharply to approximately 2%, indicating improved alignment between borrower credit risk and use of credit enhancements. The alignment also improved for microloans, with the share of microloans classified as underserved increasing from 78% to 81% following the policy change. Importantly, LMI participation did not decline, suggesting that improved risk targeting did not come at the expense of geographic equity.

However, analysis of debt-to-income (DTI) ratios suggests that some higher-risk borrowers may not have received credit enhancements under the revised framework. After the policy change, approximately 33% of standard loans and 38% of standard-DER loans issued to borrowers with higher DTI ratios did not receive credit enhancements, potentially limiting the depth of risk mitigation available to lenders during periods of economic stress.

- **Recommendation:** The program could consider incorporating borrower debt-to-income ratios alongside credit score and other existing criteria when targeting credit enhancements. Doing so may further refine risk targeting, support more effective use of LLR funds, and strengthen lender confidence while maintaining access for underserved borrowers.

8.1.4 RESEARCH OBJECTIVE 4: VERIFY GGH ENERGY SAVINGS AND FUEL SUBSTITUTION IMPACTS

Conclusion 9: The Program increased its GHG emission reductions substantially, both in aggregate and per project.

The Program financed natural gas and electricity savings measures, electrification measures, and clean energy generation measures. Since we expect reductions in gas consumption and both increases and decreases in electricity consumption, the key metric of program impact is emissions reduction. In this regard, the GGH program was successful and reduced emissions by 2,368 tCO_2. This translates to approximately 0.24 tCO_2 in emissions reductions per project, almost double the value in the previous evaluation (0.15 tCO_2 per project). Standard-loan projects accounted for 96.5% of the reductions. In standard-loan projects, the per-project GHG reduction is much higher for heat pump and DER projects.

The GGH Program continued to show strong performance in reducing energy consumption. Natural gas consumption reductions total 218,035 therms, with approximately 95% attributable to standard loans. Electricity consumption reductions total 15,044 MWh, whereas clean energy impacts total 6,209 MWh. Moreover, there is suggestive evidence that the mandatory inclusion of battery with solar may have further helped with peak load management as well, due to accurate programming of batteries based on time-of-use electricity rates throughout the state.

- **Recommendation:** The Program has progressed beyond energy savings as the primary metric for success. Given the introduction of DER projects, primarily solar and battery, clean energy generation as well as GHG emission reductions should be key metrics of program success henceforth. Additionally, a rigorous study of load shape

impact can illuminate previously undocumented peak-load impact of the DER measures installed through the Program, giving a more comprehensive picture of the package of benefits offered by the GGH Program.

Conclusion 10: There is substantial variation in impacts within different measures financed through standard loans.

The difference in measures through microloans and standard loans is well-documented and expected, given the typical costs and impacts of these measures. As an exploratory analysis, we estimated impacts by key measure categories and found that electric and gas impacts vary substantially by participant type and measures installed.

Based on program tracking data, approximately 21% of participants installed known fuel-switching measures and, as expected, experienced increases in electric consumption associated with electrification, averaging roughly 1,000 kWh per year depending on the presence of solar, and reduced annual natural gas consumption by 217 therms, roughly six times the energy equivalent of electric consumption. Additionally, approximately 13% of participants financed DER projects, primarily solar installations or expansions with battery, and generated 7,212 kWh per year, or roughly 55%.

Overall energy impacts for standard loan recipients who did not install DER projects or undertake fuel-switching measures are modest, with estimated electricity savings averaging approximately 2% for households without pre-existing solar. Electricity impacts for similar households with pre-installed solar power is statistically undetectable. Among participants with gas services who did not install fuel-switching measures, the average annual gas savings were 28 therms.

The limited electric savings observed among non-DER, non-fuel-switching standard loan recipients appear to be driven in part by the prevalence of a few popular upgrades, particularly cool roofs, windows, and doors, which together account for a substantial share of standard loans. Cool roofs represent approximately 12% of standard loans, while windows and doors account for approximately 7%. Exploratory analysis indicates that the estimated electric and natural gas savings associated with these measures are not statistically distinguishable from zero, whereas HVAC-related upgrades show savings of 6% from baseline. Additionally, the expected savings from cool roofs, windows, and doors are low compared to other measures installed through standard loans, despite costing more and not serving the underserved population.

- **Recommendation:** Given the limited evidence of energy savings (or other notable program impacts) from cool roofs and windows and doors relative to their program cost, the Program could consider whether these measures should be eligible for GGH loans (unless bundled with other measures as part of a whole-home project). This can help the Program rationalize eligibility of measures, should financing funds be limited in the future. Another option is to prioritize continued availability in regions or climate zones where these measures are more likely to deliver savings. Existing tools, such as the California Building Code climate zone guidance, could support a low-cost, stepwise implementation. However, this may cause difficulty for contractors and borrowers and reduce their ease of participation.

Conclusion 11: Current fuel switching data tracking protocols may be underrepresenting overall program impacts.

As discussed, fuel-switching projects have a large impact on natural gas reduction and increase electricity consumption. The CAEATFA does not collect baseline heating, cooling, or water-heating data and defines fuel switching indirectly. The Program has a list of measures, such as heat pumps, that constitute fuel switching in data tracking. Based on consumption data analysis and survey responses, there is likely a 5%-12% undiagnosed fuel-switching rate (described in more detail in Appendix D) among participants with both electricity and natural gas data. This can lead to mismeasurement of electricity and emissions reduction impacts.

- **Recommendation:** Refine fuel-switching data tracking at the project level to reduce misclassification across loan types. Mandatory collection of initial fuel data from contractors or participants can be the easiest way to accurately track fuel switching and ensure all program impacts are represented in evaluation.

APPENDIX A. ACRONYMS AND TECHNICAL TERMS

Abbreviation/Acronym/Terms	Description / Definition
AIC	Akaike Information Criterion
AMI	Area median income
APR	Annual percentage rate: a measure of interest rate plus additional fees charged on the loan
ART	Automated response technology
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CalEnviroScreen	Tool that identifies communities disproportionately burdened by multiple sources of pollution and socioeconomic stressors
CARE	California Alternate Rates for Energy
CCI	California Climate Investments
CDD	Cooling degree days
CDH	Cooling degree hours
CEC	California Energy Commission's
CHEEF	California Hub for Energy Efficiency Financing
CPAU	City of Palo Alto Utilities
CPUC	California Public Utilities Commission
Credit-challenged	Borrowers with a credit score of 580 to 640
Credit-enhancement	Percentage of original loan amount placed into LLR, 20% for underserved borrowers, 11% for market rate borrowers
CU	Credit union
DAC	Disadvantaged community
DER	Distributed energy resources
DSGS	Demand side grid support
DTI ratio	Debt-to-income ratio: calculated as monthly debt payments divided by gross monthly income
Default	Borrower fails to make the required interest or principal repayments on a debt
EAPR	Energy assistance program rate
EBD	Equitable building decarbonization
EE	Energy efficiency
EEM	Eligible energy measure
EEEM	Eligible energy efficiency measure
ESA	Energy Savings Assistance Program
Evaluation Period	The period covered by the new research detailed in this report: July 2023–June 2025
EV	Electric vehicle
FERA	Family Electric Rate Assistance Program
FICO Score	Fair, Isacc and Company score, i.e., credit score
FSC	Fuel substitution calculator
GGH Program	GoGreen Home Financing Program
HDD	Heating degree days
HDH	Heating degree hours
HELOCs	Home equity line of credit

Abbreviation/Acronym/Terms	Description / Definition
IOU	Investor-owned utility
Impact Analysis	Analytical methods used to estimate the outcomes of program-funded measures, such as energy savings, demand reductions, and emissions impacts, using approaches such as consumption analysis and deemed savings.
IRBD	Interest rate buy-down
ISD	Integrated surface database
LIHEAP	Low Income Home Energy Assistance Program
LLR	Loan loss reserve: ratepayer funds set aside as an allowance for potential uncollected loans and loan payments
LMI census tract	Low-to-Moderate-Income census tract: defined by the GGH Program as census tracts in which the tract median family income does not exceed 120% of the metropolitan area, county, or state area median family income
LMI Household	Low-to-Moderate-Income household: defined by the GGH Program as households with a combined income at or below the current annual income limits as determined by the California Department of Housing and Community Development, according to county and family size, and adopted in Section 6932 of Division 1 of Title 25 of the California Code of Regulations.
Measure	Specific technology, equipment type, or intervention that provides energy-related benefits to the customer and/or the electric grid
NCEI	National Centers for Environmental Information
NEM	Net Energy Metering
NGEN	National Green Energy Network
NMEC	Normalized Metered Energy Consumption
PACE	Property Assessed Clean Energy
Pilot period	The period covered by the Pilot program: July 2016–June 2018
Private Capital	Investment in assets not available on public markets
POU	Publicly owned utility
RACC	Refrigerant Avoided Cost Calculator
Rebate/Incentive	A portion of the purchase price offered as a discount or funds
REEL Pilot	Residential Energy Efficiency Loan Assistance Pilot
SCE	Southern California Edison
SES	Socioeconomic status
SGIP	Self-Generation Incentive Program
Signature Loan	Otherwise applicable loan terms, absent the GGH Program, given borrower characteristics
SMUD	Sacramento Municipal Utility District
TOU	Time-of-use
Tracking Data	Program-level data collected and maintained by administrators to monitor participation, implemented measures, and project characteristics over time
TWFE	Two-way fixed effect model

APPENDIX B. CPUC UNDERSERVED CRITERIA

Table 58. CPUC Definitions for Environmental and Social Justice and Disadvantaged Communities

Equity Segment Category	Definition
Hard-to-Reach	Customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a combination of language, geographic, income, and split incentive barriers. Two criteria are considered sufficient if one of the criteria met is geographic: ▪ **Language** – Primary language spoken is other than English ▪ **Geographic** – Homes in disadvantaged communities (as designated by CalEPA) and/or areas other than the United States Office of Management and Budget Combined Statistical Areas of the San Francisco Bay Area, the Greater Los Angeles Area, and the Greater Sacramento Area or the Office of Management and Budget metropolitan statistical areas of San Diego County ▪ **Income** – Those customers who qualify for the CARE or FERA programs ▪ **Housing Type** – Multifamily and mobile home tenants (rent and lease)
Underserved	A community that meets one of the following criteria: ▪ **"Disadvantaged communities,"** or communities in the 25% highest scoring census tracts according to the California communities Environmental Health Screening Tool (CalEnviroScreen); as well as all California tribal lands, census tracts with median household incomes less than 60% of state median income; census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0; and census tracts that score in the highest 5% of Pollution Burden within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data. ▪ **"Low-income communities,"** or census tracts with median household incomes at or below 80% of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits. ▪ Is within an area identified as among the **most disadvantaged 25%** in the state, according to the CalEPA and based on CalEnviroScreen. ▪ A community in which at least **75% of public-school students are eligible to receive free or reduced-price meals** under the National School Lunch Program. ▪ A community **located on lands belonging to a federally recognized California Indian tribe**.
Disadvantaged Communities	Communities in the 25% highest scoring census tracts according to CalEnviroScreen; as well as all California tribal lands, census tracts with median household incomes less than 60% of state median income; census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0; and census tracts that score in the highest 5% of Pollution Burden within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data.

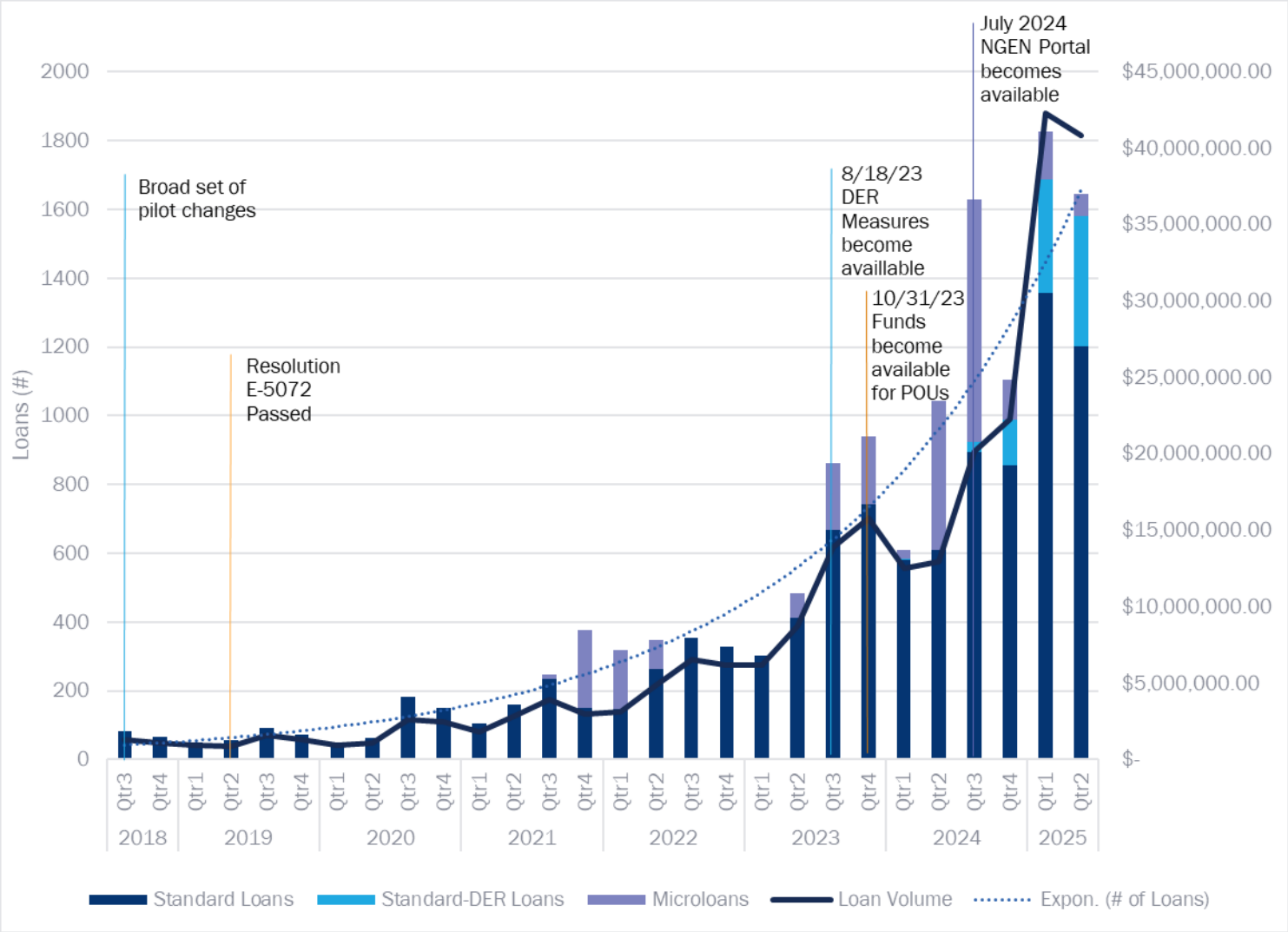
Source: CPUC. Environmental & Social Justice Action Plan Version 2.0. April 2022. esj-action-plan-v2jw.pdf (ca.gov). The disadvantaged community status was slightly modified in accordance with Senate Bill 535's Final Designation of Disadvantaged Communities, finalized in May 2022.

APPENDIX C. SUPPLEMENTAL DATA ANALYSIS

NUMBER AND GEOGRAPHIC DISTRIBUTION OF LOANS

Figure 33 shows the number of loans per quarter from the beginning of the last evaluation period (Q3, 2018) to the end of this evaluation period (Q2, 2025). For this graph, the study team used loan loss reserve funding dates to mark the inception of each loan for consistency across evaluation periods.

Figure 33. Number of Loans by Quarter, 2018-2025



Note: Unlike the previous evaluation, this figure uses loan origination rather than enrollment date. This choice was necessitated by an identified issue in tracking data, which documented enrollment dates for some loans far after the projects were initiated. However, this does not affect our main conclusion that the program expanded far faster in the July 2023–June 2025 period than in previous time periods.

Figure 34 and Figure 35 show the geographic distribution of loans by credit enhancement, overlayed with disadvantaged community (DAC) census tracts. Respectively, they show this distribution before and after the policy shift. The proportion of non-credit-enhanced loans increased after the policy shift, without a shift in loans away from DAC regions.

Figure 34. Geographic Distribution of Loans by Credit Enhancement and Disadvantaged Communities (pre-2024)

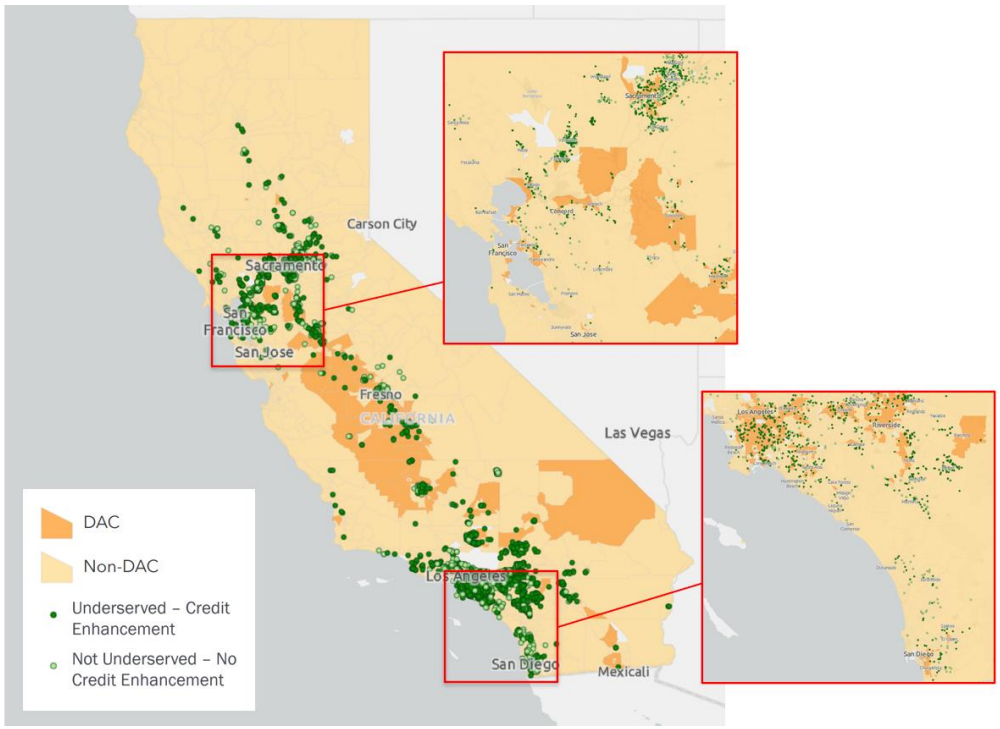


Figure 35. Geographic Distribution of Loans by Credit Enhancement and Disadvantaged Communities (2024 – June 2025)

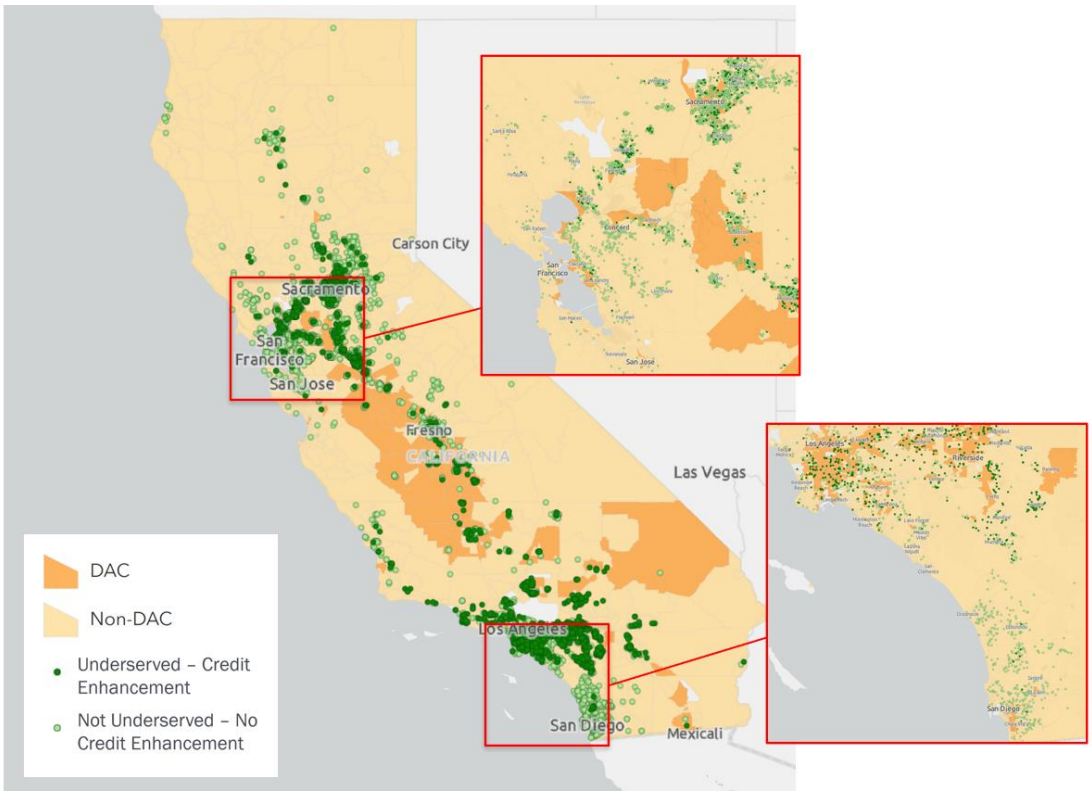


Figure 36 shows that the majority of enrolled and listed contractors are located in Southern California, the Bay Area, and Sacramento. The counties with the highest numbers of enrolled and listed contractors are Los Angeles, Riverside, Orange, Sacramento, San Bernardino, San Diego, and Contra Costa, all of which have over 250 contractors.

Figure 36. Geographic Distribution of Enrolled and Listed Contractors

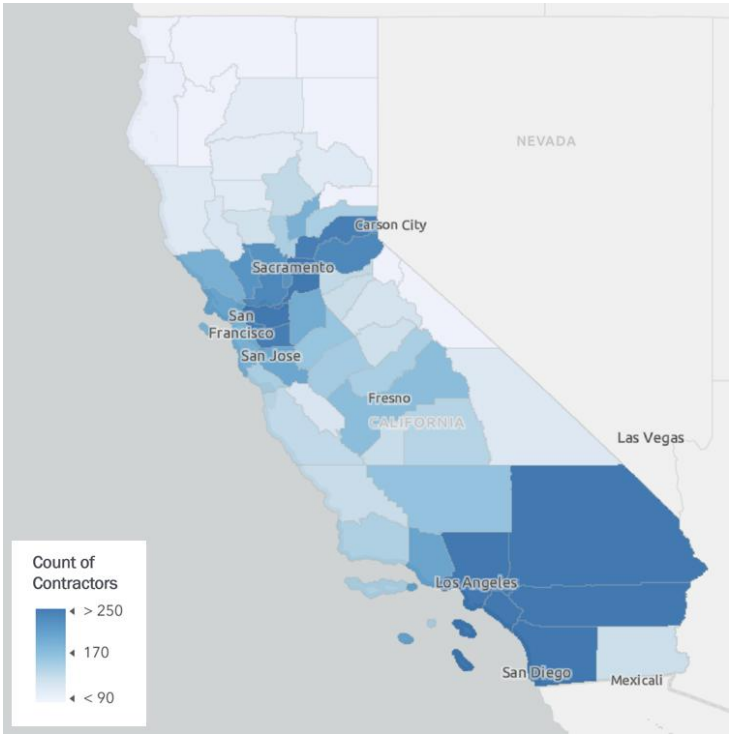
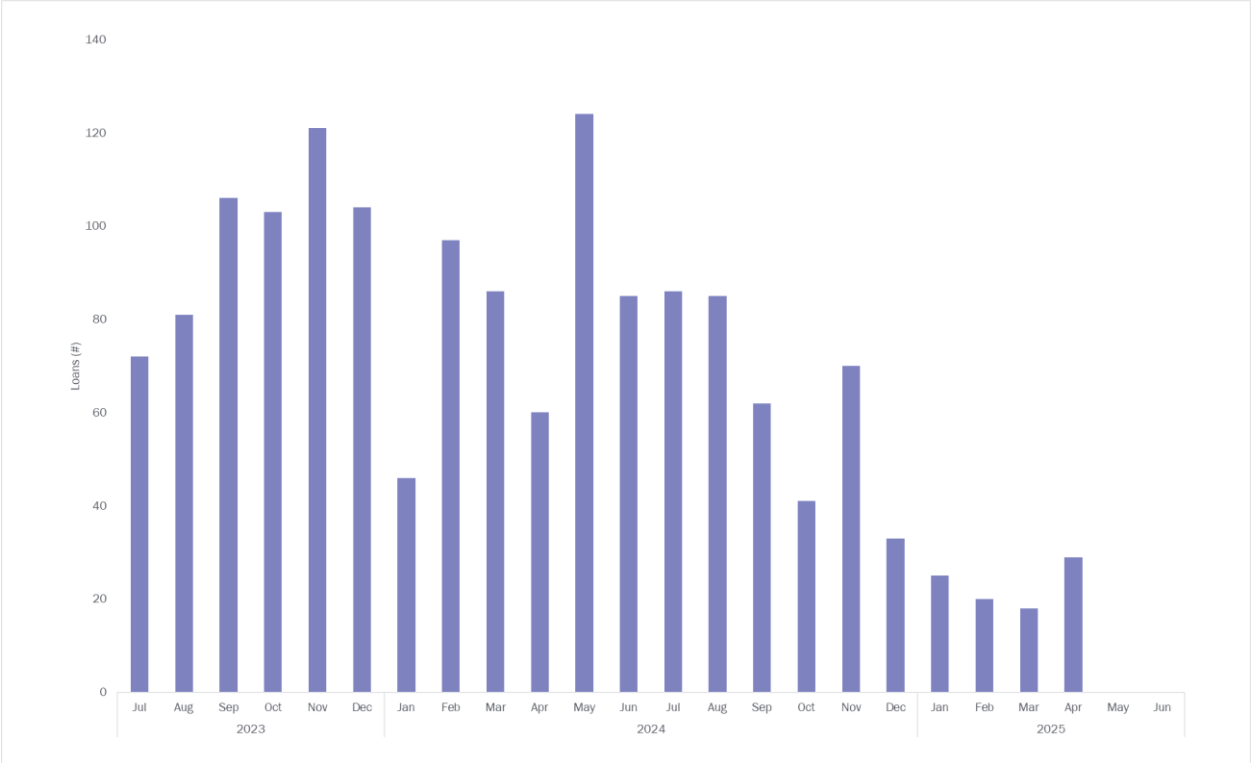


Figure 37. Number of Microloans Over Time, July 2023 and Onwards



WHOLE HOME EE FINANCING

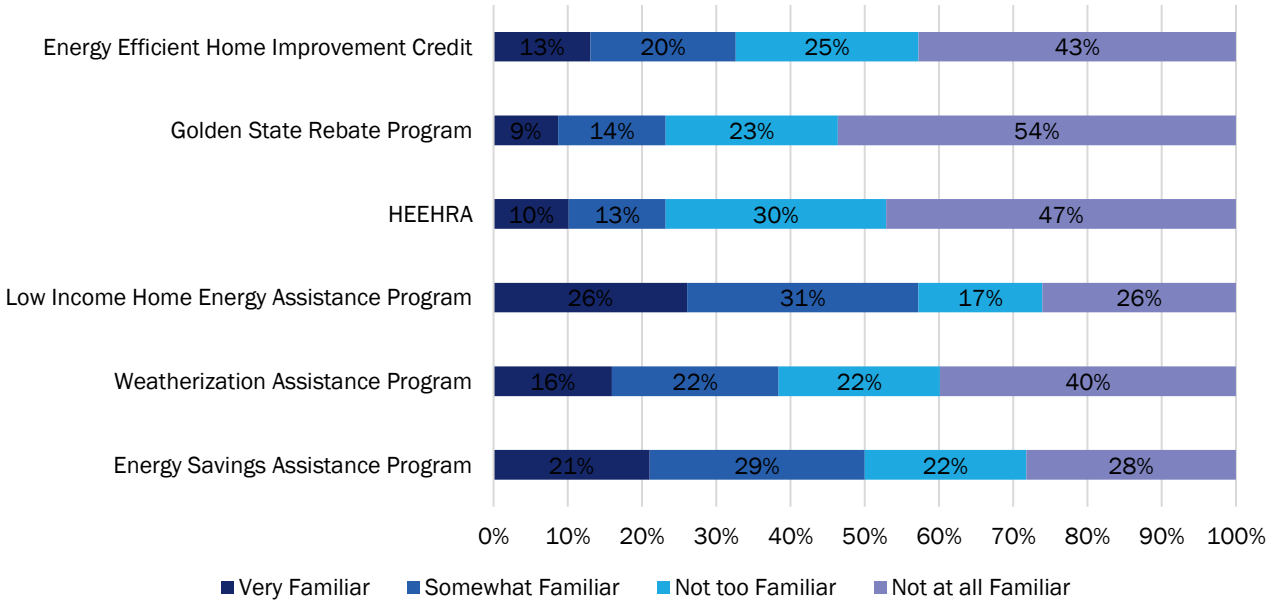
Another option for financing energy efficiency measures is the Energy Efficiency Mortgage (EE-Mortgage). EE-Mortgage can be used to buy or refinance a home that is already energy-efficient or will become more efficient through upgrades. One potential challenge for borrowers is the requirement for a home energy assessment or rating before getting financing approval. The benefit of an EE-Mortgage is that it considers the expected utility savings from energy improvements, which can help borrowers qualify for a larger mortgage or better terms. There are two main conventional EE-Mortgage programs: Fannie Mae's HomeStyle Energy and Freddie Mac's GreenCHOICE mortgage. These programs let borrowers include the cost of energy upgrades directly in their mortgage. However, it is essential to note that EE-Mortgage programs are not a direct replacement for GGH loans, as they are typically used to purchase or refinance entire homes rather than for standalone retrofit projects.

Table 59. Characteristics of Alternative EE Financing Options

Loan Terms	Fannie Mae's Homestyle	Freddie Mac's GreenCHOICE Mortgage
Type	Secured	Secured
Payback Period	Same as mortgage	Same as mortgage
Interest Rate	Not specified	Not specified
DTI Ratio	36%–45%	45%
Credit Score	620	620

MICROLOAN PARTICIPANT FAMILIARITY WITH ALTERNATIVE PROGRAMS

Figure 38. Microloan Participant Familiarity with Alternative Programs (n=138)



BORROWER CHARACTERISTICS BY PROJECTS WITH WINDOWS AND DOORS AND COOL ROOF

Table 60. Borrower Characteristics, Windows and Doors, and Cool Roof Vs. Others

Characteristics	Windows and Doors & Cool Roof	All other measures
Credit Scores		
580–640 (Fair)	1%	14%
641–700 (Fair/Good)	8%	12%
701–760 (Good/Very Good)	22%	17%
761–820 (Very Good/Exceptional)	45%	36%
821+ (Exceptional)	24%	21%
DTI Ratio		
Under 25% (Less risk)	29%	24%
26%–35% (Some risk)	31%	23%
36%–45% (More risk)	25%	19%
46%–55% (Most risk)	15%	9%
Data Unavailable	<1%	24%
Property in LMI		
Yes	62%	63%
No	38%	37%
Project Quantity and Costs		
Number of Projects	1,714	6,204
Total Project Costs	$23,248	$17,778

Source: CAEATFA tracking data

APPENDIX D. ANALYSIS OF FUEL-SWITCHING FLAG

The evaluation team conducted supplemental analyses to assess the accuracy of the heating and cooling fuel-switching flag included in the tracking data. When both natural gas and electricity consumption data were available, the consumption patterns and fuel-switching flags were jointly analyzed to assess whether weather-dependent consumption patterns are consistent with expected fuel switching (a reduction in natural gas usage paired with an increase in electricity usage following relevant measure installation). Second, in surveys, participants were asked what fuel they used before and after program participation for heating, cooling, and water heating, and their responses were compared with measures provided through the Program.

The consumption-based validation analysis focused on projects with installed measures that could plausibly lead to fuel switching in weather-dependent end uses. Based on the evaluator's assessment , these measures include heat pumps, heat pump water heaters, central heating system replacements, and tankless water heaters. Depending on the initial fuel source, these measures could involve fuel switching.

Among participants who received the aforementioned measures, we restricted our analysis to those with both gas and electric data for at least one year of post-participation data. The analysis leveraged daily electric and gas consumption data to estimate average pre- and post-participation weather-dependent consumption at the project level. These were then expressed as a percentage change from the pre-period baseline.

Among participants with both gas and electric data, 1,308 were identified as potential fuel-switching instances based on the financed measures. This was mostly driven by installing Central Heating (Furnace) and an Air Conditioning System. To detect fuel switching and weather-dependent energy consumption patterns, the evaluation team tested two different thresholds:

1. **Evaluation-Estimated Impact Thresholds**: In the second scenario, thresholds were based on gas and electric percentage impacts estimated directly from the evaluation's regression models. These thresholds reflect observed program impacts rather than deemed assumptions. The threshold used for gas reduction is 51%. For the increase in electricity consumption, the threshold is exceeded by 32% for NEM participants or 13% for non-NEM participants. Using these thresholds, 161 participants met the fuel-switching criteria, of whom 83 were flagged as fuel-switchers in the tracking data. This threshold yields a 5% undiagnosed fuel-switching rate among participants with both electricity and natural gas data.
2. **Deemed Savings-Based Thresholds:** These were derived from the 2023 CAEATFA deemed savings values for decarbonization and fuel substitution measures.[51] These savings were translated into expected percentage changes relative to participant-specific baselines. Under this scenario, participants were classified as exhibiting fuel-switching behavior if they had a gas consumption reduction exceeding 30% and an electricity increase exceeding 29% for NEM participants or 10% for non-NEM participants. Using these criteria, 253 participants exhibited consumption changes consistent with fuel switching, of whom 115 were flagged as fuel switching in the tracking data. This threshold yields an 11% undiagnosed fuel-switching rate among participants with both electricity and natural gas data.

Survey responses provide a similar picture. Among the 68 participants who responded to all fuel-switching questions in the survey, eight participants met the following criteria: i) received measures that could potentially lead to fuel switching, ii)reported switching fuel for heating, cooling, or water heating after program participation, and iii) was not flagged as fuel switching in the tracking data. This approach yields a 12% undiagnosed fuel-switching rate among participants with both electricity and natural gas data.

[51] These thresholds were derived from the 2023 CAEATFA deemed savings values for decarbonization and fuel substitution measures. Deemed Energy Savings: 2023 Year-End Report

These results suggest that tracking data fuel-switching flag underestimates fuel-switching activity. For accurate tracking, we suggest capturing initial fuel-source data to support potential fuel-switching measures. Next, we produced suggestive evidence of the effect of the unclassified fuel switches on impact estimation. Particularly, we focus on only gas analysis since the fuel switcher signal is more easily identifiable for gas projects.

As part of modeling process, we evaluated whether some participants not marked as fuel switching may nonetheless have installed fuel-switching measures financed through the program. Specifically, we identified participants exhibiting very large pre- to post-period gas reductions (defined as reductions of 80% or more) and examined their corresponding electric consumption patterns. We identified a total of 51 participants which represent an additional 1% of the modeled participant population. We found that most of these participants experienced deep gas reductions alongside meaningful increases in winter electric consumption – patterns consistent with electrification of heating end uses.

Although this subset represents a relatively small share of total participants, its presence is meaningful. Removing these likely unflagged fuel-switching participants from the non-fuel-switching cohort further reduces estimated gas savings for that group from an estimated 28.3 to 22.0 therms per year – a reduction of 22%. As a result, the modest gas savings observed for the non-fuel-switching cohort (28 therms per year, or 7%) are likely influenced by the presence of unflagged fuel-switching households, which overstates observed savings within this group. It should be noted that this issue does not lead to a lower estimated program savings. Rather, it does not properly account for savings from fuel-switching and non-fuel-switching projects.

APPENDIX E. DETAILED IMPACT ANALYSIS METHODOLOGY

The sections below describe the methodological approaches used to estimate energy impacts under the GGH Program. The program provided two types of loans, standard loans and microloans, which differ substantially in size and in the types of measures installed. For standard loans, which typically support more comprehensive energy efficiency and electrification measures, the evaluation team applied a consumption analysis approach to estimate first-year annual energy savings, following the methodology detailed below. In contrast, microloans were primarily used to install individual appliances and are expected to produce relatively small reductions in energy use. As such, a consumption analysis is unlikely to statistically detect savings. Therefore, the energy impacts of microloans were estimated using a deemed savings approach, as described in the Deemed Savings Analysis (for Microloans) section.

CONSUMPTION ANALYSIS

Opinion Dynamics conducted a consumption analysis using electric and gas advanced metering infrastructure data to estimate the overall weather-normalized electric and gas energy savings for participants who financed their projects through standard loans between July 2023 and June 2025. In preparing the data and developing the consumption models, the evaluation team was guided by the following key analytical considerations:

- **Net Energy Metering (NEM):** Identifying customers enrolled in NEM, accounting for NEM adoption occurring during either the pre- or post-installation period and differentiating between NEM and non-NEM customers within the modeling framework to ensure appropriate interpretation of changes in net consumption.
- **Fuel Switching:** Distinguishing between fuel-switching and non-fuel-switching projects, given the differing directionality and magnitude of impacts across fuels, particularly increases in electric consumption paired with reductions in gas usage for fuel-switching measures.
- **Distributed Energy Resources (DERs):** Differentiating DERs from other end uses based on their expected effects on consumption patterns. Battery storage systems are not intended to reduce total energy consumption but instead shift load within a day or season and may increase gross electric consumption due to charging losses. EVs increase overall electric consumption, while solar photovoltaic systems affect net consumption by increasing exports to the grid and reducing imports.

Data cleaning, preparation, and modeling decisions were made with these considerations in mind. The evaluation team highlights how each of these factors was addressed in the sections that follow.

PARTICIPANT DATA CLEANING AND PREPARATION

As a first step in the consumption analysis, the evaluation team completed thorough cleaning of the participant data. The data cleaning steps included validating gas and electric account numbers, participation dates, and project measure data fields to make sure that we are including the projects who participated within the program period under evaluation with valid account numbers and that measure names did not have conflicting information. Notably, we focused the consumption analysis on gas and electric projects with gas and/or electric service with Pacific Gas and Electric (PG&E), SCE, San Diego Gas and Electric (SDG&E), Sacramento Municipal Utility District (SMUD), and SoCalGas. This focus was driven primarily by the availability and ease of obtaining interval consumption data needed to support statistical modeling. Importantly, the results from the consumption analysis were extrapolated to the entire project population.

Table 61 below provides a breakdown of standard loan participant data-cleaning and inclusion steps. As can be seen in the table, a small number of participants were dropped due to the absence of valid account numbers, 6% of participants were dropped since completion dates lay outside of the program period under evaluation, and a small

number of projects were dropped due to not having electric or gas consumption data for the five utilities mentioned above. As a result of these cleaning steps, 7,302 participants were retained in the analysis.

Table 61. Participant Drops Table

Data Exploration/Cleaning Step	Participant Count
Participants with standard loans	7,780
Participants with valid account numbers	7,751
Participants with completion dates under evaluation (July 2023-June 2025)	7,311
Participants in PG&E, SCE, SoCalGas, SDG&E, and SMUD service territories	7,302

The evaluation team grouped participants for analysis based on the expected changes in energy consumption from the installed measures and the corresponding utility account type. Some measures are expected to affect only electric consumption, others only gas consumption, and some are expected to affect both. For each fuel-specific analysis, only participants who financed measures expected to affect the consumption of that fuel were included. For example, the electric consumption analysis included only projects expected to change electric usage, and the gas consumption analysis included only projects expected to change gas usage. Additionally, when possible, we separated NEM and non-NEM accounts in modeling. This approach improves model precision by ensuring that estimated effects are driven by participants with meaningful exposure to the relevant fuel-specific changes, rather than being diluted by participants with no expected impact. Participant account along these lines, LMI status, and utility are presented in Table 62.

Table 62. Participant Counts by Analysis Group (Electric and Gas)

Participant Segment	Total Participant Count
Electric Models	
Fuel Switching	1,458
No Fuel Switching	4,840
DER	861
LMI	3,845
No LMI	2,453
PG&E	3,332
SCE	524
SDG&E	309
SMUD	1,484
Other Utility	649
Gas Savings	
Fuel Switching	426
No Fuel Switching	4,012
LMI	2,832
No LMI	1,606
PG&E	3,722
SCG	486
SDG&E	200
Other Utility	30

CONSUMPTION DATA CLEANING AND PREPARATION

Following the cleaning and validation of participation data, the evaluation team cleaned and prepared electric and gas interval consumption data for use in the consumption analysis. The team requested and received hourly electric consumption data spanning January 2021 through August 2025. Daily gas consumption data covered a similar period, with data availability beginning in January 2022 and extending through August 2025. The team then merged electric and gas consumption data to the finalized participant files for each fuel. The team trimmed consumption data outside of the analysis window. As can be seen in Table 63 for 305 participants electric data was unavailable and for 227 participants, gas data was unavailable.

Table 63. Consumption Data Merge Success

Group	Count of Participants Without Consumption Data
Electric	305
Gas	227

For electric data specifically, as a first step, the team aggregated hourly electric data to the daily level by summing consumption across all hours in the day. This daily aggregation served as the standard input for the electric consumption analysis. Days with fewer than 21 hours were excluded from the analysis, and missing hours were imputed using the average hourly consumption for that day for days with 1-3 missing hours.[52]

Additionally, across all participants with electric consumption data, the team reviewed the NEM indicators provided in the utility data and found that NEM identifiers were not consistently available across utilities. And where available, were not always reflective of underlying consumption data. Exploratory checks were conducted to assess whether participants flagged as NEM exhibited non-zero energy returned to the grid and whether those flagged as non-NEM showed only zero or missing return values. These checks identified several inconsistencies; for example, some participants flagged as non-NEM demonstrated substantial energy returned to the grid. Consequently, we developed an alternative, consumption-based NEM classification. We classified participants as NEM if they exhibited at least 120 hours with positive energy returned to the grid, and we defined the NEM effective date as the first date on which positive energy return was observed.

The next data cleaning procedures were tailored to the specific characteristics of each data type (e.g., hourly electric, daily electric, and daily gas), though the overall approach followed a consistent set of principles across fuels. These steps were designed to ensure data completeness, temporal consistency, and analytical reliability prior to model estimation.

In summary. we performed the following data cleaning steps for electric consumption data:

- **Removed null and invalid values:** Observations with missing net consumption values were removed from the dataset. Additionally, negative net consumption values were excluded for non-NEM participants, as they are not possible without energy being returned to the grid.
- **Removed participants with zero usage:** Participants with zero average daily net consumption across the entire period under evaluation were excluded.
- **Explored zero and negative usage:** Given that zero and negative net consumption can occur for NEM customers, the team conducted detailed exploratory checks. These confirmed cases were valid and did not require further exclusion.

[52] This step resulted in minimal number of drops.

- **Removed outliers:** To mitigate the influence of unusually high or low usage values, the team removed the top 1% of daily net consumption values within each season (summer, winter, shoulder). Additionally, observations that deviated by more than four standard deviations from a participant's seasonal average were excluded.
- **Handled NEM status changes:** For participants who transitioned to NEM status during the study period, pre-intervention data were excluded for those who became NEM in the pre-period, and post-intervention data were excluded for those who became NEM after their project date. This helped maintain analytical consistency across customers.
- **Removed participants based on data sufficiency:** Participants were required to have at least six months of data during the pre- and post-periods, including seasonal sufficiency (at least 33% of days during cooling and heating seasons).[53] Comparison group participants (2025 projects) only needed sufficient pre-period data.

We performed the following data cleaning steps for gas consumption data:

- **Removed null and invalid values:** Observations with missing net consumption values were removed from the dataset.
- **Removed negative usage values:** Negative gas consumption values are not possible; therefore, the evaluation team excluded observations with negative usage.
- **Explored zero usage values:** Unlike electricity, zero usage for gas is plausible, particularly during non-heating months. The team conducted an exploratory analysis and retained participants who had non-zero average usage, even if some days registered zero therms.
- **Removed extreme outliers:** To mitigate the influence of unusually high or low usage values, the team removed the top 1% of daily net consumption values within each season (summer, winter, shoulder). Additionally, observations that deviated by more than four standard deviations from a participant's seasonal average were excluded.
- **Removed participants based on data sufficiency:** Participants were required to have at least six months of data during the pre- and post-periods, including seasonal sufficiency (at least 33% of days during cooling and heating seasons)[54]. Comparison group participants (2025 projects) only needed sufficient pre-intervention data.

After completing the electric consumption data cleaning steps, the evaluation team retained 86% of participants from the electric group as seen in Table 64. The vast majority of participant drops were due to insufficient pre- and post-period data sufficiency.

[53] Notably, we based indicators for the post-period start using p002_installed_date_contractor_sigcompletion_date_cd_ as the effective date. This date was validated with program staff and applied a ± 37-day dead-band period around the effective date to account for variability in installation timing. This dead-band period excludes observations immediately surrounding the installation date to ensure that neither the pre- nor post-period includes partial installation effects or atypical consumption associated with installation activities. In the consumption analysis, the dead-band period serves as a buffer that reduces contamination of estimated impacts by transitional usage patterns.

[54] Notably, we based indicators for the post-period start using p002_installed_date_contractor_sigcompletion_date_cd_ as the effective date. This date was validated with program staff and applied a ± 37-day dead-band period around the effective date to account for variability in installation timing. This dead-band period excludes observations immediately surrounding the installation date to ensure that neither the pre- nor post-period

Table 64. Electric Cleaning Drops Table (Excluding DERs)

Cleaning Step	Count of Participants	Count of Records	Average Daily Consumption
Data before cleaning	5,391	8,188,832	25.42
Removed invalid net consumption values	5,391	8,188,832	25.42
Removed negative net consumption values for non-NEM customers	5,391	8,188,826	25.42
Removed participants with 0 usage across the whole period	5,389	8,186,857	25.43
Removed the top and bottom 1% of high usage values	5,388	8,023,118	23.39
Removed observations 4 standard deviations from the mean	5,388	8,004,586	23.33
Removed observations based on NEM status	5,387	7,574,280	23.35
Removed participants with insufficient data	4,644	6,824,085	22.93

After completing the gas consumption data cleaning steps, the evaluation team retained 94% of participants, as seen in Table 65. Similar to the electric data, the vast majority of participant drops were due to insufficient pre- and post-period data sufficiency. In both cases, the retention rate is quite high.

Table 65. Gas Cleaning Drops Table

Cleaning Step	Count of Participants	Count of Records	Average Daily Consumption
Data before cleaning	4,192	5,377,309	1.21
Removed invalid consumption values	4,192	5,101,376	1.21
Removed negative consumption values	4,192	5,101,376	1.21
Removed participants with 0 usage across the whole period	4,181	5,089,042	1.21
Removed the top and bottom 1% of high usage values	4,180	5,038,125	1.09
Removed observations 4 standard deviations from the mean	4,180	5,032,242	1.08
Removed participants with insufficient data	3,932	4,754,989	1.10

For participants who installed DER measures through the program, detailed hourly shape analysis was conducted to assess load shifting and changes in hourly usage patterns, in addition to estimating changes in net daily consumption. To support this analysis, hourly electric data for DER participants were retained and underwent additional data cleaning and processing.

For DER data cleaning underwent the same set of steps as the rest of electric consumption data, but at the hourly, as opposed to daily, level. The table below provides a summary of the cleaning steps and drops. As can be seen in the table, we retained 86% of participants with electric consumption data in the analysis, with the largest drop being due to data sufficiency reasons, where we dropped 11% of participants. Hourly consumption remained largely unchanged from one cleaning step to the next.

Table 66. DER Data Cleaning Drops Table

Cleaning Step	Count of Participants	Count of Records	Average Hourly Consumption
Data before cleaning	815	39,432,990	1.08
Removed invalid net consumption values	815	39,432,511	1.08
Removed negative net consumption values for non-NEM customers	815	39,432,416	1.08
Removed participants with 0 usage across the whole period	815	39,432,416	1.08
Removed the top and bottom 1% of high usage values	815	38,643,885	1.00
Removed observations 4 standard deviations from the mean	815	38,356,371	0.98
Removed observations based on NEM status	795	37,762,688	0.98
Removed participants with insufficient data	701	36,080,328	0.99

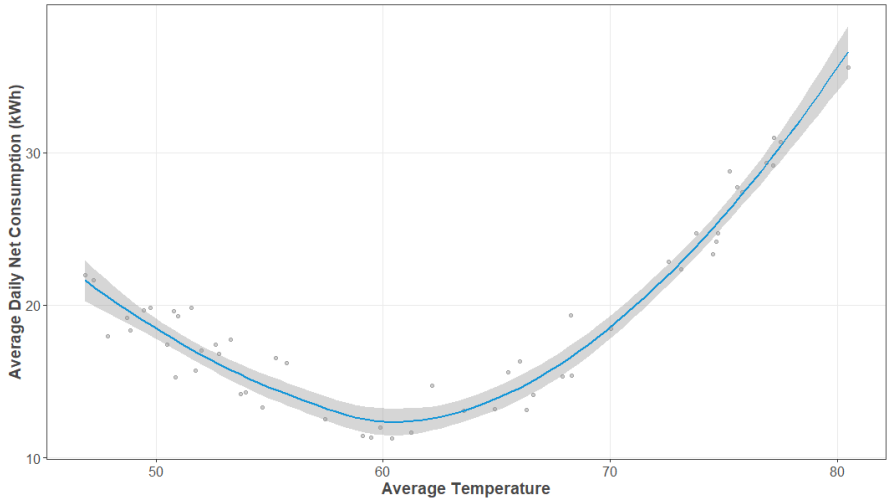
WEATHER DATA PREPARATION

The evaluation team relied on the following sources of weather data:

- Hourly Dry-bulb temperature from the National Centers for Environmental Information (NCEI) Integrated Surface Database (ISD). The data was obtained for multiple weather stations and matched to each participant based on geographic proximity as defined by participant zip code. This data was used to control for weather driven changes in energy consumption.
- Hourly typical meteorological year weather data (CZ2025). The data was obtained for multiple weather stations and matched to each participant based on the unique weather station identifier (ASAF ID) to ensure consistent use of the weather stations for individual participants.

As part of weather data preparation, the team first converted temperature data into Heating Degree Hours (HDH) and Cooling Degree Hours (CDH). We developed the estimates of HDH and CDH using the base temperature of 60°F. We used this base temperature based on our analysis of the relationship between temperature and energy consumption in the participant population as seen in Figure 39. Then the team converted HDH and CDH to CDD and HDD estimates by taking the average values across the day.

Figure 39. Relationship Between Temperature and Energy Consumption



COMPARISON GROUP SELECTION AND EQUIVALENCY

A key challenge in estimating program-induced energy impacts through consumption analysis is identifying an appropriate comparison group to represent the baseline for how much energy customers would have consumed in the absence of the program. We consider two main factors in the design of a comparison group. A comparison group must (1) have similar energy usage patterns (compared to participants) before participation (i.e., pre-participation period) and (2) effectively address self-selection bias (the correlation between the propensity to participate in a program and energy use). In an ideal experimental design, a randomized control group would be used, and it would be statistically equivalent to the treatment group in all aspects, save for the treatment being evaluated (in this case, Program participation).

When a randomized control trial is not feasible, we use different approaches to construct a comparison group, such as using future participants or creating a matched comparison group based on usage and other characteristics. There are trade-offs with these approaches. Where we can establish a reasonable level of equivalency, we use future participants as a comparison group. The use of future participants allows us to better control for self-selection, since the comparison group customers also chose to participate in the same program at a different date.

Given rolling enrollment into the program, a rolling future participant comparison group design is appropriate for this consumption analysis. Under this approach, later enrollees served as the comparison group for earlier participants during the period prior to their own participation. Thus, future participants contribute untreated observations before their program start date and treated observations afterward. A subset of participants enrolled during the program period under evaluation but did not have sufficient post-installation consumption data to support estimation of participant impacts. These participants enrolled in the program at or after January 2025, leaving an insufficient post-installation observation window for inclusion in the consumption analysis. The team retained these customers in the analysis as a future-participant comparison group only, contributing additional untreated observations prior to their participation.

The appropriate use of the future participant comparison group design depends on its equivalence with the treatment group. We used energy consumption and weather (expressed as HDD and CDD) as the primary markers of equivalency. Specifically, we compared energy consumption and weather between the treatment group (participants who enrolled in 2023 and 2024) and the comparison group (participants who enrolled in 2025) during a common pre-treatment period in which no participants had yet received program interventions (calendar year 2022). Equivalency was assessed by visually comparing pre-period consumption and weather patterns between groups and statistically testing for differences. Statistical equivalence was assessed by regressing monthly average daily consumption on month fixed effects and treatment–month interaction terms during the pre-treatment period, with standard errors clustered at the contract level to account for repeated observations.

We conducted separate equivalency assessments for subpopulations of participants based on net metering, DER, fuel-switching status, utility, and LMI status. Figure 40 through Figure 48 below provides the analysis outputs for consumption data. Detailed weather-based equivalency analysis outputs are omitted for brevity but can be provided upon request. For all groups analyzed, the comparison group was not statistically different from the treatment group at the 95% confidence level based on pre-treatment energy consumption.

Figure 40. Electric Equivalency Analysis – All Participants

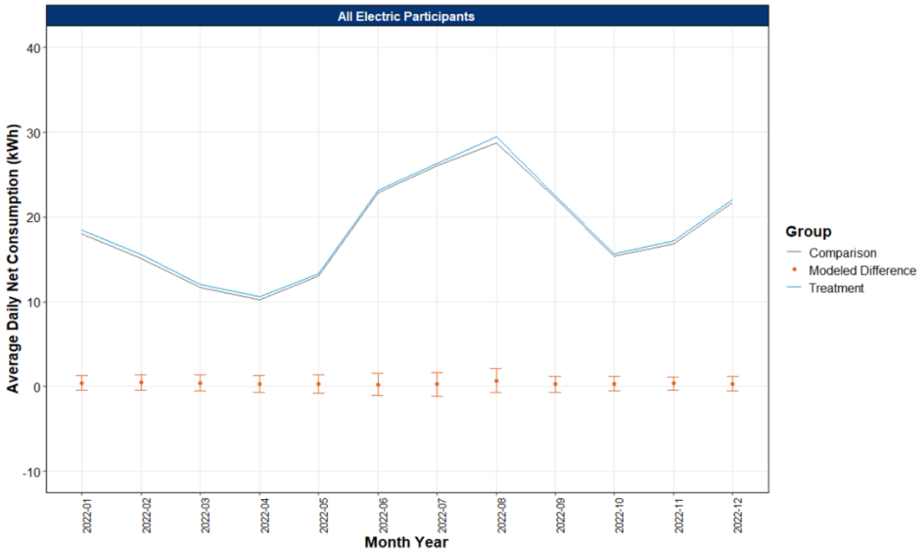


Figure 41.Electric Equivalency Analysis - NEM and Fuel Switching Status

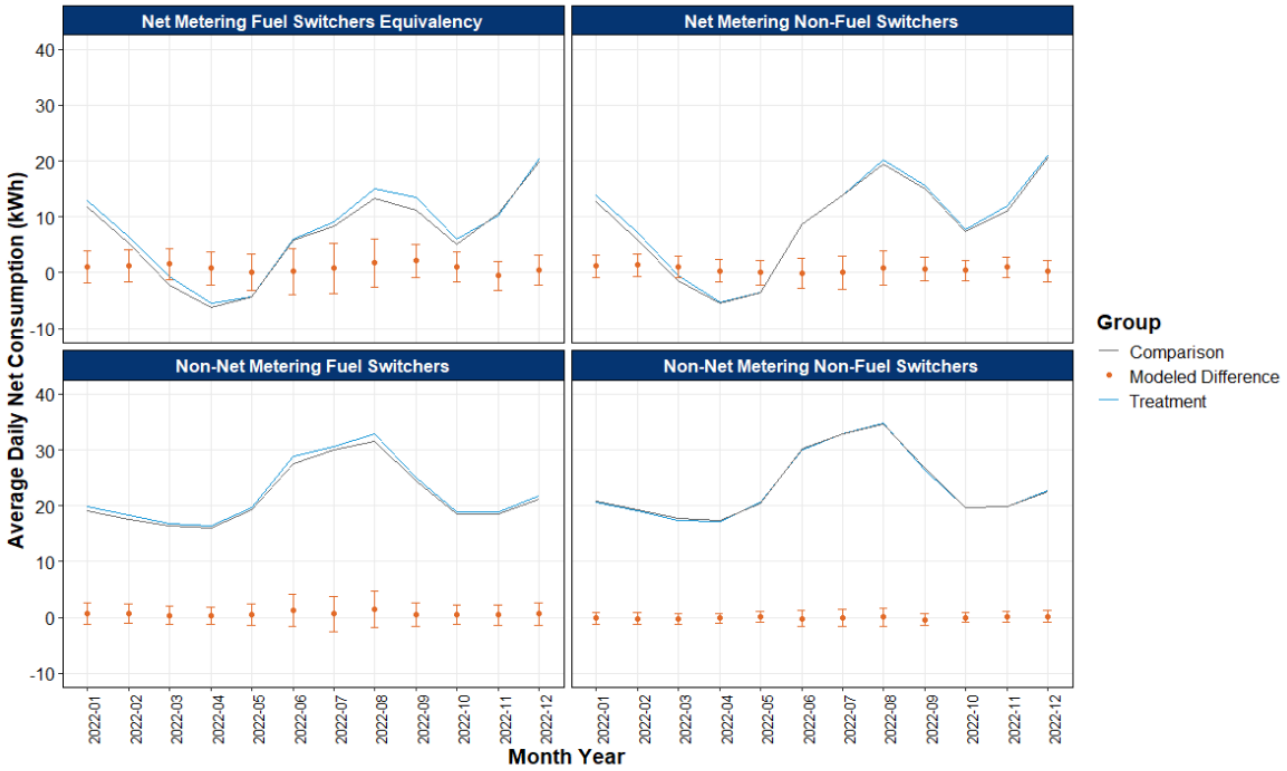


Figure 42. Electric Equivalency Analysis - Electric Utility

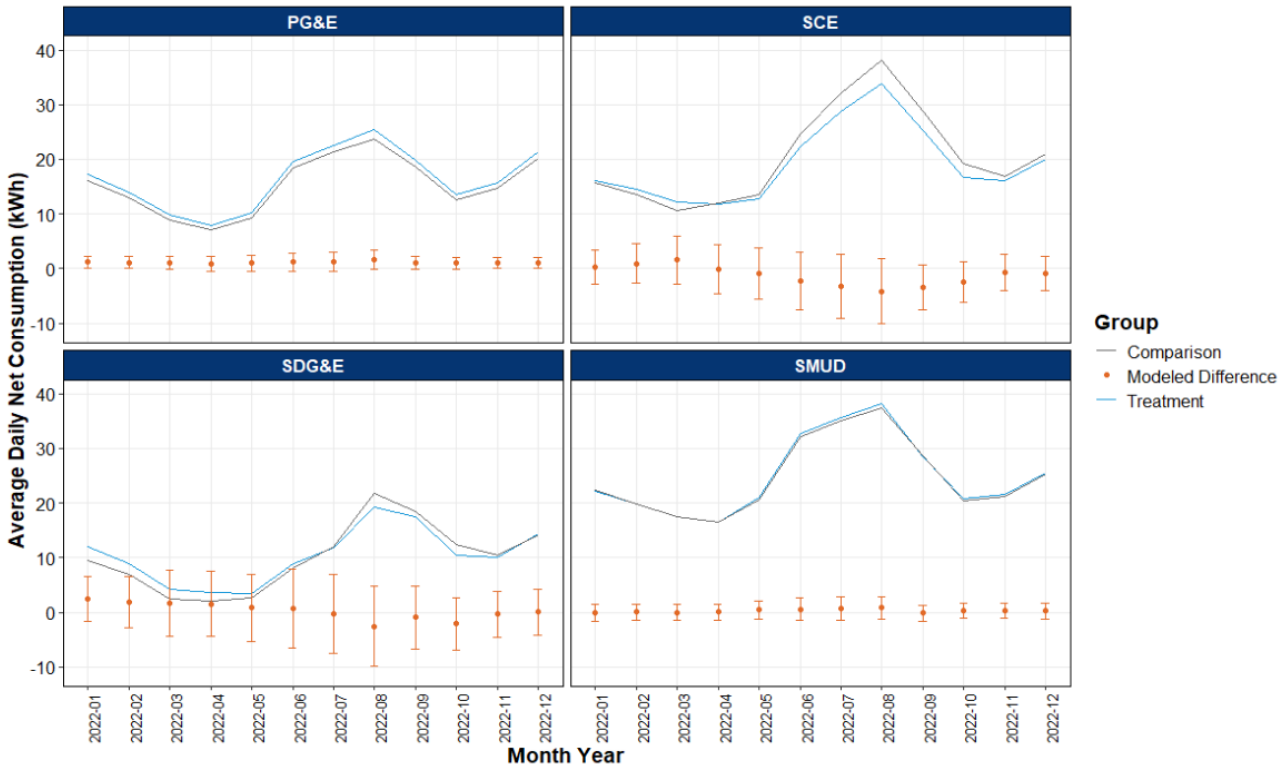


Figure 43. Electric Equivalency Analysis - LMI Status

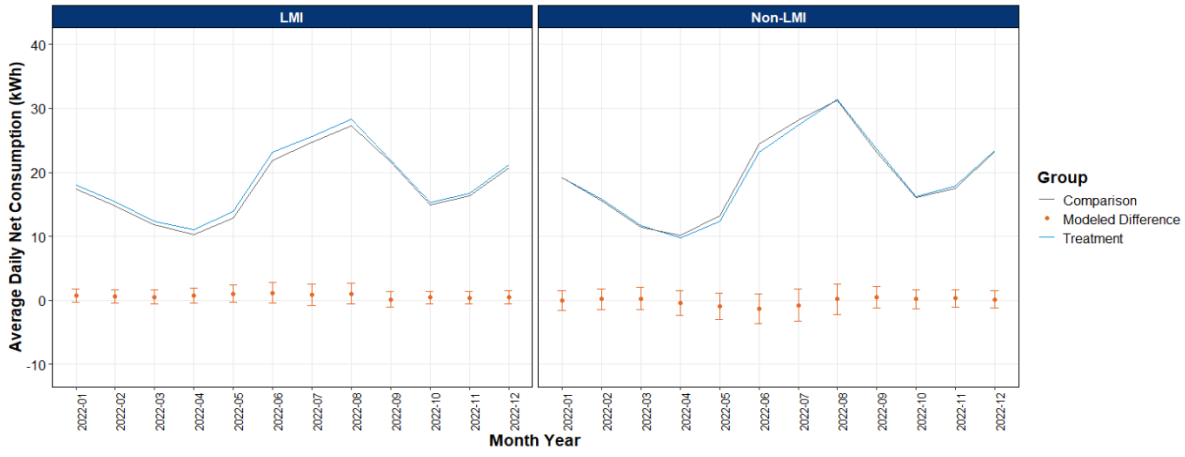


Figure 44. Electric Equivalency Analysis – DER

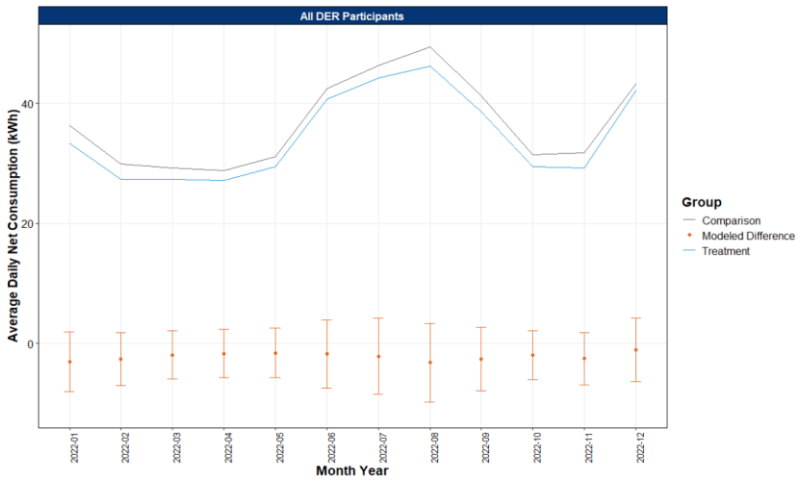


Figure 45. Gas Equivalency Analysis – All Participants

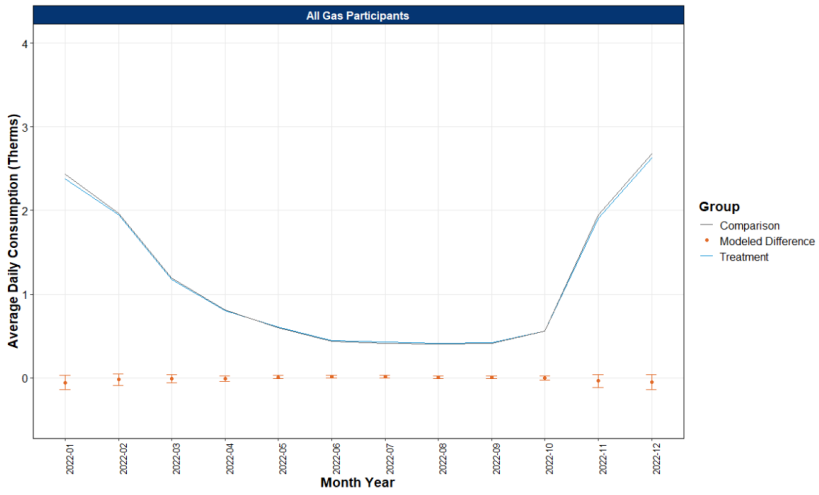


Figure 46. Gas Equivalency Analysis – Fuel Switching Status

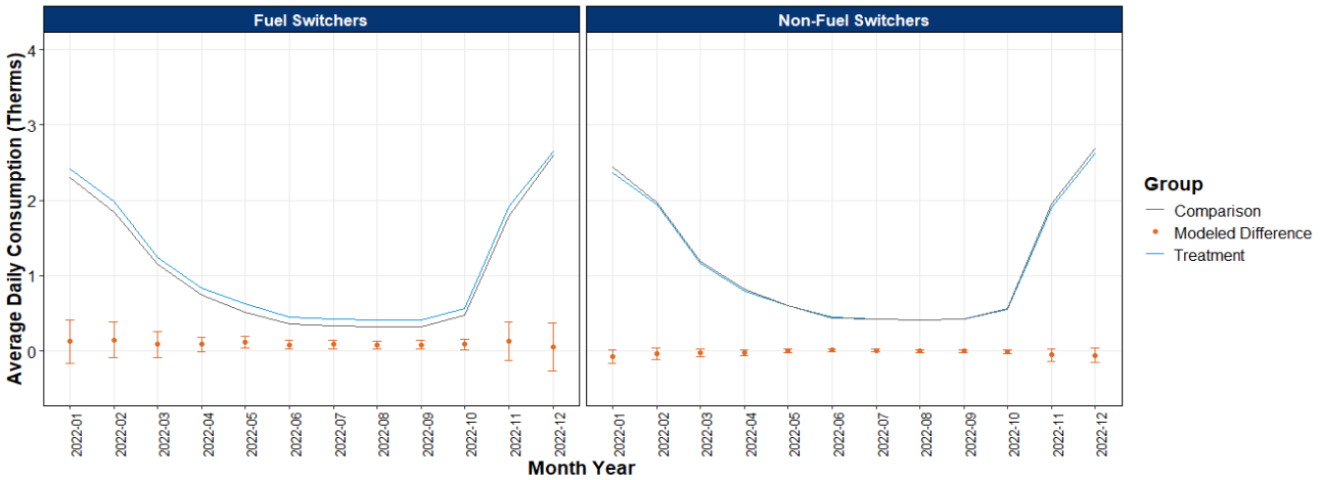


Figure 47. Gas Equivalency Analysisc– Gas Utilty

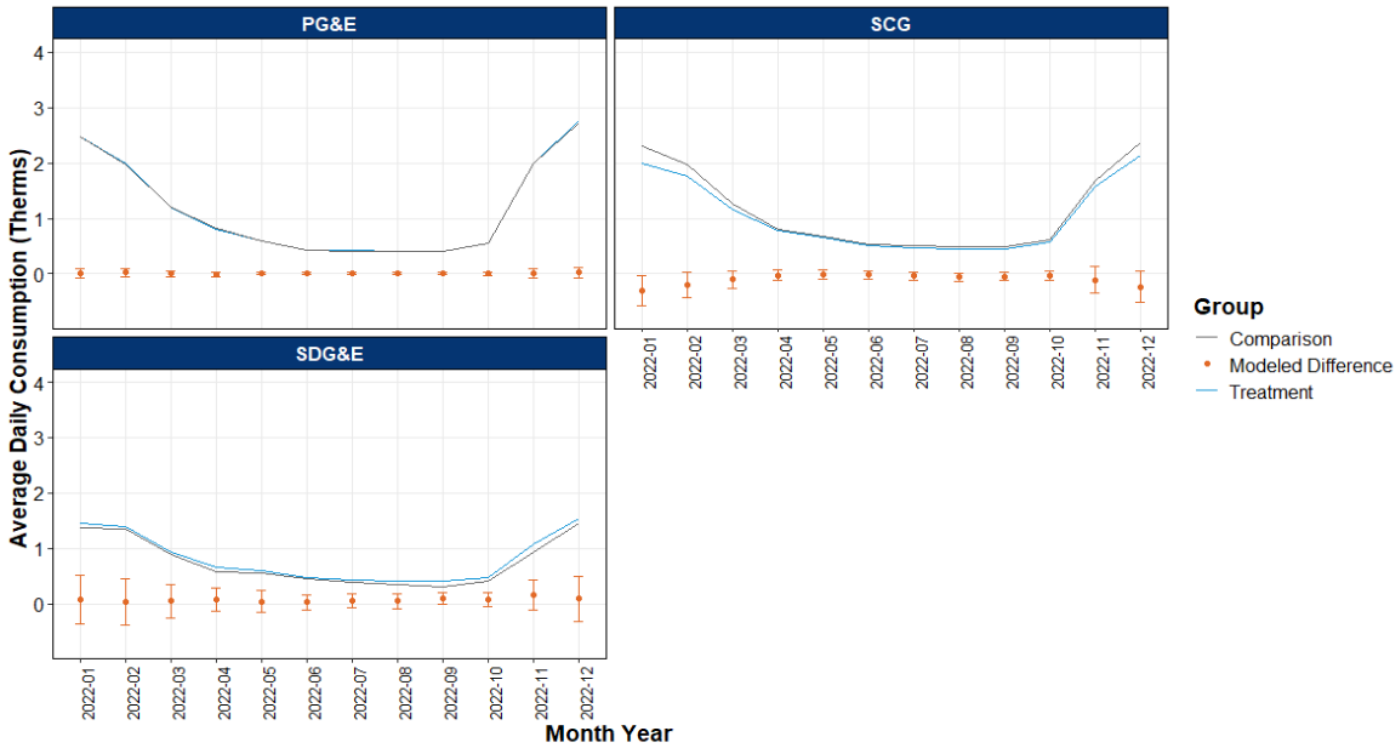
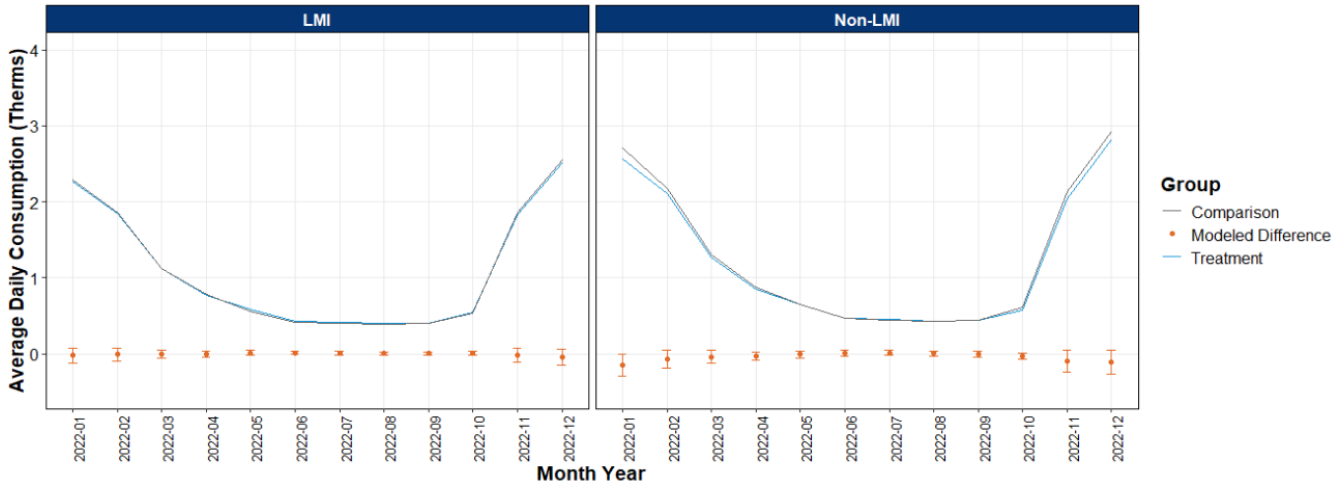


Figure 48. Gas Equivalency Analysis – LMI Status



MODEL SPECIFICATION

The evaluation team estimated program impacts using linear two-way fixed effects (TWFE) regression models. This modeling framework controls for unobserved, time-invariant participant characteristics through participant fixed effects and for temporal factors affecting all customers through time fixed effects. As a result, the model isolates changes in energy consumption attributable to program participation while accounting for persistent differences across customers and broader time trends unrelated to the program.

The models were specified within a Difference-in-Differences (DiD) framework using a rolling future participant comparison design. Under this approach, customers who enrolled in the program at a later date served as the comparison group for earlier participants during the period prior to their own participation. As enrollment progressed, future participants contributed untreated observations before their program start date and treated observations afterward, allowing the comparison group to update dynamically over time. This structure leverages staggered program adoption to control for shared external drivers such as weather, seasonality, and macro-level consumption trends.

Electric and gas consumption models were estimated separately, recognizing the distinct usage patterns, data structures, and impact mechanisms associated with each fuel.

For each fuel, a range of model specifications were tested, beginning with simple pre–post models and incrementally incorporating additional controls, including weather variables, seasonal indicators, day-of-week effects, and fixed effects. For each fuel and analysis group, we evaluated alternative specifications using adjusted R-squared and Akaike Information Criterion (AIC) metrics to assess model fit. The team selected final model specifications based on overall performance across these metrics, prioritizing explanatory power and parsimony.

Given the differing directionality and magnitude of expected impacts across participant types, models were estimated separately by key participant characteristics. Specifically, the team specified separate models based on NEM and fuel switching status. This approach reflects the fact that fuel-switching projects can increase electric consumption while reducing gas usage, and that NEM customers exhibit fundamentally different net consumption patterns than non-NEM customers. Estimating impacts within more homogeneous subgroups improved model interpretability and reduced the risk of masking offsetting effects in aggregate estimates. Similarly, impacts for participants with DER measures were estimated separately.

To support a more nuanced interpretation of results and better understand the drivers of overall impacts, the team conducted additional stratified analyses. These included models estimated separately for participants located in low-income or disadvantaged communities, by utility, and by enduse. When specifying these additional models, we ensured sufficient sample sizes and maintained consistency in treatment of NEM status and fuel-switching characteristics within each subgroup.

All models included weather terms to control for observed weather variation, and modeled impacts were normalized to typical-year weather conditions to ensure comparability across time periods.

Equation 1 and Equation 2 contain final electric and gas model specifications.

Equation 1. Electric Model Specification

$$kWh_{it} = \gamma_i + \tau_t + \beta_1 Treat_{1,it} + \beta_{CDD} CDD_{it} + \beta_{HDD} HDD_{it} + \beta_{CDD-Treat} CDD_{it} * Treat_{it} + \beta_{HDD-Treat} HDD_{it} * Treat_{it} + \beta_{Summer-Treat} Summer_{it} * Treat_{it} + \beta_{Winter-Treat} Winter_{it} * Treat_{it} \varepsilon_{it}$$

Where:

- kWh_{it}= Average daily net consumption for account *i* in time (date) *t*
- γ_i = Account-specific intercept for account *i*
- τ_t = Date-specific intercept for time *t*
- $Treat_{it}$ = Indicator variable for the first participation year period (coded “1” in the first year after participation, coded “0” otherwise)
- CDD_{it} = Daily cooling degree days for account *i* at time *t*
- HDD_{it} = Daily heating degree days for account *i* at time *t*

- $Summer_{it}$ = Indicator variable for summer months (coded "1" for June, July, and August, coded "0" otherwise)
- $Winter_{it}$ = Indicator variable for winter months (coded "1" for December, January, and February, coded "0" otherwise)
- β_x = Model coefficients
- ε_{it} = Error term

Equation 2.Gas Model Specification

$$Therms_{it} = \gamma_i + \tau_t + \beta_1 Treat_{1,it} + \beta_{HDD} HDD_{it} + \beta_{HDD-Treat} HDD_{it} * Treat_{it} + \varepsilon_{it}$$

Where:

- $Therms_{it}$= Average daily consumption for account *i* in time (date) *t*
- γ_i = Account-specific intercept for account *i*
- τ_t = Date-specific intercept for time *t*
- $Treat_{it}$ = Indicator variable for the first participation year period (coded "1" in the first year after participation, coded "0" otherwise)
- HDD_{it} = Daily heating degree days for account *i* at time *t*
- β_x = Model coefficients

ε_{it} = Error term

Table 67 and Table 68 present the key electric and gas model outputs used to estimate annual baseline consumption and annual energy impacts. To develop program-level results, we aggregated subgroup impacts by weighting per-participant modeled estimates by the number of participants in each subgroup, as reported in Table 67. For solar participants whose net-metering status was inferred through consumption-based analysis and therefore not available in the program tracking data, we estimated population counts by applying proportional distributions from the modeled participant population. When aggregating impacts across subgroups, we propagated uncertainty using standard quadratic error-combination formulas in order to develop upper and lower bounds.

Table 67. Final Electric Model Summaries

Subgroup	Average Daily Impact Estimate (kWh)	Average Daily Impact Standard Error	90% Confidence Interval		Average Daily Modeled Baseline (kWh)	Modeled Participants	Number of Observations	Adjusted R-Squared	AIC	Statistically Significant
			Upper	Lower						
NEM and Fuel Switching Status										
Net Metering-Fuel switching	-2.67	0.62	-3.69	-1.66	8.38	499	631,314	0.54	5,070,717	Yes
No net metering-Fuel switching	-3.03	0.42	-3.72	-2.34	22.73	611	852,724	0.61	6,288,212	Yes
Net Metering-No fuel switching	0.27	0.42	-0.95	0.42	9.05	1,045	1,332,273	0.55	10,766,633	No
No net metering-No fuel switching	0.41	0.20	0.08	0.74	22.74	2,489	3,471,282	0.63	25,573,676	Yes
DER										
Overall	19.76	1.98	16.50	23.00	36.19	701	863,259	0.62	7,679,620	Yes
LMI	18.96	1.41	16.63	21.29	34.73	355	439,729	0.61	3,870,733	Yes
Non-LMI	20.81	3.61	14.87	26.74	38.00	346	423,530	0.63	3,805,879	Yes
PG&E	21.43	2.39	17.50	25.36	39.45	488	631,906	0.64	5,662,813	Yes
SCE	8.73	3.36	3.20	14.25	39.64	43	50,290	0.48	436,077	Yes
SDG&E	14.73	2.12	11.24	18.22	25.28	161	170,079	0.57	1,425,509	Yes
SMUD*	*	*	*	*	*	*	*	*	*	*
LMI and Fuel Switching Status										
LMI-Fuel switching	-2.75	0.45	-3.48	-2.02	15.17	640	855,988	0.58	6,603,888	Yes
LMI-No fuel switching	0.70	0.23	0.32	1.01	18.72	2,276	3,097,950	0.61	23,630,065	Yes
Non LMI-Fuel switching	-2.88	0.59	-3.86	-1.91	17.31	470	628,050	0.59	5,002,576	Yes
Non LMI-No fuel switching	0.23	0.32	-0.76	0.30	19.05	1,258	1,705,605	0.60	13,441,100	No
Utility and Fuel Switching Status										
PG&E-Fuel switching	-2.73	0.44	-3.45	-2.01	13.92	748.00	1,001,869	0.56	7,871,375	Yes
PG&E-No fuel switching	0.41	0.25	0.01	0.81	16.70	2,023.00	2,753,195	0.58	21,408,069	Yes
SCE-Fuel switching	-0.33	1.55	2.87	2.22	21.35	56.00	67,099	0.46	538,788	No
SCE-No fuel switching	0.18	0.78	-1.11	1.47	20.35	288.00	363,373	0.53	2,857,237	No
SDG&E-Fuel switching	-0.67	2.28	-4.42	3.08	11.99	31.00	36,698	0.56	285,944	No
SDG&E-No fuel switching	0.01	0.80	-1.32	1.31	10.00	180.00	220,488	0.57	1,654,946	No

Subgroup	Average Daily Impact Estimate (kWh)	Average Daily Impact Standard Error	90% Confidence Interval		Average Daily Modeled Baseline (kWh)	Modeled Participants	Number of Observations	Adjusted R-Squared	AIC	Statistically Significant
			Upper	Lower						
SMUD-Fuel switching	-4.20	0.73	-5.41	-2.99	23.52	275.00	378,372	0.66	2,862,259	Yes
SMUD-No fuel switching	0.31	0.32	-0.22	0.85	25.11	1,043.00	1,466,499	0.64	11,072,218	No
Non-Fuel Switching Enduse*										
HVAC	1.04	0.29	0.57	1.52	18.80	1,424.00	1,959,318	0.62	15,086,713	Yes
Cool Roofs	0.02	0.41	-0.65	0.69	19.12	809.00	1,102,423	0.57	8,455,978	No
Doors and Windows	0.30	0.57	-0.64	1.24	18.06	367.00	472,080	0.60	3,715,961	No

*Note: All SMUD participants who received a DER measure participated in 2025; therefore, they did not have post period, it was not possible to estimate impacts for that group.
*Note: The evaluation team only included participants for whom end-use specific energy impacts were estimated using projects that installed only the measure of interest. The HVAC group also includes participants who received only an HV-CACS (Air Conditioning System) measure. Lastly, fuel-switching projects were also excluded from these results.

Table 68. Final Gas Model Summaries

Subgroup	Average Daily Impact Estimate (Therm)	Average Daily Impact Standard Error	90% Confidence Interval		Average Daily Modeled Baseline (Therm)	Modeled Participants	Number of Observations	Adjusted R-Squared	AIC	Statistically Significant
			Upper	Lower						
Fuel Switching Status										
Fuel switching	0.59	0.04	0.53	0.66	1.17	379	405,094	0.56	954,805	Yes
No fuel switching	0.08	0.01	0.06	0.09	1.19	3,553	3,862,461	0.58	3,862,461	Yes
LMI and Fuel Switching Status										
LMI-Fuel switching	0.55	0.05	0.48	0.63	1.09	230	246,156	0.54	560,813	Yes
LMI-No fuel switching	0.04	0.01	0.02	0.06	1.12	2,266	2,468,315	0.57	5,749,804	Yes
Non LMI-Fuel switching	0.68	0.06	0.57	0.78	1.32	149	158,939	0.58	388,785	Yes
Non LMI-No fuel switching	0.15	0.02	0.12	0.18	1.31	1,287	1,394,146	0.60	3,431,265	Yes
Utility and Fuel Switching Status										
PG&E-Fuel switching	0.63	0.04	0.56	0.69	1.18	330	353,395	0.56	842,719	Yes
PG&E-No fuel switching	0.09	0.01	0.07	0.11	1.21	3,013	3,294,399	0.59	8,012,785	Yes
SCG-Fuel switching	0.36	0.13	0.14	0.57	0.95	38	39,587	0.54	83,226	Yes
SCG-No fuel switching	0.03	0.03	-0.03	0.09	1.06	392	417,938	0.59	852,930	Yes

Subgroup	Average Daily Impact Estimate (Therm)	Average Daily Impact Standard Error	90% Confidence Interval		Average Daily Modeled Baseline (Therm)	Modeled Participants	Number of Observations	Adjusted R-Squared	AIC	Statistically Significant
			Upper	Lower						
SDG&E-Fuel switching	0.36	0.25	-0.05	0.77	1.11	11	12,112	0.52	25,378	No
SDG&E-No fuel switching	0.02	0.04	-0.05	0.09	0.82	148	150,124	0.51	253,096	No
Non-Fuel Switching Enduse*										
HVAC	0.07	0.02	0.05	0.10	1.19	1,617	1,791,608	0.58	4,352,200	Yes
Cool Roofs	-0.01	0.02	-0.04	0.02	1.08	783	832,990	0.57	1,881,707	No
Doors and Windows	0.05	0.03	-0.01	0.09	1.21	418	444,304	0.59	1,048,245	No

*Note: The evaluation team only included participants who received only the specific measure. People who received these measures in addition to another one are not included in this table. The HVAC group also includes participants who received only an HV-CACS (Air Conditioning System) measure. Lastly, fuel-switching projects were also excluded from these results.

DEEMED SAVINGS ANALYSIS (FOR MICROLOANS)

- The evaluation team applied the following method(s) to arrive at the deemed savings for EEMs installed using microloans, as presented in Table 69.
- Identify deemed savings source. The evaluation team referenced the California Technical Forum (Cal TF) eTRM. The eTRM is an online repository for all statewide prescriptive measures and provides deemed energy savings for variations of project and measure specifications, including but not limited to location, baseline, building type, building age, equipment size, and program type. The evaluation team established the appropriate version of the eTRM based on the project date identified in the program tracking data.
- Review program materials. The evaluation team reviewed program materials, such as the Enervee storefront and program tracking data, to identify measure-specific characteristics and project details to inform the application of deemed savings from the eTRM.
- Established average deemed savings. The eTRM provides measure-level deemed savings for several different scenarios. The evaluation team established an average deemed savings for each measure, incorporating factors from the scenarios most applicable to the measures offered through the program. Though many differ by measure, those common across all evaluated measures include the following:
- Building Vintage: Existing (not new construction)
- Building Type: Weighted for all residential home types (e.g., single family, multifamily)
- Delivery Type: Downstream (non-Direct Install)
- Location: Deemed savings applied specific to project climate zone (based on zip code lookup)
- Model: ENERGY STAR®
- Measure-specific factors that informed the average deemed savings, included the following:
- Clothes Dryer: Size (standard and compact).
- Clothes Washer: Configuration (top loading and front loading); Offering (not common area).
- Refrigerator: Size (standard); Configuration (bottom freezer, top freezer, side-by-side.
- Freezer: Size (large, medium, small); Configuration (upright); Defrost (automatic, manual).

Table 69. Microloan Deemed Savings

Measure	Measure Quantity	Units	Per Measure Savings		
			kWh	kW	Therms
Refrigerator	793	Refrigerators	53.54	<0.001	(0.61)
Clothes Washer	612	Washers	49.20	0.008	7.97
Clothes Dryer (Electric)	214	Dryers	57.77	0.014	(0.37)
Dishwasher	174	Dishwashers	23.95	0.006	0.52
Air Purifier	61	Purifiers	39.80	0.006	(0.53)
Smart Thermostat	22	Thermostats	82.68	N/A	5.53
Freezer	28	Freezers	41.13	0.006	(0.44)
Mini Split Ductless AC	2	Systems	166.00	N/A	N/A
Clothes Dryer (Heat Pump)	2	Dryers	157.33	N/A	(1.03)
Mini Split Ductless Heat Pump	1	Systems	32.48	0.041	16.55
Clothes Dryer (Gas)	314	Dryers	(0.95)	N/A	3.36
Tankless Water Heater (Gas)	72	Water Heaters	(10.08)	(0.002)	80.43
Heat Pump Water Heater	1	Water Heaters	(1,103.43)	0.012	161.78
Induction Cooktop	14	Cooktops	(79.20)	0.000	7.75
Convection Oven (Electric)[a]	1	Ovens	N/A	N/A	N/A

Source: California Technical Forum (Cal TF) Electronic Technical Reference Manual (eTRM).
Note: Total program savings applied climate-specific deemed savings; however, the deemed savings presented above are weighted by the number of measures purchased within each climate zone.
Electric convection ovens are not an energy-efficient measure and therefore do not have associated deemed savings values.

EMISSIONS REDUCTION METHODOLOGY

Emissions reduction calculations used the CPUC RACC - FSC. We estimated the emissions reductions from electricity savings by applying the annual conversion factors (tCO_2/MWh) presented in Table 70 to each year of energy savings. These annual conversion factors are developed from long-run emissions inputs from the 2022 ACC Electrical Model v1b - IRP 2021 Reference System Plan. In addition to annual conversion factors, we estimated the share of total electricity savings in a year by estimating the share of "post-period" number of days each year relative to all "post-period" number of days in the Program.

Table 70. Annual Factors and Share of Total Electric Savings, 2023-2026

Year	Annual Factors (tonnes CO2e/MWh)	Share of Electricity Savings in Year (EEMs Installed Using Standard Loans)	Share of Electricity Savings in Year (EEEMs Installed Using Microloans)
2023	0.1712	9.18%	42.78%
2024	0.1778	35.33%	52.60%
2025	0.1756	40.79%	4.62%
2026	0.1756	14.70%	0.00%

Other key parameters are presented in Table 71.

Table 71. Key Parameters Used in GHG Emission Reduction Calculation

Name	Value	Units/Description
Ton to Tonne	1.10231	short ton/metric tonne
MMBtu to Therms	0.1	MMBtu/therm
Btu to Therm	100,000	Btu/therm
Btu to kWh	3,413	Btu/kWh
Natural Gas Carbon Content	0.0585	short tons/MMBtu
Natural Gas Carbon Content	0.005307	metric tons/therm
Upstream in-state methane leakage	0.0557	Methane leakage upstream of natural gas power plants. Methane leakage avoided cost is this percentage times the value of GHG emissions
Residential behind-the-meter methane leakage (Gas only)	0.0378	Applies to the elimination of natural gas appliances from a residential building.

The emissions reduction in year t, from electricity savings resulting from EEMs installed using standard loans, $Emissions\ Reductions\ (Standard)_t$, is given by:

Equation 3. Year-Wise Emission Reduction from EEMs Installed Using Standard Loans

$$Annual\ Factor_t * Share\ of\ Savings\ in\ t\ (Standard) * Total\ Savings\ (Standard) * (1 + Upstream\ methane\ leakage)$$

The emissions reduction in year t, from electricity savings resulting from EEMs installed using microloans, $Emissions\ Reductions\ (Micro)_t$, is given by:

Equation 4. Year-wise emission reduction from EEMs Installed using Microloans

$$Annual\ Factor_t * Share\ of\ Savings\ in\ t\ (Micro) * Total\ Savings\ (Micro) * (1 + Upstream\ methane\ leakage)$$

Thus, the GHG reductions from electricity savings are given by:

Equation 5. GHG Reductions from Electricity Savings of the Program

$$\sum_{t=2023}^{2026} Emissions\ Reductions\ (Standard)_t + Emissions\ Reductions\ (Micro)_t$$

For emissions reductions that result from gas savings, a single conversion factor, the carbon content of a single unit of natural gas (tCO_2/therms), is applied to the total gas savings. Thus, the Program GHG reductions from gas savings are given by:

Equation 6. GHG Reductions from Gas Savings of the Program

$$Natural\ Gas\ Carbon\ Content\ (metric\ tons\ CO2/therm) * Gas\ Savings * (1 + Upstream\ methane\ leakage + Residential\ methane\ leakage)$$

The total GHG reductions from energy savings are the sum of GHG reductions from electricity savings and gas savings.

APPENDIX F. CONJOINT METHODOLOGY AND SUPPLEMENTARY FIGURES

CONJOINT METHODOLOGY SUMMARY

We conducted a choice-based conjoint (CBC) analysis using Sawtooth Software to estimate preferences for alternative energy efficiency financing designs. In each choice task, respondents were presented with multiple loan options that varied across the following attributes:

- Interest rate (APR) (3%-12%)
- Out-of-pocket cost ($0-$6000)
- Loan term (5-year, 10 year, 15-year)
- Loan provider (e.g., bank, credit union, contractor)
- Contractor endorsement

Respondents first selected the option they preferred among those shown. In a second step, they were asked whether they would actually move forward with their chosen option if it were available to them, allowing us to distinguish between relative preference and stated likelihood of real-world uptake.

Choice data were analyzed using a Hierarchical Bayesian (HB) multinomial logit model, consistent with Sawtooth Software's recommended best practices for CBC analysis. HB estimation produces individual-level part-worth utility estimates by combining each respondent's observed choices with overall sample-level preference patterns, resulting in stable and reliable utility estimates even with a limited number of choice tasks per respondent. These utility estimates reflect the relative value respondents place on each attribute level when evaluating financing options.

Utilities were used to calculate attribute importance measures and to conduct predictive simulations. Importance scores summarize the relative influence of each attribute based on the range of its estimated utilities. Simulation analysis generates preference shares, defined as the model-predicted proportion of respondents expected to select a given financing option when presented with a specified set of alternatives. These simulations allow us to assess how changes in APR, term, out-of-pocket cost, provider type, or contractor endorsement are expected to influence financing demand.

UTILITY/RELATIVE PREFERENCES RESULTS

Figure 49. Relative Preferences by Attribute Level (Market Rate n=103)

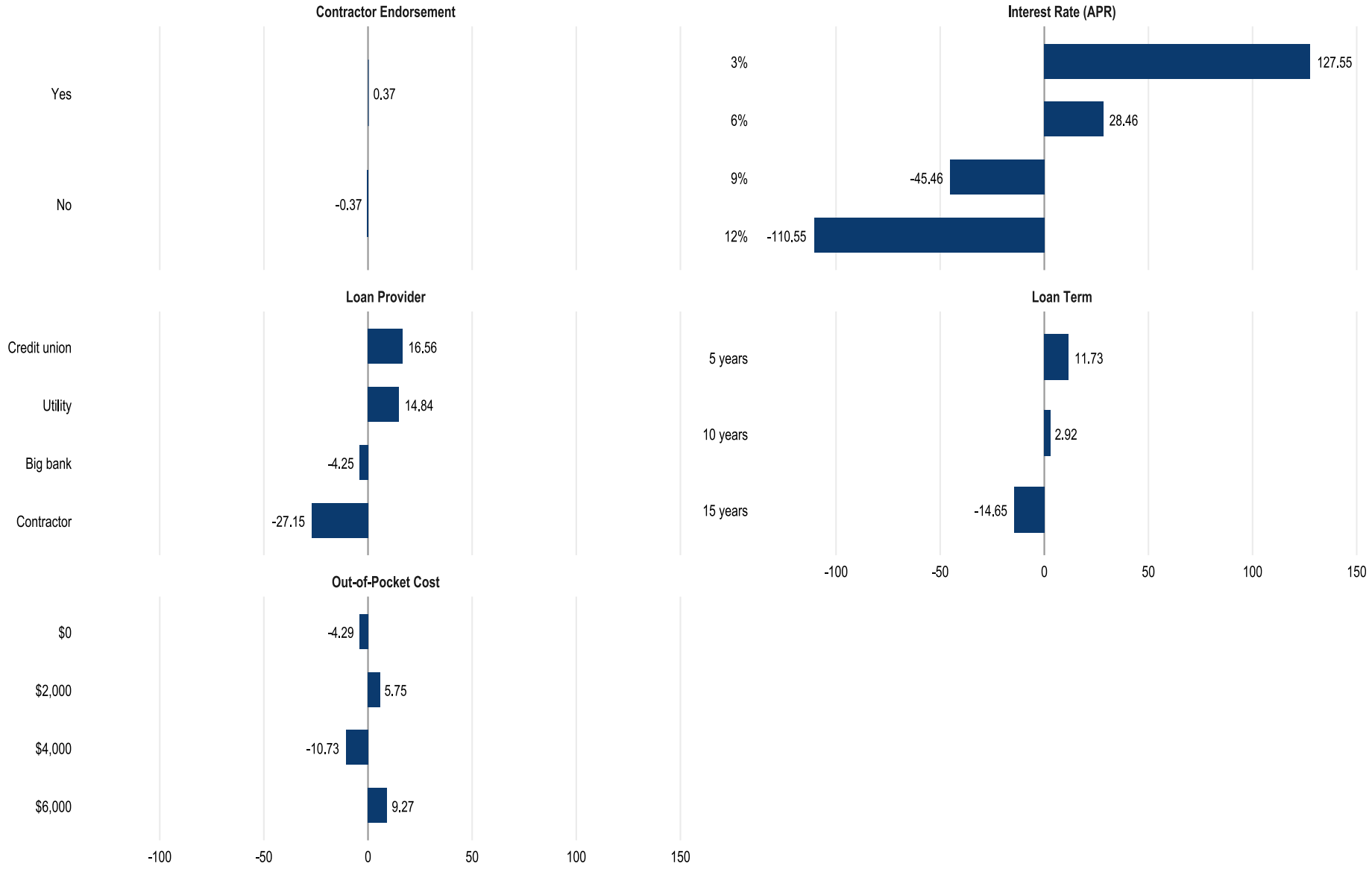
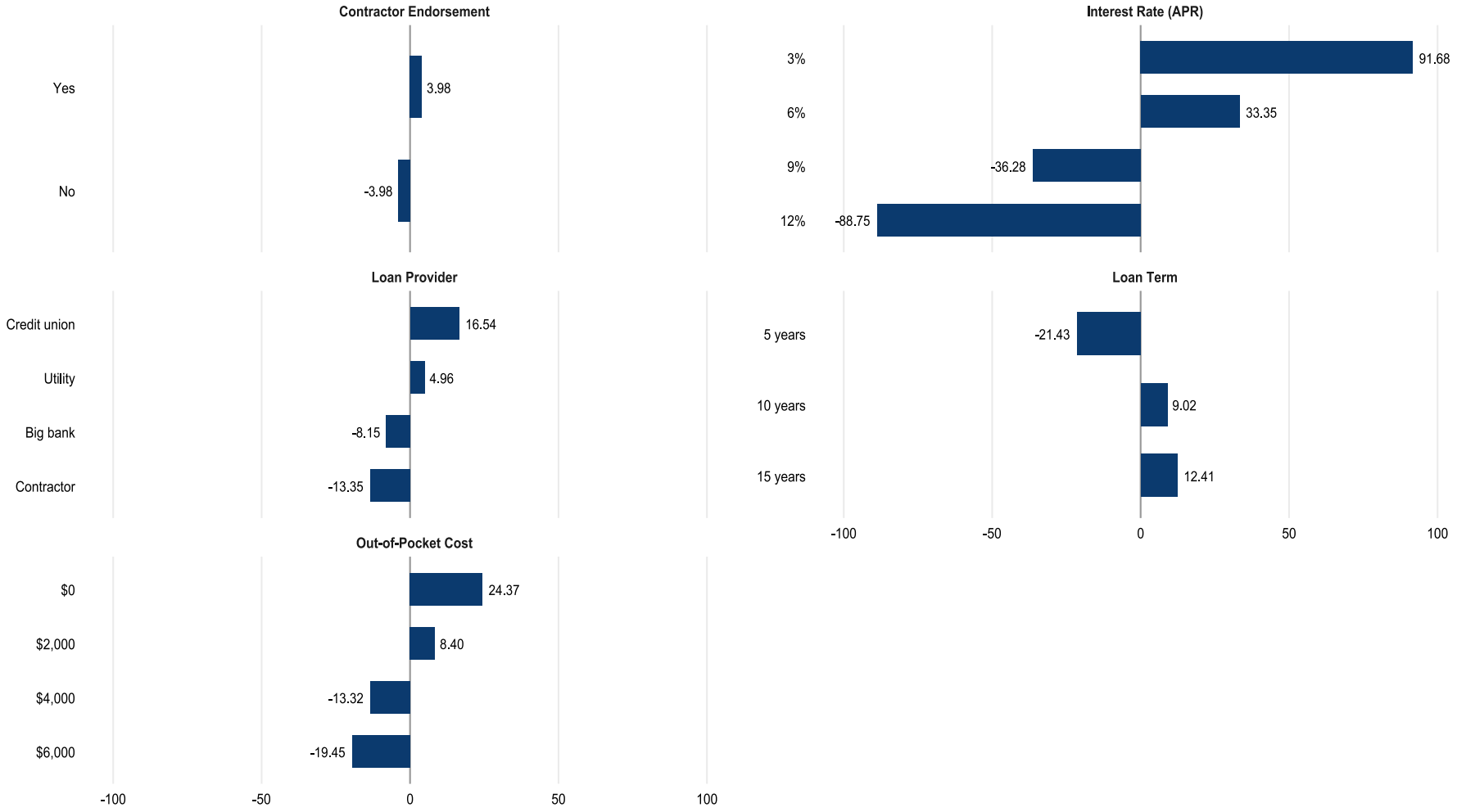


Figure 50. Relative Preference by Attribute Level (Underserved n=78)



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