GOGREEN HOME ENERGY FINANCING PROGRAM

IMPACT EVALUATION REPORT

APRIL 30, 2024

ACKNOWLEDGMENTS

LEGAL NOTICE

CONTENTS

TABLES & FIGURES

I. EXECUTIVE SUMMARY

1.1 PROGRAM HISTORY

In 2012, the California Public Utilities Commission ordered the California investor-owned utilities (IOUs) to allocate $75.2 million to kick-start and test multiple innovative energy efficiency (EE) financing pilots over an initial period ending 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 mid-point review of program performance (in August 2017 via working group). 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.

Decision 13-09-044 also specified that $25 million in ratepayer funds would be allocated to fund a loan loss reserve[1] (LLR). The LLRs improve residential customer access to direct and indirect local and regional financial products for adoption of eligible energy efficiency measures (EEEMs) with enhanced terms.[2] 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 between $5,000 and $50,000 ("macro-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. 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 this decision, the CPUC required an evaluation of the REEL Pilot (now GGH Program) by April 30, 2024. In August 2021, the Program was renamed the GoGreen Home (GGH) Financing Program as part of a renewed marketing effort. In September 2021, CAETAFA partnered with Enervee, California's online marketplace implementer, to offer loans less than $5,000 ("micro-loans") for EEEMs purchased through the marketplace.[3] 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.

Figure 1 illustrates the history of the GGH Program rulemaking.

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[1] 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.

[2] A list of eligible energy efficiency equipment can be found at www.gogreenfinancing.com/residentialmeasures.

[3] Enervee. 2024. Last modified March 20, 2024. https://ca.enervee.com/

Figure 1. GGH Program History

2012	• CPUC allocates $75.2 million in ratepayer funds to test financing as a mechanism to make energy efficiency improvements more affordable; $25 million is reserved for residential LLR
July 2016	• REEL Pilot issues first loan
March 2017	• CPUC D.17-03-026 gives CAEATFA flexibility to modify REEL Pilot
December 2017	• CPUC specifies program performance metrics and EM&V process via R. E-4900
March 2018	• First REEL Pilot modifications go into effect
January 2020	• Opinion Dynamics completes evaluation of REEL Pilot period
April 2020	• R. E-5072 pursuant to D. 17-03-026 expands REEL Pilot into full-scale Program; calls for additional rulemaking process
August 2021	• CPUC approves additional funding requested by CAEATFA and IOUs • Program is renamed to the GoGreen Home Financing Program (GGH Program)
September 2021	• CAEATFA introduces micro-loans for EEEMs purchased via California's Enervee online marketplace
September 2022	• GGH Program changes go into effect based on evaluation and stakeholder feedback

1.2   PROGRAM OVERVIEW

The GGH Program leverages financing to make EE improvements more affordable to residential customers, focusing on reaching underserved customers. CAEATFA administers the GGH Program statewide, as one of its CHEEF programs. The GGH Program connects California homeowners and renters with lenders to finance their energy efficiency projects through two types of loans:

- **Macro-loans:** Between $5,000 and $50,000 for major EE improvement projects typically implemented through GGH contractors.

- **Micro-loans:** Up to $5,000 for EEEM purchases made through the California Enervee[4] or Southern California Gas (SoCalGas) Marketplace.[5] Enervee is the California online marketplace program administrator.

Borrowers must use at least 70% of their GGH loan to fund EEEMs. The funds used for EEEMs are the claim-eligible portion of the loan amount. For each project or equipment purchase financed via a GGH Program loan, CAEATFA puts money into LLR accounts equal to a percentage of the claim-eligible portion of the loan amount. This percentage is set at 11% for loans distributed to market rate borrowers and 20% for loans distributed to borrowers who meet at least one criteria under the GGH Program's definition of underserved: (1) Fair, Isaac and Company (FICO) credit score below 640,

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[4] Enervee. 2024. Last modified March 20, 2024. https://ca.enervee.com/.
[5] SoCalGas Marketplace. 2024. Last modified March 20, 204. https://marketplace.socalgas.com/.

(2) property in a low-to-moderate income (LMI) census tract, and (3) household income is LMI (i.e., <120% average median income [AMI]). 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 broaden loan eligibility to market segments that otherwise may not have access to financing with favorable loan terms. 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 macro- and micro-loan components during the evaluation period (July 1, 2018 to June 30, 2023).

Table 1. GGH Program Component Comparison

Program Feature	Macro-Loan	Micro-Loan
Eligible loan size	$5,000 - $50,000	<$5,000
Eligible program measures	EEEMs installed by a GGH participating contractor	EEEMs purchased on Enervee online marketplace
Number of participant loans	3,320	567
Average loan amount	$18,253	$1,498
Average interest rate	4.9%	9.2%
Average loan payback terms	106 months	60 months
Number of participant lenders	8 (2 statewide, 6 regional)	2 (currently 1 active participant)
Default rates	1%	16%
LLR account (equal to a percentage of the claim-eligible portion of the loan amount)	11% for market rate borrowers 20% for underserved borrowers	

During the evaluated period, the GGH Program saw significant growth compared to the REEL Pilot. Table 2 lists the key accomplishments of the GGH Program during the evaluation period. Since the REEL Pilot, the GGH Program saw greater uptake in loans overall, but specifically for fuel substitution projects, encouraging 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)
Average program loans per year	106	777
Average loan size	$17,246	$18,253 (macro-loan) $1,498 (micro-loan)
Average financing generated per year	$1,828,067	$12,289,839
Average loan payback terms	117 months	106 months (macro-loan) 60 months (micro-loan)
Loan default rates	<1%	1% (macro—loan) 16% (micro-loan)
Number of participant lenders	4 total lenders: 2 statewide 2 regional lenders	10 total lenders: 2 statewide lenders 6 regional lenders 2 micro-loan lenders (currently 1 active participant)
Number of participant contractors	282	959
Annual program energy savings	63.7 MWh 1,262 therms	556 MWh 80,740 therms
Energy savings per macro-loan participant (compared to baseline energy usage)	5.4% electricity reduction 1.5% gas reduction	3.0% electricity reduction 5.7% gas reduction

1.3   RESEARCH OBJECTIVES AND METHODS

1.3.1   RESEARCH OBJECTIVES

The evaluation period covered GGH Program performance from July 1, 2018, to June 30, 2023. The purpose of the study was to reassess the performance of the GGH Program since scaling from a pilot to a full-scale program. The evaluation sought to address the following research objectives:

1. Assess whether GGH is scalable
2. Identify whether GGH is leveraged by private capital and support
3. Gauge whether GGH reaches underserved Californians who would not otherwise have participated in EE upgrades and explore the possibilities,[6] benefits, and drawbacks of modifying how CAEATFA defines "underserved"
4. Verify that GGH produces energy savings
5. Gauge if Resolution E-4900 metrics (see Appendix B) remain valid performance indicators for the current/future GGH Program, if there are new metrics to track, and/or if original metrics should be modified.

1.3.2   RESEARCH METHODS

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 in-depth interviews with CAEATFA and 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 EEEMs 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:** The team verified energy savings produced by GGH-financed measures via a consumption analysis, applied per-unit savings deemed appropriate by the California eTRM to micro-loan equipment, and conducted source energy savings review.[7] The team conducted 13 follow-up interviews with participants with unexplained savings patterns.

- **Participant Surveys:** The team fielded online surveys with GGH Program participants to support the team in understanding the participant experience, collect information about participants' households, and gather details on any nonroutine adjustments participants made to their homes or behaviors after completing a home upgrade/purchasing energy-efficient equipment. The team completed 144 online surveys with macro-loan participants and 60 with micro-loan participants. The evaluation team developed the sample and survey targets to achieve 90% confidence with 10% precision.

- **Program Influence Analysis:** The team used self-reported data from the participant survey to qualitatively understand the overall influence of GGH financing on decision-making, the influence of GGH financing compared

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[6] GGH regulations define underserved borrowers as those whose property is in a Low-to-Moderate Income (LMI) census tract, whose household income is LMI (<120% AMI), or who have a credit score below 640.

[7] "ETRM Overview." California Technical Forum, www.caltf.org/etrm-overview. Accessed 01 March. 2024

to other financing options available, and the influence of financing relative to that of rebates when customers take advantage of both.

1.4 CONCLUSIONS AND RECOMMENDATIONS

1.4.1 RESEARCH OBJECTIVE 1: ASSESS WHETHER GGH IS SCALABLE

CONCLUSION 1: THE GGH PROGRAM SCALED SINCE THE REEL PILOT.

Since the REEL Pilot evaluation, the GGH Program experienced significant growth in yearly number of loans (106 compared to 777) and yearly financing generated ($1.8 million compared to $12.3 million). Despite the growth in loan number, defaults for macro-loans remained consistent to the pilot period as did the loan performance, with only 1% of macro-loans defaulting during the GGH evaluation period.

CAEATFA successfully dispersed the GGH Program's reach to areas beyond Southern California (where participation was concentrated during the REEL Pilot). However, the GGH Program remains concentrated in three main areas of the state: Southern California, the Central Corridor, and the Bay Area.

- **Recommendation 1:** To scale to a truly statewide offering, target lenders and contractors serving the areas of the state not-yet-touched by the GGH Program, such as Northern California and the eastern inland areas of the state. Provide lenders and contractors in these areas with program marketing and education materials to ensure customers are aware of the GGH Program in these areas.

1.4.2 RESEARCH OBJECTIVE 2: IDENTIFY WHETHER GGH IS LEVERAGED BY PRIVATE CAPITAL AND SUPPORT

CONCLUSION 2: AN INCREASE IN PARTICIPATING PRIVATE LENDERS INCREASED PROGRAM REACH.

CAETAFA recruited additional lenders to the program, successfully increasing the participant lender pool from four during the REEL Pilot (two statewide and two regional lenders) to 10 during the evaluation period (two statewide micro-loan lenders, two statewide and six regional macro-loan lenders). Two of the legacy statewide lenders accounted for 62% of the private capital generated whereas two of the newly recruited regional macro-loan lenders contributed a third of the private capital generated through the Program. The remaining four regional lenders (including the two legacy regional lenders) accounted for less than 1% of GGH Program private capital each. Micro-loan lenders, classified as statewide lenders, were introduced through One Finance, but Lewis and Clark Bank is now the sole micro-loan lender. Given the relatively more recent introduction and smaller size of each micro-loan compared to macro-loans, micro-loans make up only 1% of private capital generated for the GGH Program.

- **Recommendation 2:** Identify opportunities to increase program activity among less active lenders (those who have contributed no more than 1% of GGH Program private capital each). Host an event with participating lenders to encourage them to share best practices for successful GGH Program loan activity. During these events participant lenders may also share challenges and ways to mitigate these issues.

CONCLUSION 3: CONTRACTORS DRIVE PROGRAM ACTIVITY BUT MANY ENROLLED CONTRACTORS ARE NOT ACTIVELY ENGAGED WITH THE PROGRAM.

Contractors are the primary source of GGH Program awareness for macro-loan participants. Nearly two-thirds of macro-loan participants (63%) heard about the GGH Program through their contractor. Most micro-loan participants do not need to engage with a contractor because measures purchased from the California Enervee and SoCalGas Marketplaces are easy to self-install. By September 2023, CAEATFA had recruited nearly 1,000 contractors to enroll in the GGH Program, a significant increase compared to the REEL Pilot period. However, contractor participation is very uneven. Ten contractors (about 1% of the total enrolled contractor base) contributed to more than one-third (36%) of all GGH Program projects (n=1,598) during April 2016 to September 2023. Despite most of the enrolled contractor network serving Southern California, most of the active contractors for the program (nine of the 10) are concentrated in the Bay Area and Central parts of the state. The recruitment of these active contractors is a driving factor for the GGH Program's reach expanding outside of Southern California during the evaluation period

- **Recommendation 3:** Weigh the costs and benefits of keeping contractors enrolled with the GGH Program who are not actively promoting the program and submitting projects.

- **Recommendation 4:** Identify opportunities to increase program activity among less active contractors. Since the contractor network is vast, the GGH Program may start by identifying markets for greater program activity and targeting the contractors in those areas with program education and training opportunities to increase their engagement (such as in Northern California and the eastern inland areas of the state). Contractor incentives can also be useful at increasing program engagement. Identify if any of these incentives already exist and make sure to inform contractors of the stacked benefits of submitting GGH Program projects. For example, BayREN offers a $1,000 incentive for qualifying contractors that install heat pump water heaters.[8] Help contractors connect the dots that they may benefit from multiple programs when completing a single project.

I.4.3   RESEARCH OBJECTIVE 3: GAUGE WHETHER GGH REACHES UNDERSERVED CALIFORNIANS WHO WOULD NOT OTHERWISE HAVE PARTICIPATED IN EE UPGRADES AND EXPLORE THE POSSIBILITIES, BENEFITS, AND DRAWBACKS OF MODIFYING HOW CAEATFA DEFINES "UNDERSERVED"

CONCLUSION 4: THE INTRODUCTION OF MICRO-LOANS EXPANDED THE GGH PROGRAM TO A GREATER NUMBER OF UNDERSERVED BORROWERS.

Macro-loans facilitated through the GGH Program reached borrowers in LMI areas. However, a large portion of these borrowers may not be credit challenged. In September 2021, CAEATFA introduced micro-loans as a GGH Program financing product. During the evaluation period, micro-loans were only eligible for SCE and SoCal Gas customers, but CAEATFA intends to expand the micro-loan component of the program to customers across the state. The average macro-loan size during the evaluation period was $18,253 while the average micro-loan size was only $1,498. Half of the micro-loan borrowers (50%) during the evaluation period had a FICO credit score below 640. Nearly three-quarters (71%) of micro-loan borrowers resided in census tracts with a tract median income below 120% of the area median income (defined as an underserved area by the GGH Program). Nearly three-quarters (74%) of micro-loan borrowers also had an annual income below $100,000. The opposite was true of macro-loan borrowers: only 4% had FICO credit scores less than 640, 57% resided in census tracts where the tract median income was less than 120% area median income, and only 16% had an income of less than $100,000. Compared to macro-loan participants, a statistically

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greater number of micro-loan borrowers also indicated they would be unlikely to qualify for other financing options outside of the GGH Program (4% compared to 30%, respectively).

However, micro-loans are riskier for lenders than macro-loans. During the evaluation period, 16% of micro-loans defaulted, whereas only 1% of macro-loans defaulted. Additionally, a larger percentage of micro-loan payments were past-due relative to macro-loan payments (14% compared to less than 1%, respectively). All these problematic loans, however, were administered by the program's first micro-loan lender, One Finance. One Finance is no longer active in the program; Lewis and Clark Bank has served as the GGH Program micro-loan lender since June 2023.

- **Recommendation 5:** Monitor default rates for micro-loans to ensure that program components' performance stabilizes over time. Credit-challenged borrowers' credit scores may be worsened by increased defaults on micro-loans adversely impacting the underserved borrowers the program intends to reach.

CONCLUSION 5: THE GGH PROGRAM'S DEFINITION OF "UNDERSERVED" ADEQUATELY CAPTURES THE PORTION OF UNDERSERVED BORROWERS REACHED.

As previously mentioned, the GGH Program defines underserved borrowers as those with a FICO credit score below 640, residing in a census tract where the median tract income is less than 120% of the area median income, or with a household income less than 120% area median income. More than half (59%) of the macro-loans and 85% of the micro-loans were given to underserved borrowers as per the GGH Program definition. Breaking it down further, 59% of program loans were to borrowers residing in a census tract where the median tract income was less than 120% area median income and 11% were to borrowers with a credit score less than 640.

The CPUC has broader definitions of equity for many of its energy programs, including hard-to-reach, underserved customers, and disadvantaged communities. When comparing GGH program activity to the CPUC's Environmental and Social Justice Action Plan's definition of underserved Californians, 48% of macro-loans and 77% of micro-loan went to an underserved population, and 23% of macro-loans and 36% of micro-loans went to disadvantaged communities. CAEATFA does not track the data necessary to calculate hard-to-reach customer penetration, such as borrower language, utility bill assistance program participation, housing type, or ownership status.

1.4.4 RESEARCH OBJECTIVE 4: VERIFY GGH PRODUCES ENERGY SAVINGS

CONCLUSION 6: THE GGH PROGRAM ACHIEVES ENVIRONMENTAL IMPACTS BEYOND ENERGY SAVINGS.

Overall, the GGH Program achieved 555.58 MWH annual electric energy savings and 80,739.50 therms annual gas savings. This equates to approximately 3% electricity savings and 5.7% gas savings per participant. Electricity savings are lower for the GGH Program than the REEL Pilot, however, during the evaluation period, the GGH Program made efforts (such as partnering with the TECH program) to emphasize financing for fuel substitution projects, not just energy-saving projects, to align with California's broader energy transition goals. The GGH Program's emphasis on fuel substitution and gas savings led to deeper emissions reductions. The GGH Program achieved 575.87 Metric Tons of CO2 emission reductions. Nearly all program savings and emission reduction impacts (97%) are driven by macro-loan projects rather than micro-loan equipment purchases. The consumption analysis confirmed that Electrification of major energy using systems, such as HVAC and water heating, eliminates the need to use gas and these measure types typically provide the highest impact from a savings perspective (more so than window/door measures and appliances).

However, the evaluation team's review of measures adopted through the program and analysis of participant-specific pre-post models suggests that fuel substitution may not be fully documented or tracked as part of the program tracking

data. The evaluation team found that among 581 participants for whom we had both gas and electricity savings estimates and without known fuel substitution measures in the tracking data, 131 participants increased electricity consumption and decreased gas consumption after participation in the GGH Program.

- **Recommendation 6:** Require contractors/customers to mark whether their financed project is for fuel substitution on their loan application. Train contractors to coach customers on the meaning of fuel substitution and how it impacts their project, so customers are familiar with the concept when applying for GGH Program financing.

- **Recommendation 7:** Align GGH Program performance metrics with program objectives. If fuel substitution is a viable program objective, add growth in fuel substitution projects and emission reductions over time as a program performance metric for future tracking. Verifying whether the GGH Program produces energy savings does not currently provide the full context of program impacts.

CONCLUSION 7: CUSTOMERS INTERESTED IN FUEL SUBSTITUTION HAVE THE GREATEST POTENTIAL FOR PROGRAM IMPACT.

Not all GGH Program macro-loan projects contributed equally to energy savings for participants. Among the 61% of macro-loan participants that were "positive savers," those with known fuel substitution measures were more likely to deliver deeper positive savings. This is likely because "positive savers" with known fuel substitution measures undertook larger projects with multiple end-uses. Additionally, "positive savers" that installed HVAC, weatherization, and water heating measures achieved deeper savings compared to participants who installed cool roof and window/door measures.

Overall, "positive savers" were more likely to have higher average baseline usage. As baseline usage of a participant increases, so does the energy savings. In an exception to this rule, net metering customers experienced much higher annual per-participant energy savings than non-net metering customers (588 kWh compared to 111 kWh respectively) despite having a much lower baseline grid electricity usage. Customers who have already invested in solar have a vested interest in fuel substitution because their solar panel generation offsets their electricity usage, not their gas usage. A greater number of net metering customers had known fuel substitution measures included in their GGH Program projects than non-net metering customers (17% compared to 9%, respectively). Among "positive savers," net metering participants in climate zones 10-13 (primarily Central California) saw nearly double the savings from GGH Program projects than non-net metering participants in these same areas. This was highly correlated to net metering customers having a higher incidence of installing HVAC measures as part of their GGH Program projects compared to non-net metering customers.

- **Recommendation 8:** Emphasize GGH Program promotion among enrolled HVAC contractors. HVAC projects have the greatest opportunity for savings among macro-loan participants.

- **Recommendation 9:** Develop marketing collateral that emphasizes the benefits of fuel substitution and the opportunities to offset upfront costs of fuel substitution with GGH Program financing (this could be developed in coordination with the TECH Program). Target solar customers with this GGH program literature to increase awareness among customers with the greatest opportunity for savings.

CONCLUSION 8: THE GGH PROGRAM INFLUENCES CUSTOMER DECISION-MAKING.

Overall, the GGH Program financing is influencing the majority of participants to make upgrades. More than half of macro-loan survey respondents (54%) and nearly two-thirds of micro-loan respondents (61%) said they would have been unlikely to make their home upgrade at all in absence of the GGH Program financing. All the micro-loan respondents (n=60) and 90% of the macro-loan respondents (n=144) indicated the GGH Program financing was

influential on their decision to complete their home upgrade. Among those macro-loan respondents who received a rebate for their home upgrade (in addition to the financing), more than half (16 of 29) said the financing was more important to their decision to complete the home upgrade than the rebate. Macro-loan participants were most motivated to use the GGH Program financing because of the low interest rates, while micro-loan participants were most motivated by the easy process. Please see Section 7.4.1 for more information.

I.4.5 RESEARCH OBJECTIVE 5: GAUGE IF RESOLUTION E-4900 METRICS REMAIN VALID INDICATORS OF PERFORMANCE FOR THE CURRENT/FUTURE GGH PROGRAM, IF THERE ARE NEW METRICS TO TRACK, AND/OR IF ORIGINAL METRICS SHOULD BE MODIFIED

CONCLUSION 9: GGH PROGRAM PERFORMANCE METRICS DO NOT HAVE TARGETS TO ADEQUATELY MEASURE SUCCESS.

Without established targets, the Resolution E-4900 metrics are not sufficient to adequately measure program success. CAEATFA collects all the data necessary to track and monitor the metrics established by Resolution E-4900 but it is not possible for the evaluation team to determine if the program is successfully meeting these metrics without targets or benchmarked data. For the purposes of this evaluation, the team measured GGH Program success in comparison to the REEL Pilot period. Moving forward, to adequately measure if the GGH Program is operating as intended, these metrics will need to be compared to established targets.

- **Recommendation 10:** The CPUC should coordinate an effort to establish targets for the Resolution E-4900 metrics based on baseline evaluation results (during the current evaluation period) or benchmarked data. Revisit these targets on a regular basis to determine whether they are viable targets for future stages of the program. For instance, as the program matures, monitoring default rates separately by micro- and macro-loans will allow for identification of potential risks early on.

2.   PROGRAM OVERVIEW AND STUDY PURPOSE

This chapter provides an overview of the program design and introduces the study research objectives.

2.1   PROGRAM HISTORY

In 2012, the CPUC allocated up to $25 million in ratepayer funds to test the effectiveness of financing as a mechanism to make EE improvements more affordable to residential homeowners.[9] Through the REEL Pilot, the CPUC tested the ability to leverage ratepayer funds to stimulate deeper energy savings than the state has historically achieved through other market incentives, such as rebates. The goals of the Pilot were to attract private capital to increase the volume of EE financing available, increase the penetration of EE upgrades in California, and attempt to reach residents in LMI markets. CAEATFA administered the REEL Pilot, which issued its first loan in July 2016. The evaluation team completed the first evaluation of the REEL Pilot in 2019, covering the period of July 2016 to June 30, 2018.

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. The Program was later renamed the GoGreen Home Financing Program (GGH Program) in August 2021 as part of a renewed marketing effort. The GGH Program received authorization for additional funding through June 30, 2027, via Decision 21-08-006 Rulemaking 20-08-022 released on August 5, 2021. CAEATFA remains the GGH Program administrator.

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[9] The CPUC provided guidance for, allocated budget to, and ordered the implementation of the energy efficiency financing pilots via Decisions 12-05-015, 12-11-015, and 13-09-044 (pg. 114).

Figure 2. GGH Program History

2012	• CPUC allocates $75.2 million in ratepayer funds to test financing as a mechanism to make energy efficiency improvements more affordable; $25 million is reserved for residential LLR
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September 2021	• CAEATFA introduces micro-loans for EEEMs purchased via California's Enervee online marketplace
September 2022	• GGH Program changes go into effect based on evaluation and stakeholder feedback

2.2   PROGRAM DESCRIPTION

Like the REEL Pilot, the GGH Program aims to expand the adoption of EE improvements by reducing the hurdle of upfront cost for customers via financing. This evaluation focuses on GGH Program operations and performance from July 2018 to June 30, 2023 (referred hereafter as the "evaluation period"). During the evaluation period, the GGH Program operated by establishing an LLR as a risk mitigation strategy for lenders that enroll and offer GGH Program loans to customers.[10] The evaluation analyzed two types of GGH Program loans:

▪ **Macro-loans:** Between $5,000 and $50,000 for major EE improvement projects typically implemented through GGH contractors. The loans are available to residential property owners and renters who receive gas or electricity from one of the four California IOUs. However, as most of the EE improvements stay with the building, renters are unlikely to take macro-loans.

▪ **Micro-loans:** Up to $5,000 for EEEM purchases made through the California Enervee or Southern California Gas (SoCalGas) Marketplace. CAEATFA launched the micro-loan component of the program in September 2021. Micro-loans were available only to SoCalGas and Southern California Edison (SCE) customers during the evaluation

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[10] To incent lending to underserved borrowers, the GGH LLR contribution (i.e., the percentage of the original and eligible loan amount CAEATFA puts into the LLR) is set at 20% of the loan value for underserved borrowers and 5%–11% for other borrowers, mitigating a greater portion of lender risk.

period. EEEMs financed via micro-loans are typically appliances available to homeowners and renters and are self-installed.

For each project/EEEM financed via a GGH Program loan, CAEATFA puts money into the LLR equal to a percentage of the original loan amount. This percentage was between 5% and 11% for loans distributed to market rate borrowers and 20% for loans distributed to borrowers identified as meeting at least one criteria under the GGH Program's definition of underserved: (1) FICO credit score below 640, (2) property in an LMI census tract, and (3) household income less than 120% of AMI.

The LLR can cover up to 90% of potential losses experienced by lenders in cases of loan default. This mitigates a large portion of lender risk, enabling lenders to offer loans for EE projects and EEEMs with lower interest rates, longer payback periods, and broader eligibility criteria. The better loan terms and broadened eligibility criteria reduce monthly payments and aim to enhance market coverage in underserved market segments, such as LMI or credit-challenged borrowers.

In addition to the GGH Program loan, borrowers may qualify for utility rebates to further lower the upfront cost of eligible equipment. Whereas macro-loan borrowers must identify and apply for rebates, utility rebates for EEEMs purchased through the Enervee or SoCalGas Marketplace using a micro-loan are applied at the point of sale.

2.3   PURPOSE OF THE STUDY

The overarching purpose of this study was to reassess the performance of GGH since scaling beyond the initial pilot stage. Based on metrics adopted in Resolution E-4900,[11] included for reference in Appendix B, as well as additional performance metrics agreed upon by the CPUC and evaluation team, this study has the following specific research objectives:

1. **Assess whether GGH is scalable**, by analyzing the following:
   a. Growth in the number of loans on a month-by-month basis over the evaluation period (July 2018 to June 30, 2023);
   b. The number of loans made by the program, average loan size, and total amount of financing generated (since Resolution E-5072 was adopted);
   c. The geographic distribution of loans, including the ability to reach new regions of the state, especially those with large, underserved populations;
   d. Loan performance to date in terms of defaults, late payments, and use of LLR; and
   e. Participant details, including credit scores, loan terms, percent underserved, and percent who may qualify for other private loan options (e.g., based on FICO score and income).
2. **Identify whether GGH is leveraged by private capital and support**, by tracking the following:
   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 REEL Pilot to attract additional funding for the GGH Program and the total amount of private capital attracted to date;
   c. Any program modifications CAEATFA implemented (or proposes to implement) to improve consumer protections and attract additional lenders;
   d. The incidence of early payoffs and the implications of this on savings and annual percentage rate (APR) benefits; and whether customer early repayments alter the attractiveness of participation for lenders; and

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[11] D.21-08-006

e. Whether the incremental funds from additional ratepayer funding were needed to implement GGH, and if so, how much.
3. **Gauge whether GGH reaches underserved Californians who would not otherwise have participated in EE upgrades and explore the possibilities,[12] benefits and drawbacks of modifying how CAEATFA defines "underserved,"** by reviewing the following:
    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 (including a comparison across California's definitions for customers in vulnerable populations [e.g., underserved, hard-to-reach, disadvantaged communities, low income/moderate income/market rate]);
    d. How other entities define "underserved" Californians in comparison to GGH; and
    e. Whether participants would have qualified for existing private EE loan programs at interest rates and terms they could afford or would accept.
4. **Verify that GGH produces energy savings**, by assessing the following:
    a. Customer meter data provided by the utilities to conduct a consumption analysis and understand how much energy savings GGH produced, including electric and gas savings, taking into account fuel shifting from gas to electric, per participant and overall;
    b. Differences in energy savings achieved across subpopulations of interest, such as climate zone, loan size, loan recipient type (e.g., LMI), presence of solar generation, and presence of fuel substitution, provided participation levels and available data allow for such comparisons;
    c. Energy savings from other loan programs and comparing the EM&V results to those of the GGH Program;
    d. The influence of the program on customer decision-making and relative influence of financing and rebates, where applicable;
    e. Source energy and CO_2 emission reductions from financed projects (including fuel substitution measures).
5. **Gauge if Resolution E-4900 metrics remain valid performance indicators** for the current/future GGH Program, if there are new metrics to track, and/or if original metrics should be modified.

3. METHODOLOGY OVERVIEW

CPUC issued Resolution E-4900 to establish metrics for measuring financing pilot success and require regular EM&V of the financing pilots, including the GGH Program. When CPUC elevated the REEL Pilot to a full-scale program via Resolution E-5072, the CPUC required an evaluation of the REEL Pilot (now GGH Program) by April 30, 2024. Resolution E-5072 suggested that the evaluation cover additional metrics beyond Resolution E-4900. The evaluation team measured GGH Program performance against the Resolution E-4900 metrics as well as additional evaluation metrics discussed with the CPUC to fully address this study's research objectives and cover the Resolution E-5072 requirements. The full list of metrics the evaluation team used to measure GGH Program performance are listed in Table 3.

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[12] GGH regulations define underserved borrowers as those whose property is in a Low-to-Moderate Income (LMI) census tract, whose household income is LMI (<120% AMI), or who have a credit score below 640.

Table 3. EE Financing Pilot Metrics

Research Objective	Resolution E-4900 Metric[a]	Additional GGH Program Evaluation Metrics
The financing tool is **scalable**	Number of loans made by the Pilot, with breakdown by: ▪ Growth in the number of loans on a month-by-month basis over the lifetime of the Pilot ▪ Total amount of financing generated by the Pilot ▪ Geographic distribution of loans, including the ability to reach new regions of the state, especially those with large, underserved populations	▪ The number of loans made by the program and average loan size (since Resolution E-5072 was adopted) ▪ Loan performance to date in terms of defaults, late payments, and use of loan loss reserve ▪ Participant details including credit scores, loan terms, percent underserved, and percent who may qualify for other private loan options (e.g., based on FICO score and income)
The financing tool is **leveraged** by private capital and support	Private capital participation in the Pilot, as measured by: ▪ Number of financial institutions participating in the Pilot and types of financial institutions participating (such as credit unions) ▪ Amount of private capital attracted	▪ The number and type of program-certified contractors ▪ Analysis of the distribution of participation across participating financial institutions and program-certified contractors ▪ Any changes CAEATFA made from the REEL pilot to attract additional funding for GGH; ▪ Any program modifications CAEATFA implemented (or proposes to implement) to improve consumer protections and attract additional lenders; ▪ The incidence of early payoffs and the implications of this on savings and annual percentage rate (APR) benefits; and whether customer early repayments alter the attractiveness of participation for lenders ▪ Whether the incremental funds from additional ratepayer funding were needed to implement GGH, and if so, how much
The financing tool **reaches underserved Californians** who would not otherwise have participated in EE upgrades	Analysis of participants in the Pilot, according to: ▪ Credit scores of loan participants reported on an aggregate basis ▪ Length of time allowed for applicants to pay back the loans ▪ Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, AMI, or other poverty statistics ▪ Whether participants would have qualified for existing private energy efficiency loan programs at interest rates and terms that they can afford or would accept	▪ Comparison of participation across California's definitions for customers in vulnerable populations [e.g., underserved, hard-to-reach, disadvantaged communities, low income/moderate income/market rate]) ▪ How other entities define "underserved" Californians in comparison to the Program
The financing tool produces **energy savings**	Energy savings that resulted, as measured: ▪ Through customer meter data provided by the utilities via Energy Division data request (customer privacy must be maintained) ▪ Through Normalized Metered Energy Consumption (NMEC) analysis, as an option ▪ Comparison of energy savings from other loan programs to that of the pilot, if possible, to assess through EM&V studies	▪ Average energy savings per participant ▪ Differences in energy savings achieved across subpopulations of interest, such as climate zone, loan size, loan recipient type (LMI), presence of solar generation, and presence of fuel substitution ▪ The influence of the program on customer decision-making and relative influence of financing and rebates ▪ Source energy and CO_2 emission reductions from financed projects (including fuel substitution measures)

[a]Source: CPUC Resolution E-4900. December 18, 2018.
Note: Blue text indicates the Resolution E-5072 requirements for evaluation beyond Resolution E-4900.

This report includes results from a range of data collection and analytical methods to support evaluation of GGH Program performance based on the metrics discussed in Table 3. Table 4 summarizes the specific tasks undertaken to conduct this evaluation. Detailed descriptions of the methods are available in Appendix A.

Table 4. Summary of Program Evaluation Tasks

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 the IOUs. Additionally, the team conducted in-depth interviews with CAEATFA and Enervee (the current implementer of the GGH Program's Eco-Financing micro-loan component) 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 characterize participants in terms of borrower characteristics (e.g., credit score, debt-to-income [DTI] ratio, geographic distribution, climate zone, home upgrade project/EEEM purchase characteristics, and loan size).

Impact Analysis	The evaluation team verified energy savings produced by measures financed through GGH using three methods:
	▪ A consumption analysis for macro-loan projects:
	  ▪ The team estimated individual pre-post models to identify drivers of energy savings
	  ▪ The team estimated annual per-household electricity and gas savings using linear fixed effects regression (LFER) models.
	▪ A deemed savings application for micro-loan measures:
	  ▪ The team applied deemed savings from California's eTRM to estimate energy savings for EEEMs purchased through the California Enervee Marketplace and financed through the GGH Program[a]
	▪ A source energy savings review to quantify environmental impacts from the GGH-financed projects:
	  ▪ The team estimated emissions reduction using CPUC's Fuel Substitution Technical Guidance for Energy Efficiency. The accompanying emissions reduction calculator was used, and assumptions were updated to match this evaluation context.

Participant Surveys and Interviews	The evaluation team fielded two online surveys with GGH Program participants; 204 participants completed the surveys: ▪ 144 macro-loan participants (65 who installed a fuel substitution measure, 79 who did not install a fuel substitution measure), and ▪ 60 micro-loan participants. The surveys supported the team by aiding in understanding the participant experience, collecting information about participants' households, and increasing understanding of any nonroutine adjustments participants made to their homes or behaviors after completing a home upgrade/purchasing EEEMs (to provide context for the consumption analysis). As a follow-up to the online surveys, the team interviewed 13 participants identified by the consumption analysis as having increased energy usage after program participation. The phone interviews aimed to further illuminate non-routine events associated with macro-loan participants.
Program Influence Analysis	The team used self-reported data from the participant surveys to qualitatively understand the influence of GGH financing compared to other financing options available, understand the relative influence between financing and rebates when customers take advantage of both, and assess the influence of the GGH Program on customer decision-making when considering home energy improvements and purchase of EEEMs.

[a] "ETRM Overview." California Technical Forum, www.caltf.org/etrm-overview. Accessed 01 March. 2024

4. PROGRAM SCALABILITY

The purpose of this chapter is to assess whether the GGH Program is further scalable, by analyzing the following:

- Growth in the number of loans on a month-by-month basis over the evaluation period (July 1, 2018–June 30, 2023);

- The number of loans made by the program, average loan size, and total amount of financing generated (since the adoption of Resolution E-5072 in April 2020);

- The geographic distribution of loans, including the ability to reach new regions of the state, especially those with large, underserved populations;

- Loan performance to date in terms of defaults, late payments, and use of LLR; and

- Participant characteristics including credit scores, loan terms, the percent underserved, and the percent who may qualify for other private loan options (e.g., based on Fair, Isaac and Company [FICO] score and income).

The evaluation team reviewed program tracking data, conducted a participation analysis, and completed participant surveys with macro-loan and micro-loan borrowers to assess program scalability.

4.1 HISTORICAL GROWTH IN LOANS

During the evaluation period, the GGH Program facilitated 3,887 loans (3,320 macro-loans and 567 micro-loans). Figure 3 shows the number of macro-loans and micro-loans facilitated each month. The number of loans per month steadily increased while experiencing seasonal fluctuations, typically peaking in the summer months. As expected, the monetary volume of the loans distributed each month increased with the number of loans. There was an increase in macro-loans per month from 22 to 73 loans on average after the GGH Program was elevated to full-scale program status by the passage of Resolution E-5072 in April 2020.

One Finance (the GGH Program's first micro-loan provider) issued its first micro-loan in September 2021. However, they did not continue with the GGH Program and issued their last micro-loan nine months later, in June 2022. Lewis and Clark Bank joined the GGH Program in June 2023 as a micro-loan provider. The GGH Program did not offer micro-loans to customers between July 2022 and May 2023.

Figure 3. Quantity and Volume of GGH Loans Over Time
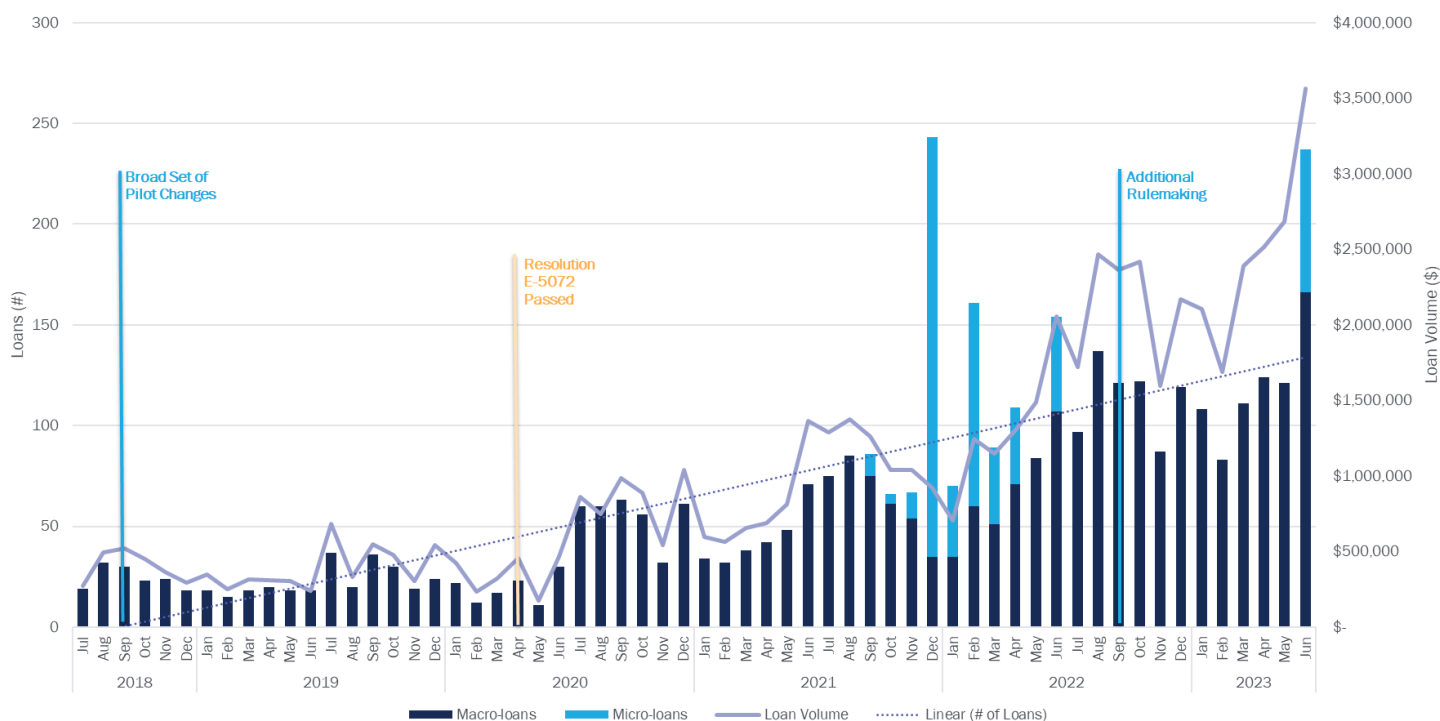
Source: CAEATFA tracking data.

4.2   PROGRAM LOAN GENERATION

Table 5 presents the number of loans, average number of loans per month, average loan size, and total amount of financing generated in the pre-Resolution E-5072 (July 2018–March 2020), post-Resolution E-5072 (April 2020–June 2023), and full evaluation period (July 2018–June 2023). Of the 3,320 macro-loans distributed over the course of the evaluation period, 15% (accounting for $8,291,075 of financing) were distributed under the REEL Pilot, and the remaining 85% (accounting for $52,308,912 of financing) were distributed under the GGH Program. Since micro-loans launched in September 2021, all 567 microloans (accounting for $849,209 of financing) were administered post-Resolution E-5072. More than 99% of the loan principal amount was eligible for claims, implying that almost all of the finances generated went towards installing EEEMs.[13]

Across the entire evaluation period, macro-loans distributed per month averaged 66, a notable increase from the average of 9 loans per month during the Pilot period (Pilot initiation–June 2018). Over the months that micro-loans were available, 57 micro-loans were distributed each month on average.

The average macro-loan size was $17,095 in the pre-resolution E-5072 period and $18,451 in the post-resolution E-5072 period, representing a nominal increase in loan amount by 7%. However, construction costs increased in California by 5% between July 2018 and March 2020 and 37% between April 2020 and June 2023. As such, macro-loan projects likely did not actually increase in scope post-resolution E-5072.[14]

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[13] Up to 30% of a GGH loan principal can be used for non-EEEM components of a project. However, the portion of the principal used for non-EEEM components is not eligible for claims.

[14] Construction cost inflation is estimated from DGS California Construction Cost Index CCCI:
 https://www.dgs.ca.gov/RESD/Resources/Page-Content/Real-Estate-Services-Division-Resources-List-Folder/DGS-California-Construction-Cost-Index-CCCI

Table 5. Number of Loans, Total Amount of Financing Generated, and Average Loan Size

Evaluation Period	Pre-Resolution E-5072 (July 2018–March 2020)		Post-Resolution E-5072 (April 2020–June 2023)		Total Evaluation Period (July 2018–June 2023)	
Loan Category	Macro-Loans	Micro-Loans[a]	Macro-Loans	Micro-Loans	Macro-Loans	Micro-Loans
Number of Loans	485	N/A	2,835	567	3,320	567
Average Number of Loans Per Month[b]	22	N/A	73	57	66	57
Total Amount of Financing	$8,291,075	N/A	$52,308,912	$849,209	$60,599,987	$849,209
Average Loan Size	$17,095	N/A	$18,451	$1,498	$18,253	$1,498

Source: CAEATFA tracking data.
[a] Micro-loans launched in September 2021 after the CPUC issued Resolution E-5072.
[b] The team calculated average micro-loans per month using periods during which micro-loans were offered (September 2021 to June 2022 and June 2023.

4.3   GEOGRAPHIC DISTRIBUTION OF LOANS

The previous evaluation found that most of the participation in the REEL Pilot was in Southern California. Since the previous evaluation, four regional lenders have joined the program, and existing lenders have expanded their loan distribution to larger parts of the state. Figure 4 shows the distribution of GGH loans throughout California in the current evaluation period before and after Resolution E-5072, distinguishing between loans provided by the two statewide macro-loan lenders, regional macro-loan lenders, and micro-loans. As in the Pilot period, a large proportion of the statewide macro-loans were provided in Southern California. Despite operating statewide, the two statewide lenders' branch locations are limited to Southern California; however, customers may apply and qualify for loans virtually as well as in-person at branch locations. Unlike during the Pilot period, statewide lenders distributed a sizeable number of macro-loans to customers in the Central (Central Corridor) and Northern (Bay Area) parts of the state. Additionally, there was a notable increase in loans provided by regional macro-loan lenders that CAEATFA recruited to the program after the Pilot period. Regional macro-loan lenders were primarily concentrated in the North Central Corridor and the Bay Area.

In alignment with micro-loans only available to SCE customers during the evaluation period, micro-loan distribution was concentrated in Southern California. Micro-loans are now (as of March 2024) available to all IOU customers.[15]

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[15] As per https://ca.enervee.com/ on March 11, 2024.

Figure 4. Geographic Distribution of Loans by Lender Type
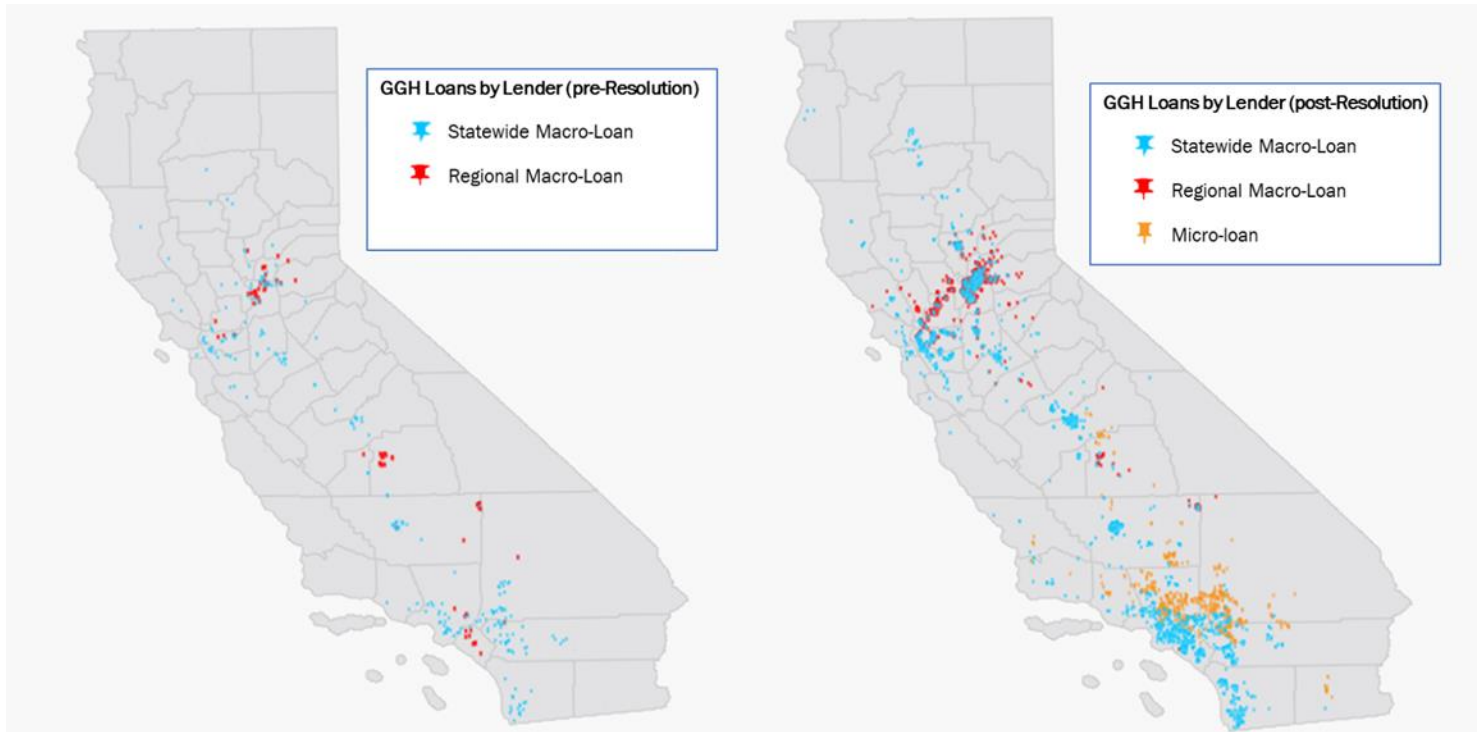
Source: CAEATFA tracking data

Figure 5 shows the loan density by county (per 100,000 residents). The figure shows that loans were more concentrated in the North Central Corridor than in Southern California. This observation further reinforces the geographic shift of loan distribution from the Pilot period to the current evaluation period. As previously mentioned, this is due to the introduction of a new regional macro-loan lender.

Figure 5. Loan Density by County
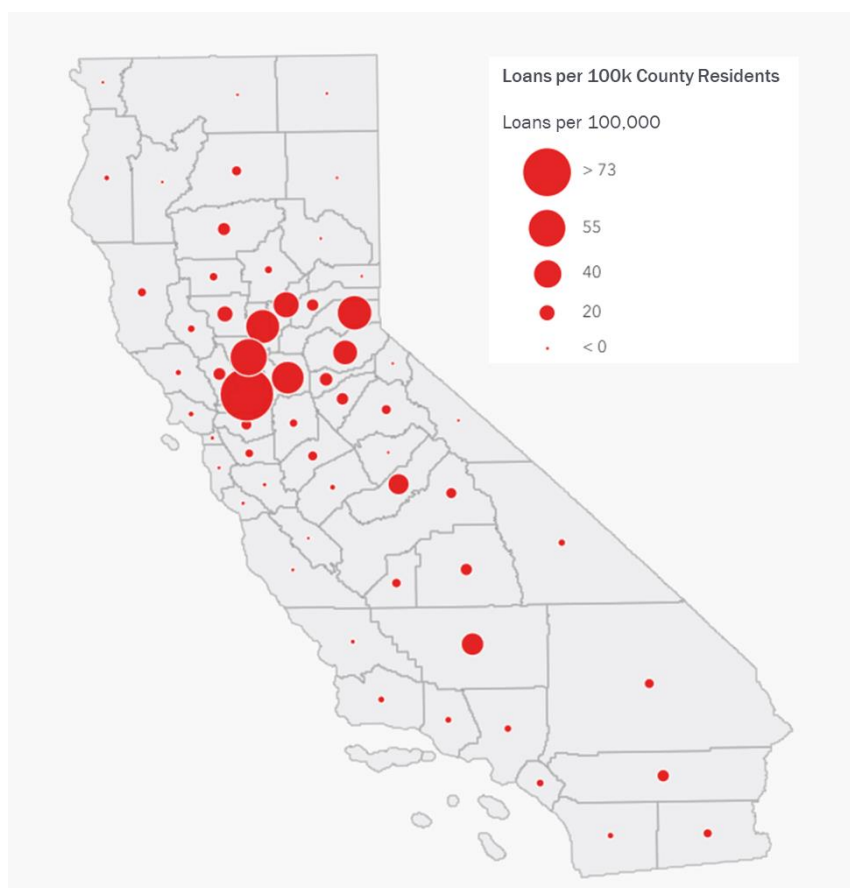
Source: CAEATFA tracking data

As previously mentioned, the GGH Program aims to provide underserved customers with financing for EE improvements with favorable terms. Figure 6 shows the distribution of loans by census tract, with census tracts identified as underserved highlighted in green.[16] Despite the large percentage of California identified as underserved, only 50% of loans fell within an underserved census tract.

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[16] For the purpose of this map, underserved census tracts were identified as (1) disadvantaged communities, (2) low-income communities as defined by paragraph (2) of subdivision (d) of Section 39713 of Health and Safety Code, (–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 adopted pursuant to Section 50093 (3) tracts meeting CALEPA disadvantaged community criteria, (4) tracts where 75%+ of public-school students receive free or reduced-price meals, and (5) federally recognized tribal lands.

Figure 6. Loan Density by Census Tract – Underserved Census Tracts
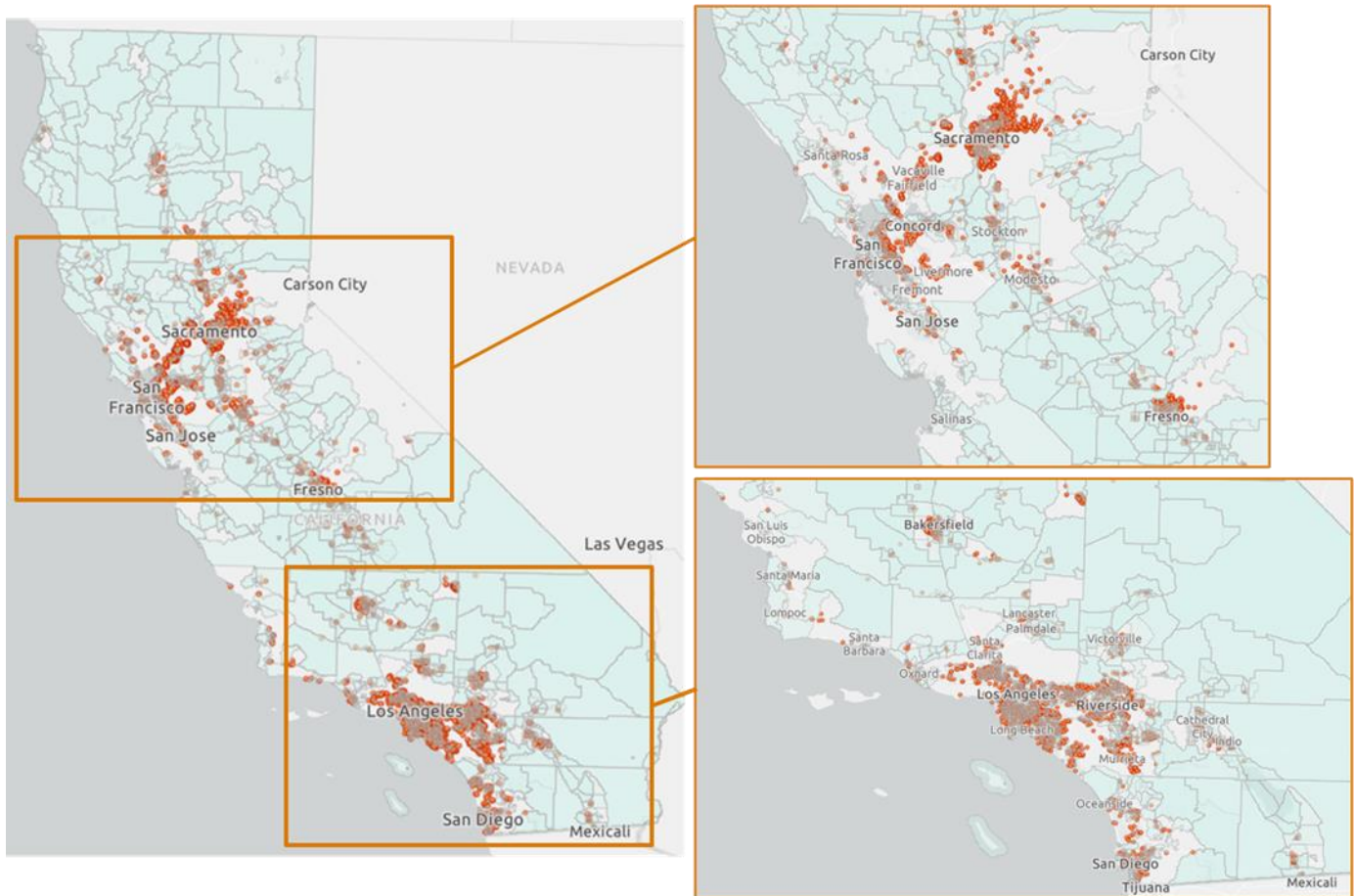
Source: CAEATFA tracking data

4.4   LOAN PERFORMANCE

Although most macro-loan and micro-loan borrowers were up to date or ahead on loan payments at the end of the evaluation period, loan performance was better among macro-loan borrowers than micro-loan borrowers. Table 6 depicts the distribution of loans by payment status and loan type as of the end of the evaluation period (June 30, 2023). Of the loans distributed during the evaluation period, 80% of macro-loans and 56% of micro-loans were current on payments. By the end of the evaluation period, a larger percentage of micro-loans than macro-loans had been defaulted (16% vs. 1%). Additionally, a larger percentage of micro-loan payments were past-due relative to macro-loan payments (14% vs. <1%). The incidence of pay-off was similar by loan type, with 18% of macro-loans (up from 6% in the Pilot period) and 13% of micro-loans distributed during the evaluation period paid in full by the end of the period.

Table 6. Loan Performance as of June 30, 2023

Loan Payment Status	Macro-loan				Micro-loan			
	Loan Count	Original Loan Amount	Outstanding Loan Amount	Amount Defaulted	Loan Count	Original Loan amount	Outstanding Loan Amount	Amount Defaulted
Paid in Full	607	$9,396,023	$0	NA	75	$96,925	$0	NA
Current	2,660	$50,453,000	$42,312,398	NA	320	$484,081	$327,054	NA
30 Days Past Due	7	$95,290	$58,299	NA	32	$56,637	$39,288	NA
60 Days Past Due	6	$103,144	$68,729	NA	22	$34,148	$24,322	NA
90 Days Past Due	1	$11,096	$8,231	NA	21	$29,423	$19,300	NA
120 Days Past Due	NA	NA	NA	NA	7	$14,337	$11,652	NA
150 Days Past Due	NA	NA	NA	NA	0	$0	$0	NA
Defaulted	39	$541,435	$342,128	$479,970	90	$133,658	$13,111	$113,504
Total	3,320	$60,599,987	$42,789,784	$479,970	567	$849,209	$434,727	$113,504

Source: CAEATFA tracking data.

As seen in Table 7, California Coast Credit Union and Matadors Community Credit Union accounted for 34 of the 39 defaulted macro-loans distributed during the evaluation period (87% of claimed paid off by CAEATFA using the LLR). However, California Coast Credit Union and Matadors Community Credit Union, the two statewide macro-loan providers, were among the top three macro-loan providers in terms of number of macro-loans distributed during the evaluation period (accounting for 60% of total macro-loans distributed). Only 2% of the macro-loans distributed by California Coast Credit Union and Matadors Community Credit Union had defaulted by the end of the evaluation period.

CAEATFA distributed LLR funds to lenders equal to a percentage of the loan amount defaulted. In the case of macro-loans, LLR funds covered 89% to 90% of defaulted macro-loan financing. As of the end of evaluation period, LLR funds covered 35% of defaulted micro-loan financing.

Table 7. Defaults and Claims Paid as of June 30, 2023

Lender	Loan Count	Default Amount at Time of Default	CAEATFA Distributed LLR Funds	Recoveries Paid to Program
Macro-loan				
California Coast Credit Union[a]	24	$289,385	$257,820	$(16,018)
Matadors Community Credit Union[a]	10	$126,495	$113,846	$0
First US Community Credit Union	2	$21,527	$19,375	$0
Valley Oak Credit Union[a]	2	$28,132	$25,318	$0
Travis Credit Union	1	$14,432	$12,988	$0
Macro-loan Total	**39**	**$479,970**	**$429,347**	**(16,018)**
Standard Loan Net Credit Enhancement Funds Expended – Macro-loan				*$413,329*
Micro-loan				
One Finance	90	$113,504	$39,706	$0
Micro-loan Total	**90**	**$113,504**	**$39,706**	**$0**
Standard Loan Net Credit Enhancement Funds Expended – Micro-loan				*$39,706*
Total Loans	**129**	**$593,474**	**$469,053**	**$(16,018)**
Standard Loan Net Credit Enhancement Funds Expended – All Loans				*$453,035*

Source: CAEATFA tracking data.

[a] Indicates legacy lenders that enrolled and began loans in the pilot period prior to July 2018.

4.5   PARTICIPANT CHARACTERISTICS

Figure 7 summarizes the participation of this evaluation period across six key characteristics: FICO credit score, DTI ratio, CalEnviroScreen score, LMI census tract, loan term, and household income. Notably, whereas the first five characteristics are summarized for all participants, household income is only available for participants who completed the participant survey. See Section 6 for further details and a discussion of these characteristics.

Figure 7. Summary of Participant Characteristics

FICO Score
All participants

Range	Macro-loan	Micro-loan
580-640 (Fair)	4%	50%
641-700 (Fair/Good)	15%	29%
701-760 (Good/Very Good)	29%	17%
761-820 (Very Good/Exceptional)	40%	4%
821+ (Exceptional)	12%	0%
NO FICO	<1%	0%

DTI Ratio
All macro-loan participants

Range	Macro-loan
Under 25% (Less risk)	25%
25-35% (Some risk)	34%
36-45% (More risk)	27%
46-55% (Most risk)	14%

CalEnviroScreen Score
All participants

Range	Macro-loan	Micro-loan
0 – 25 (Least vulnerable)	30%	9%
26 – 50	34%	25%
51 – 75	23%	36%
76 – 100 (Most vulnerable)	13%	30%

LMI Census Tract
All participants by census tract median income /area median income

Range	Macro-loan	Micro-loan
120+ (Non-LMI)	43%	29%
80 – <120 (LMI)	37%	41%
60 – <80 (LMI)	14%	20%
<60 (LMI)	6%	11%

Loan Term
All participants

Metric	Macro-loan (Months)	Micro-loan (Months)
Average	106	60
Median	120	60
Minimum	12	60
Maximum	180	60

Household Income
2022 income of participant survey respondents

Range	Macro-loan	Micro-loan
Less than $25,000	1%	12%
$25,000 to less than $50,000	3%	22%
$50,000 to less than $100,000	12%	40%
$100,000 to less than $200,000	38%	13%
$200,000 or more	24%	3%
Don't know/prefer not to say	23%	10%

The team compared the distribution of household income from the 2022 American Community Survey five-year estimates to that of the participant survey respondents who provided a valid 2022 income response (Table 8). Participation in the program is concentrated among households with an annual income of more than $50,000 and increases among households with an annual income of $100,000. Though more top-heavy than the state, the income distribution of GGH Program participants is not concentrated enough to warrant a re-focus of marketing efforts for future growth. Given that census data estimates that in 2022, half of households in California (over seven million) had an income less than $100,000, there is ample opportunity for increasing GGH Program participation in lower-income households, particularly through micro-loans (see Table 22).

Table 8. Statewide Distribution of Households by Annual Income (Compared to Survey Respondents)

Household Income	2022 5-Year Estimate Census Data		Participant Surveys: Macro- and Micro-loans	
	Count (Household)	Percent	Count (Respondent)	Percent
Less than $25,000	1,757,689	13%	9	5%
$25,000 to less than $35,000	798,949	6%	7	4%
$35,000 to less than $50,000	1,158,477	9%	10	6%
$50,000 to less than $75,000	1,824,268	14%	20	12%

Household Income	2022 5-Year Estimate Census Data		Participant Surveys: Macro- and Micro-loans	
	Count (Household)	Percent	Count (Respondent)	Percent
$75,000 to less than $100,000	1,597,899	12%	21	13%
$100,000 to less than $150,000	2,370,216	18%	35	21%
$150,000 to less than $200,000	1,424,793	11%	28	17%
$200,000 or more	2,383,532	18%	36	22%
Total	13,315,822	100%	166	100%

Sources: 2022 American Community Survey 5-Year Estimates and Macro-loan and Micro-loan participant surveys.

The team compared the statewide distribution of households in LMI census tracts (defined as those with a tract median family income that does not exceed 120% of the area median family income) to that of all borrowers during the evaluation period. As seen in Table 9, whereas 34% of households statewide are in a non-LMI census tract, 41% of borrowers in the evaluation period were in a non-LMI tract.

Table 9. Statewide Distribution of Households by LMI Census Tract Status (Compared to All Borrowers)

Census Tract Median Income/Area Median Income (Percentile)	2023 FFIEC Census Data		CAEATFA Tracking Data	
	Count (Households)	Percent	Count (Borrowers)	Percent
120+ (Non-LMI)	4,462,008	34%	1,578	41%
80 – <120 (LMI)	4,737,214	36%	1,465	38%
60 – <80 (LMI)	2,290,213	17%	579	15%
<60 (LMI)	1,560,340	12%	265	7%
Not Known	121,154	1%	0	0%
Total	13,170,929	100%	3,887	100%

Sources: 2023 FFIEC Census Data and CAEATFA tracking data.

5. PROGRAM FINANCING SUPPORT

The purpose of this chapter is to assess whether the GGH Program is leveraged by private capital and support, by tracking:

- 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;

- Any changes CAEATFA made from the REEL Pilot to attract additional funding for the GGH Program and the total amount of private capital attracted to date;

- Any program modifications CAEATFA implemented (or proposes to implement) to improve consumer protections and attract additional lenders;

- The incidence of early payoffs and the implications of this on savings and annual percentage rate (APR) benefits and whether customer early repayments alter the attractiveness of participation for lenders; and

- Whether the incremental funds from additional ratepayer funding were needed to implement the GGH Program, and if so, how much.

To address this research objective, the evaluation team reviewed program changes, reviewed program tracking data, and conducted a participation analysis.

5.1   PARTICIPATING FINANCIAL INSTITUTIONS AND PRIVATE CAPITAL GENERATED

Over the evaluation period, ten participating lenders distributed 3,887 GGH Program loans (3,320 macro-loans, 567 micro-loans) to borrowers across the state, amounting to $61.4M ($60.6M macro-loans, $0.8M micro-loans) in private capital lending. This is an increase from the 212 loans amounting to $3.7M in capital provided during the REEL Pilot. Only four lenders participated in the REEL Pilot.

Approximately 43% of GGH financing came from the GGH Program's largest private capital lender, California Coast Credit Union. California Coast Credit Union is a legacy lender, having enrolled during the REEL Pilot and accounting for 71% of private capital in the pilot period. Matadors Community Credit Union, the second largest lender, accounted for 19% of the GGH Program's private capital. Matadors Community Credit Union was the first financial institution to enroll in the REEL Pilot and accounted for 23% of the Pilot's private capital. Both California Coast Credit Union and Matadors Community Credit Union operate statewide. During this evaluation period, there were six regional macro-loan lenders, four of which each accounted for one percent or less of the Program's private capital; however, First US Community Credit Union and Travis Credit Union accounted for 18% and 15%, respectively. The two micro-loan providers accounted for 1% of the Program's private capital. Table 10 shows the number of loans, 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 2018 and June 2023.

Table 10. Lender Characteristics

Lender	Lender Type	Date of First Loan	# of Loans	Original Loan Amount (Private Capital)	LLR Contribution	Proportion of GGH Private Capital
Macro-loan Lenders						
California Coast Credit Union[a]	Statewide	1/13/2017	1,455	$26,522,262	$4,103,433	43%
Matadors Community Credit Union[a]	Statewide	7/19/2016	563	$11,974,685	$1,868,869	19%
First US Community Credit Union	Regional	9/28/2018	694	$11,040,132	$1,742,842	18%
Travis Credit Union	Regional	5/13/2021	510	$9,477,075	$1,689,482	15%
Desert Valleys Federal Credit Union[a]	Regional	9/11/2017	47	$787,520	$98,744	1%
Valley Oak Credit Union[a]	Regional	11/28/2016	36	$532,140	$95,672	1%
Eagle Community Credit Union	Regional	8/10/2018	12	$210,348	$36,311	<1%
Pasadena Service Federal Credit Union	Regional	9/20/2018	3	$55,824	$9,206	<1%
Macro-loan Total			3,320	$60,599,987	$9,644,559	99%
Micro-loan Lenders						
One Finance	Statewide	9/30/2021	496	$725,579	$135,667	1%
Lewis And Clark Bank	Statewide	6/9/2023	71	$123,630	$23,232	<1%
Micro-loan Total			567	$849,209	$158,899	1%
Total All GGH Loans			3,887	$61,449,196	$9,803,459	100%

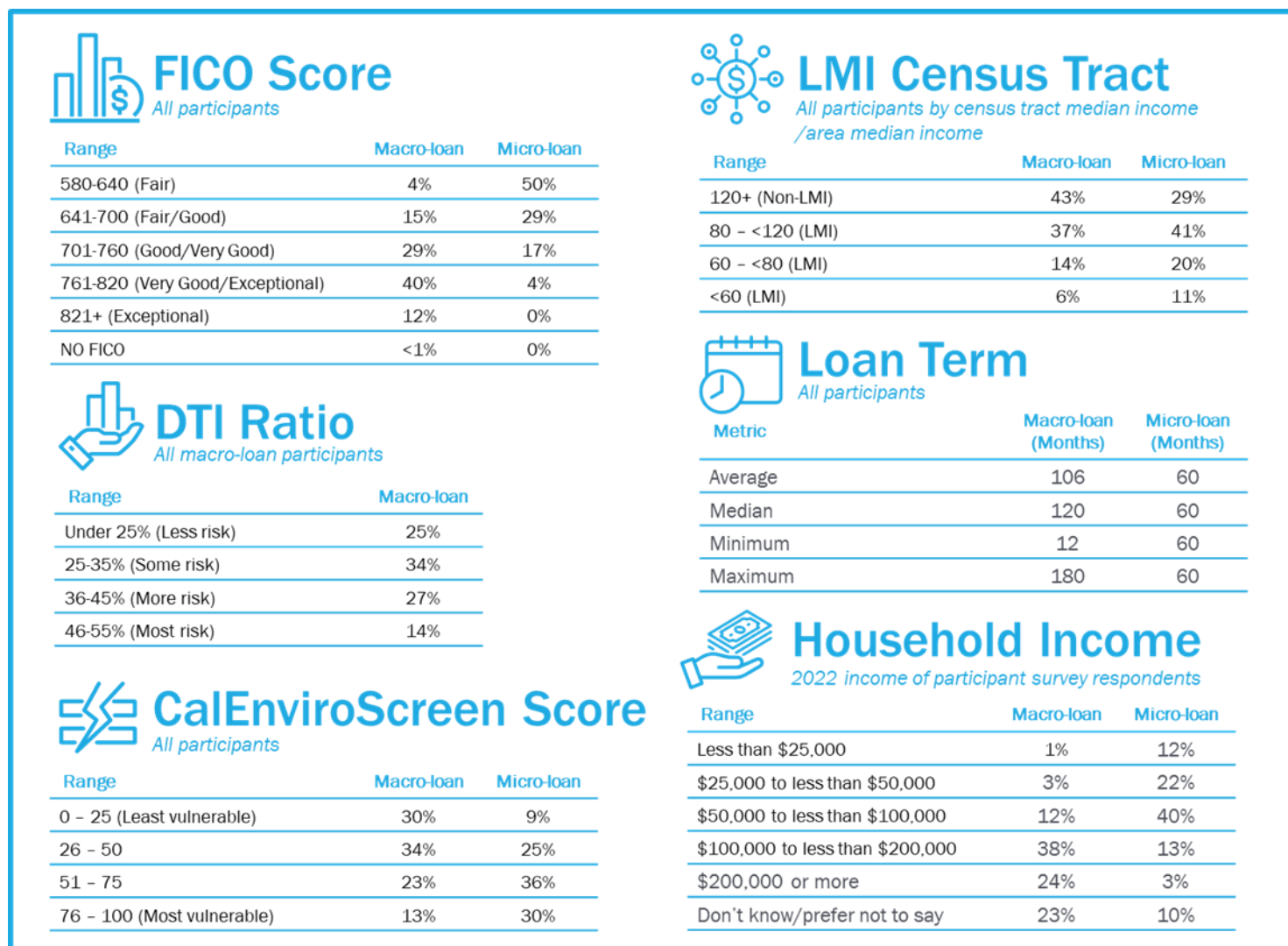Source: CAEATFA tracking data.

a Indicates legacy lenders that enrolled and began loans in the pilot period prior to July 2018.

Of the ten lenders that participated in the GGH Program between July 2018 and June 2023, four were legacy lenders who began participating during the Pilot period, and six enrolled during the evaluation period. Figure 8 depicts the timeline of when lenders began their participation.

Figure 8. Lender Participation Timeline
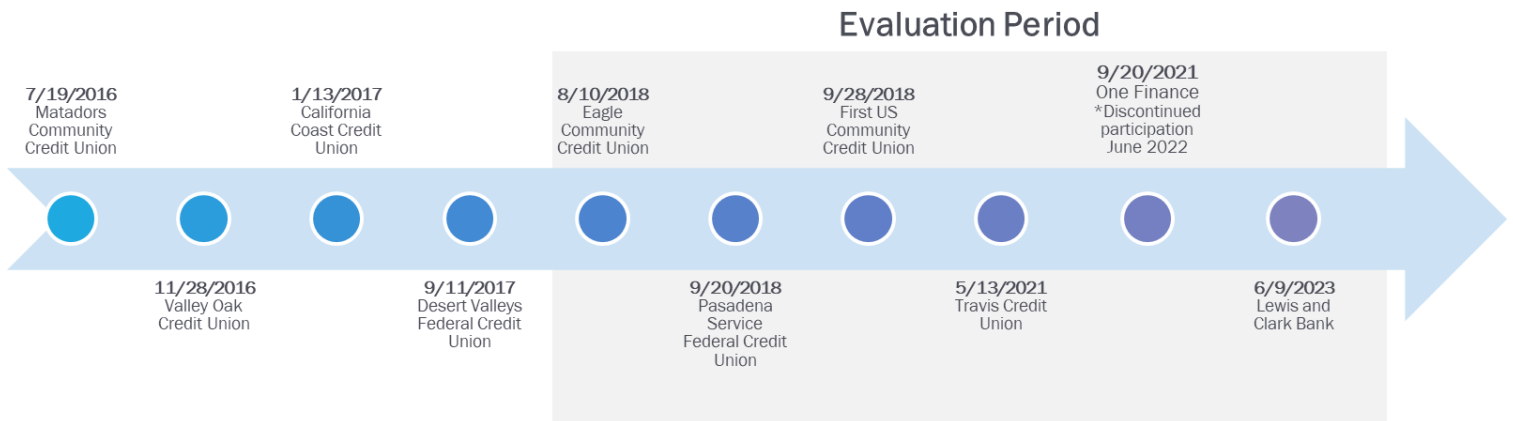
Source: CAEATFA tracking data.

Figure 9 shows the quantity and amount of loans over time relative to when new lenders joined the GGH Program.

Figure 9. Quantity and Amount of GGH Loans Over Time Relative to Lender Enrollment
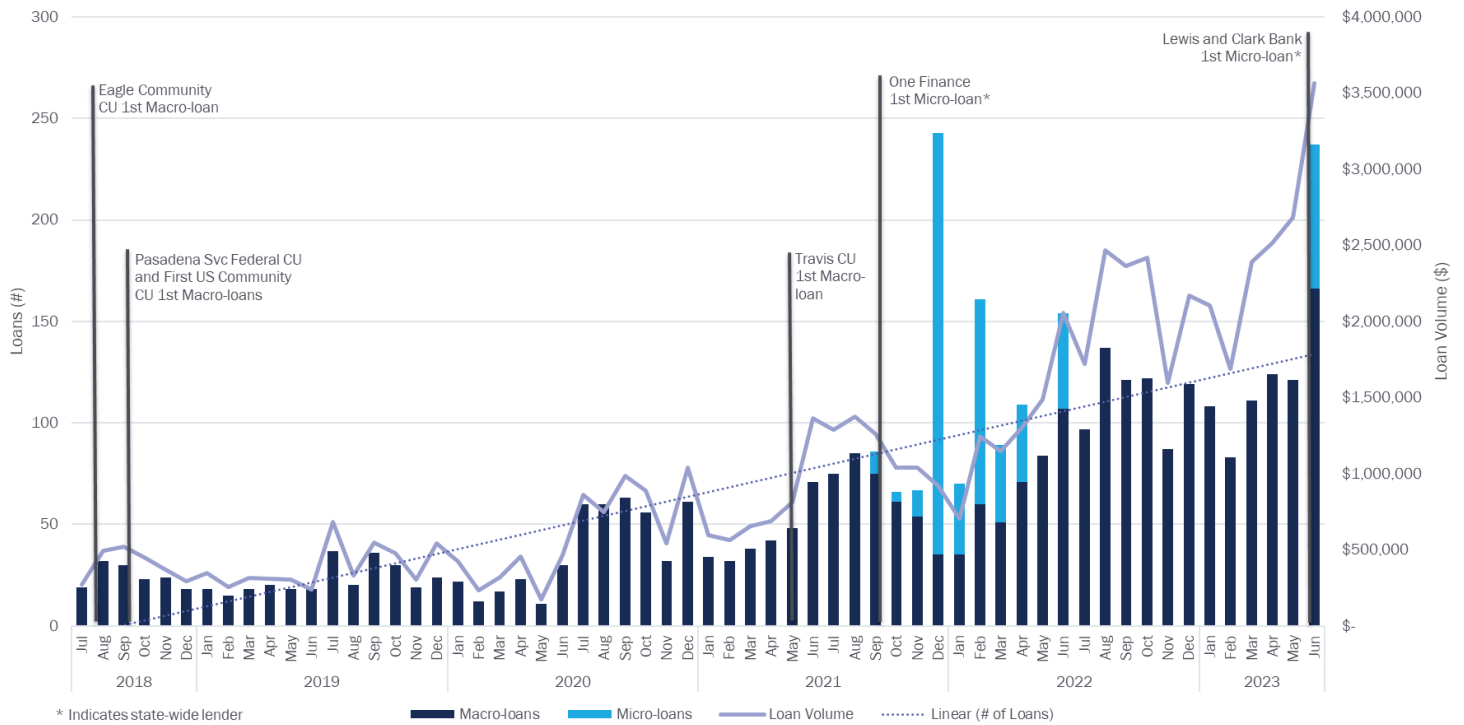
Source: CAEATFA tracking data.

5.2 EARLY LOAN PAYOFFS

Of the 3,320 macro-loans and 567 micro-loans distributed during the evaluation period, 607 macro-loans (18%) and 75 micro-loans (13%) were paid in full by the end of the evaluation period. The evaluation team used the original LLR funding date and date paid in full to calculate how far borrowers were into their loan term when they paid their loan off.

The median macro-loan term was 120 months (ten years), and the static micro-loan term was 60 months (five years). As seen in Table 11, of those who paid off their macro-loan by the end of the evaluation period, about 19% paid off the loan within 5% of the loan term (six months at median macro-loan term). 74% paid it off in the first 30% of the loan payoff term (three years at median macro-loan term). Likewise, 25% of the micro-loan borrowers paid off their loans within six months, and 96% paid off their loans by 30% of the loan payoff term (18 months for micro-loans).

Table 11. Percentage of Time Through Loan Payoff Term at the Time of Full Payoff

Percentage Through Loan Term at Time of Payoff	Macro-loan		Micro-loan	
	Count	Percent	Count	Percent
Immediate (<5%)	118	19%	10	13%
5% – <10%	101	17%	9	12%
10% – <20%	128	21%	26	35%
20% – <30%	100	16%	27	36%
30% – <40%	46	8%	3	4%
40% – <60%	55	9%	0	0%
60% – <80%	27	4%	0	0%
80% – 100%	22	4%	0	0%
Past term	10	2%	0	0%
Total	607	100%	75	100%

Source: CAEATFA tracking data

All participating lenders allow for and do not have any penalties or fees associated with early payoff (i.e., paying off the loan before the original loan payment term is over). As such, early payoffs do not affect APR; however, early payoff results in lenders receiving less cumulative interest than forecasted based on the original loan payoff term. The team used the original loss reserve funding date and date paid in full to estimate the interest paid over the actual payment period accounting for amortization. The team compared these estimates to lenders' initial estimates of cumulative interest expected over the original loan payoff period to estimate how much interest customers saved (and therefore lenders did not receive) due to early payoff.

As seen in Table 12, macro-loan borrowers who paid off their loan early paid approximately $370,000 in interest but saved over $2.5 million, according to this estimate. Over $2.3 million of these savings were associated with macro-loan borrowers who paid off their loans within 30% of the original loan payoff term.[17] Micro-loan borrowers who paid their loan off early paid approximately $3,500 in interest but saved over $20,000. Lenders are missing out on a sizeable amount of interest payments due to early payoffs.

Table 12. Borrower Interest Savings Associated with Early Payoff

Percentage Through Loan Term at Time of Payoff	Macro-loan			Micro-loan		
	Interest Paid	Interest Saved	Percentage of Expected Interest Saved	Interest Paid	Interest Saved	Percentage of Expected Interest Saved
Immediate – <5%	$16,692	$830,240	98%	$92	$5,225	98%
5% – <10%	$39,280	$569,352	94%	$151	$2,066	93%
10% – <20%	$109,237	$690,060	86%	$1,172	$6,675	85%

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[17] For context, the average loan term of macro-loans is 106 months.

Percentage Through Loan Term at Time of Payoff	Macro-loan			Micro-loan		
	Interest Paid	Interest Saved	Percentage of Expected Interest Saved	Interest Paid	Interest Saved	Percentage of Expected Interest Saved
20% – <30%	$81,200	$293,362	78%	$1,756	$6,002	77%
30% – <40%	$43,882	$90,869	67%	$323	$780	71%
40% – <60%	$39,127	$45,232	54%	N/A	N/A	N/A
60% – <80%	$21,435	$10,856	34%	N/A	N/A	N/A
80% – 100%	$13,399	$2,171	14%	N/A	N/A	N/A
On time or late	$7,164	N/A	N/A	N/A	N/A	N/A
Total	$371,417	$2,532,141	87%	$3,494	$20,748	86%

Source: CAEATFA tracking data
Note: The estimate is based on interest compounded at the daily level.

The participant surveys asked respondents how they paid for their project or equipment other than GGH Program financing to assess the financial resources respondents had available to them. As seen in Table 13, 28% of macro-loan and 25% of micro-loan respondents indicated they supplemented their GGH Program loan using cash or a debit card. Two of the five macro-loan respondents who used a credit card to supplement their GGH loan amount indicated they intended to pay off the balance immediately.

Table 13. Payment Methods Other Than GGH Financing

Payment Methods Other Than GGH Loan	Macro-loan (n=144)	Micro-loan (n=60)
None	58%	65%
Cash or debit card	28%	25%
Utility rebates/incentives	15%	8%
Other rebates/incentives (not from utility)	8%	0%
Credit card	3%	0%
Financing OTHER THAN the GoGreen Home Loan	3%	0%
Other	0%	0%

Source: Macro-loan and Micro-loan participant surveys
Question: In addition to [the GoGreen Home Loan/EcoFinancing], did you use any of the following ways to pay for your project?
Note: Responses will not sum to 100% as multiple responses were permitted.

5.3   PARTICIPATING CONTRACTORS

The evaluation team reviewed program tracking data provided by CAEATFA to analyze contractor participation in the GGH Program. Notably, the timeframe of the available data differed from the evaluation period. Therefore, project counts do not align with the number of loans distributed during the evaluation period.[18] The CAEATFA contractor tracking data covers when the first contractor was approved as a GGH Program contractor (i.e., April 2016) through to

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[18] CAEATFA program tracking data contains contractor names and identifiers for projects implemented by a contractor but does not include enrollment dates, and status of contractors. Duplicate contractor names in the program tracking data often have slight spelling variations. As such, the evaluation team used a separate contractor tracking data file provided by CAEATFA for the contractor participation analysis.

September 2023 and includes all contractors regardless of whether they were removed or suspended from the Program.

Figure 10 shows that contractor enrollment has grown consistently since 2016, aside from a dip in enrollment in 2021. Of the 959 contractors in the tracking data, 82% were still enrolled as of September 2023, 13% were removed, and 5% were suspended.

Figure 10. Contractor Enrollment Over Time (April 2016–September 2023)
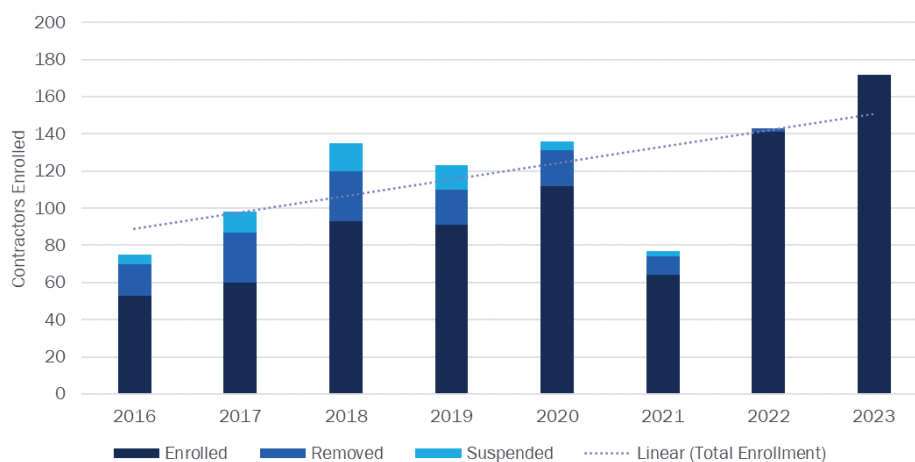
Source: CAEATFA contractor tracking data.

As seen in Table 14, about 43% of contractors approved as GGH Program Contractors (regardless of their current enrollment status) had not yet completed a GGH-financed project, and 48% had only completed between one and ten projects through the Program. Notably, the 465 contractors who did one to ten projects accounted for approximately the same proportion of total projects as the five contractors who did more than 100 projects each (27%).

Table 14. Number of Projects by Contractors Who Enrolled Between April 2016 and September 2023

Number of Projects (Range)	Contractors		Projects	
	Count	Percent	Count	Percent
None	413	43%	0	0%
1–10	465	48%	1,210	27%
11–30	54	6%	925	21%
31–60	17	2%	728	16%
61–100	5	1%	390	9%
More than 100	5	1%	1,208	27%
Total	959	100%	4,461	100%

Source: CAEATFA tracking data

Figure 11 depicts the number of enrolled and listed contractors per county as of September 2023 and loan concentration per county over the evaluation period.[19] In line with the geographic distribution of macro-loans (Section 4.3), the areas with the most contractors were Southern California (in particular the Southern Coast), the Northern Central Corridor, and the Bay Area.

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[19] A small number of contractors were enrolled in the GGH Program but not listed on the GGH Program website as of September 2023.

Figure 11. Geographic Distribution of Enrolled and Listed Contractors
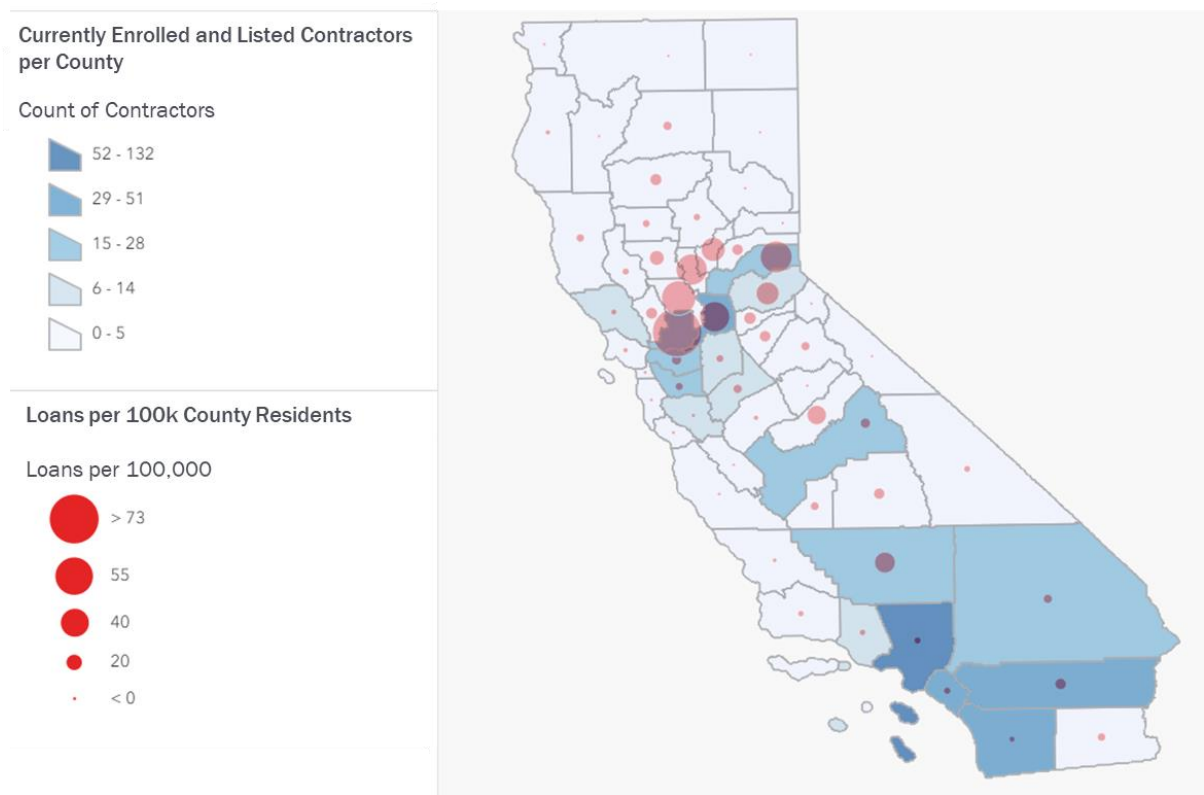
Source: CAEATFA tracking data

Of the ten contractors who completed more than 60 projects through the GGH Program, nine served territories in the Northern Central Corridor and/or Bay Area, and only one served Southern California, suggesting disparities in contractor engagement by service territory. Contractor engagement is another contributing factor to the rise of macro-loan participation outside of Southern California.

5.4   PROGRAM CHANGES SINCE REEL

The REEL Pilot issued its first loan in July 2016. In November 2016, the CPUC issued a ruling requesting comment from parties on the next steps regarding REEL. In early 2017, in response to these comments and perceived issues with the Pilot, the CPUC issued Decision 17-03-026, giving CAEATFA flexibility to modify the REEL Pilot through an emergency rulemaking process, resulting in a group of Pilot modifications in March 2018. The modifications enacted in this rulemaking sought to simplify the participation process for lenders, broaden program eligibility, and increase program benefits.

The rulemaking included the following modifications:

- Adding a statewide list of EEEMs (previously, each IOU had its own individual set of eligible measures);
- Giving lenders the option of using average census tract income to determine LMI status instead of verifying borrower household income;
- Combining IOU credit enhancement funds into a single account to allow for statewide, consolidated LLR accounts for lenders and to provide a more valuable credit enhancement at the same overall cost;

- Decoupling EE measure eligibility for financing from eligibility for IOU rebate and incentive programs to allow for broader measure eligibility and simplify eligibility for lenders;

- Adding the option to file UCC-1 fixture filings (financing statement filed in the local jurisdiction where the debtor's property is located and then filed in property records) in loan terms, allowing lenders to place a priority on the loan; and

- Removal of program paperwork and forms that were proven to be burdensome to lenders.

In April 2020, following the completion of the first EM&V process for the REEL Pilot, the CPUC issued Resolution E-5072, transitioning the REEL Pilot into a full-scale program. The REEL Pilot was rebranded to the GGH Program in August 2021.

CAEATFA completed another rulemaking process to modify the GGH Program between the summer of 2021 and September 2022 in response to Decision 21-08-006 of the CPUC Clean Energy Financing Proceeding. These modifications specifically aimed to attract new lenders, further streamline the lender participation process, and enhance borrower protections.

The rulemaking introduced the following changes aimed at **attracting new lenders**:

- Adding equipment leases and service agreements as eligible for financing for residential customers (already available for commercial properties through the GoGreen Business Financing program);

- Creating a Channel Partner role to attract lenders that leverage partners to fulfill parts of the lending process (e.g., lenders that leverage partners for marketing, data submission, and deal generation);

- Creating the micro-loan product offering for financing under $5,000;

- Reducing the minimum net worth eligibility requirement for lenders interested in participating in the GGH Program from $1M to $500,000; and

- Adding the option to establish up to three LLR accounts upon request for lenders who participate in the secondary market and want to maintain separate pools of loans (e.g., lenders may want to have separate loan pools if they have several funding sources or loan portfolio management plans).

The rulemaking also aimed to further streamline and simplify the lender participation process through the following:

- Allowing CAEATFA to utilize non-IOU EE ratepayer sources of funding for credit enhancements, allowing for more uniform measure eligibility across IOU and publicly owned utility (POU) areas (lenders' ability to receive credit enhancement was previously limited to measures corresponding to an IOU fuel source, limiting the eligibility of POU electric customers interested in fuel substitution from gas to electric and resulting in complicated eligibility requirements);

- Allowing CAEATFA to accept loan and project information digitally and in batches rather than individual physical documents/PDFs; and

- Moving project permit verification responsibilities away from participating lenders to GGH contractors.

Lastly, the rulemaking sought to provide additional consumer protections by introducing the following:

- Updating the borrower privacy disclosure to clarify the types of information shared by the Program with audiences and better align with California's Information Practices Act;

- Adding a requirement for financial providers offering loans for lease/service agreements to disclose either the APR or total project cost for each agreement added;

- Adding a requirement for lease/service agreement providers to guarantee functionality of the equipment if the borrower is paying an added ongoing service and maintenance fee; and

- Providing alternative eligibility requirements for lease/service agreement lenders so they are not legally required to get a California Finance Lender's License.

As of June 2023, CAEATFA was considering several improvements (for future implementation) aimed at attracting additional, including the following:

- Allowing the deployment of interest rate buy-down (IRBD) promotions funded by external parties in the form of payment provided by CAEATFA directly to the private capital provider to reduce the customer's interest rate;

- Implementing an online project portal for lenders and contractors to use to submit loan and project data; and

- Addition of energy generation and storage measures as eligible measures (as granted by Decision 23.08.026).

5.5   ADDITIONAL PROGRAM FUNDING

The D.13-09-044 directed the IOUs to allocate $75.2 million to kick-start and test multiple innovative EE-financing programs over an initial period ending June 30, 2022. Towards that end, CAEATFA launched the California Hub for Energy Efficiency Financing (CHEEF) programs, including the GGH program. Initially, an allocation of $28.9 million was recommended for the GGH Program. The CHEEF programs received authorization for additional funding through June 30, 2027, via Decision 21-08-006 Rulemaking 20-08-022 released on August 5, 2021. That decision added an incremental fund of $51.1 million to the estimated carryover amount of $24.0 million to bring the total CHEEF budget for FY 2022-2026 (July 01, 2022 – June 30, 2027) to $75.2 million (Table 15).

Table 15. Incremental Funding Request

Item	Amount
Estimated Carryover Amount from Original Budget Authorized by D.13-09-044[a]	$23,986,777
Incremental Funding Request	$51,187,749
CHEEF FY 2022-2026 Budget	$75,174,526

[a] Estimate provided by CAEATFA based on current spending and loan activity forecasts. The incremental funding among will adjusted based on carryover amount.
Source: Advice Letter 4506G/6355E of Decision 21-08-006.

Advice Letter 4506G/6355E, issued jointly by CAEATFA and the IOUs, breaks down the expected allocation of funds for different CHEEF programs and overall administrative costs. $23.2 million (31%) of the total $75.2 million for FY 2022-2026 is allocated for overall CAEATFA administration. The GGH program is forecasted to utilize between $19.7 million to $39.4 million of the funds as new LLR funds between FY 2022-2026. The three scenarios presented in Table 3 of Attachment 2 posit a new LLR fund requirement of $19.7 million under the low first-year volume scenario (S1), $39.4 million under the mid-first-year volume scenario (S2), and $68.7 million under the high first-year volume scenario (S3). In FY 2022-2023, the GGH program increased its total LLR contribution by $4.5 million. This aligns closely with their mid-first-year volume requirement of $4.1 million in new LLR funds. As such, the incremental funds are likely required.

The GGH Program allocation forecast were developed using assumptions of average macro- and micro-loan sizes, growth in number of loans, average LLR contribution percentages, default rates, and percentages paid off annually. See Attachment 2 of Advice Letter 4506G/6355E for details. Table 16 presents some key assumptions about the LLR funds requirement and their realized values from July 01, 2022 – June 30, 2023, the base year for fund requirement calculations. The total loan volume was $27.7 million, in between the low- (S1) and mid- (S2) volume scenarios. The

loan volume will likely grow faster since the micro-loan offering was only reintroduced in Q2 of the Fiscal Year 2022–23. Moreover, we also see that the average micro- and macro-loan size is larger than assumed. This is unsurprising, given that the general price levels and cost of construction are increasing. In addition, the LLR contribution percentages were higher as well.

Table 16. Comparison of Assumed and Realized Base Year (July 01, 2022–June 30, 2023) Values

Key Parameters	Realized Values Macro-loans	Realized Values Micro-loans	Assumed Values	
Total loan volume ($ Millions)	27.6	0.1	S1: 18.8 S2: 37.6 S3: 67.0	
Num. of loans	1396	71	Macro-loans	Micro-loans
			S1: 1000 S2: 2000 S3: 3000	S1: 2500 S2: 5000 S3: 20,000
Average LLR contributions (%)	0.17	0.19	0.16	
Average loan amount ($)	19,748	1,741	Macro-loans	Micro-loans
			16,660	850
Average Term Length (Month)	109	60	109	

Comparison of the assumed and realized *default rate* and *paid-off percentage* of the portfolio is difficult since these values are forward-looking assumptions, but enough time has not passed to derive reliable base year estimates. Nevertheless, historical macro-loan default has been less than 1% so far. The micro-loan default rate was 16% during the initial roll-out of micro-loans, beset by implementation challenges that are likely to ameliorate with the introduction of a new partnering financial institution.[20] Thus, the assumed default rate of 2% may be an overestimation but it is well within justifiable range.

The realized base year values indicate that the new LLR fund requirement will likely be closer to $19.7 million (low first-year volume scenario) than any other scenario. Data corresponding to the post-evaluation period in 2023 (July 2023–December 2023) from published GGH data summaries suggest that the growth assumptions may have differed from expectation than expected.[21] For instance, 1,410 new macro-loans and 392 new micro-loans were issued in the second half of 2023. Moreover, the average size of macro-loans was much larger. These factors helped increase loan volumes and LLR contributions by more than 40% in six months, as opposed to an assumed growth of 20% in loan volume over July 01, 2023–June 30, 2024. The realized base year values combined with the post-base year loan growth indicate that the likely scenario is a new LLR fund requirement of $19.7 to $39.4 million.

6. PROGRAM REACH

The purpose of this chapter is to provide insights into whether the GGH Program reaches underserved Californians who would not otherwise have completed EE upgrades and explores the possibilities, benefits, and drawbacks of modifying how CAEATFA defines "underserved," by reviewing the following:

▪ Length of time allowed for applicants to pay back the loans;

▪ Credit scores of loan participants reported on an aggregate basis;

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[20] As per CAEATFA staff interview on November 30, 2023.

[21] "Monthly Data Summaries, GoGreen Home Reports." CAEATFA, https://www.treasurer.ca.gov/caeatfa/cheef/cheef-reports-and-additional-materials.asp. Accessed 01 March. 2024

- How other entities define "underserved" Californians in comparison to the GGH Program;

- Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, AMI, or other poverty statistics (including a comparison across California's definitions for customers in vulnerable populations [e.g., underserved, hard-to-reach, disadvantaged communities, low-income/moderate-income/market rate]); and

- Whether participants would have qualified for existing private EE loan programs at interest rates and terms they could afford or would accept.

The evaluation team used data from the participation analysis and participant surveys to analyze the reach of the GGH Program.

6.1 LOAN TERMS

Table 17 shows that the average loan amount was $18.2K for macro-loans and $1.5K for micro-loans.[22] The average loan term was just under nine years for macro-loans (median was ten years). All micro-loans had a loan term of five years. The average interest rate for macro-loans was 4.9%, down from 6.95% in the pilot period.

Table 17. GGH Loan Product Summary: July 2018–June 2023

Characteristic	Macro-loan (n=3,320)				Micro-loan (n=567)			
	Average	Median	Min	Max	Average	Median	Min	Max
Loan Amount	$18,253	$15,536	$1,989	$50,098	$1,498	$1,204	$215	$4,792
Interest Rate	4.9%	5.0%	3.0%	9.0%	9.2%	9.0%	9.0%	11.4%
Loan Term	106 months	120 months	12 months	180 months	60 months	60 months	60 months	60 months
Monthly Payment	$251	$205	$31	$2,006	$31	$25	$4	$100

Source: CAEATFA tracking data.

6.2 UNDERSERVED BORROWER REACH

One of the intentions of the GGH Program was to create a financing product for customers who otherwise may not be able to obtain loans for EE upgrades. GGH regulations define "underserved borrowers" as those whose,

- FICO credit score is below 640 (i.e., credit-challenged);

- Property is in an LMI census tract (<120% AMI); OR

- Household income is LMI (<120% AMI).

The CPUC's *Environmental & Social Justice Action Plan Version 2.0.* lists definitions for hard-to-reach, underserved, and disadvantaged communities, outlined in Table 18.

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[22] Although the average macro-loan amount is up from $17K in the pilot period, this should not be considered as evidence of larger projects given differences in price levels.

Table 18. 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 California Alternative Rates for Energy (CARE) or the Family Electric Rate Assistance Program (FERA) ▪ **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 California Environmental Protection Agency (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 modified slightly based on *Senate Bill 535's Final Designation of Disadvantaged Communities,* finalized on May 2022.

6.2.1   BORROWER CREDIT METRICS

FICO SCORE

Borrowers with FICO scores as low as 580 are considered for loans under GGH; however, for applicants with FICO scores between 580 and 640, the lender must verify the borrower's income as part of the underwriting process. Very few macro-loan borrowers in the evaluation period could be considered "underserved" as defined by their FICO score alone. Over the current evaluation period, only 4% of macro-loan borrowers had a FICO score of 640 or less, down from 8% in the pilot period. Likewise, 52% of macro-loan borrowers had a "very good" or "exceptional" FICO score, up from 34% in the pilot period. Unlike macro-loan borrowers, 50% of micro-loan borrowers had FICO score of 640 or less. Table 19 depicts the distribution of FICO scores by loan type for the evaluation period and pilot period.

Table 19. FICO Scores Among Borrowers

FICO Credit Score Range	Evaluation Period (July 2018–June 2023)		Pilot Period (July 2016–July 2018)
	Macro-loan (n=3,320)	Micro-loan (n=567)	Macro-loan (n=212)
580–640 (Fair)	4%	50%	8%
641–700 (Fair/Good)	15%	29%	16%
701–760 (Good/Very Good)	29%	17%	42%
761–820 (Very Good/Exceptional)	40%	4%	26%
821+ (Exceptional)	12%	0%	8%
NO FICO	<1%	0%	0%

Source: CAEATFA data.

DEBT-TO-INCOME RATIO

Debt-to-income (DTI) ratios, although not an indicator of underserved status for the GGH Program, are often used by lenders to determine creditworthiness or ability to repay a loan. According to financial sources, borrowers with DTI ratios above 36% are often considered risky, and borrowers above 55% are commonly considered too risky for lending, even with an LLR. As shown in Table 20, during the evaluation period, less than 40% of macro-loan borrowers had DTI ratios between 36% and 55% (loans with a greater risk for lending), down from 54% in the Pilot period. The GGH Program does not track DTI ratios for micro-loan borrowers.

Table 20. Debt-to-Income Ratios Among Borrowers

DTI Ratio	Macro-loan	
	Evaluation Period (July 2018–June 2023) (n=3,320)	Pilot Period (July 2016–July 2018) (n=212)
Under 25% (Less risk)	25%	14%
25%–35% (Some risk)	34%	32%
36%–45% (More risk)	27%	33%
46%–55% (Most risk)	14%	21%

Source: CAEATFA data.
Note: The GGH Program does not track DTI ratios for micro-loan borrowers.

6.2.2   BORROWER INCOME METRICS

LOW-TO-MODERATE INCOME CENSUS TRACT

The GGH identifies LMI census tracts as those in which the tract median income does not exceed 120% of the AMI.[23] Under this criterion, 57% of macro-loan borrowers resided in an LMI census tract, an increase from 49% in the Pilot period. Compared to macro-loan borrowers, a larger percentage of micro-loan borrowers resided in an LMI census tract (71%).

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[23] Both census tract median income and area median income are midpoints of a given territory's income distribution; however, whereas census tract median income is calculated at the census tract level, area median income is calculated for larger areas, often containing multiple census tracts.

Table 21. LMI Census Tract Status Among Borrowers

| Census Tract Median Income/Area Median Income (Percentile) | Evaluation Period (July 2018–June 2023) | | Pilot Period (July 2016–July 2018) |
	Macro-loan (n=3,320)	Micro-loan (n=567)	Macro-loan (n=212)
120+ (Non-LMI)	43%	29%	51%
80–<120 (LMI)	37%	41%	33%
60–<80 (LMI)	14%	20%	10%
<60 (LMI)	6%	11%	7%

Source: CAEATFA data.

HOUSEHOLD INCOME

As the GGH Program does not track details on borrower household income, the evaluation team collected this information as part of the study's participant survey effort. As seen in Table 22, most macro-loan respondents (62%) had an income of more than $100,000. The team compared macro-loan respondents who installed a fuel-substitution upgrade as part of their GGH-financed home upgrade project to those who did not install fuel substitution measures as part of their project. Those who installed a fuel substitution measure were more likely than those who did not install a fuel substitution measure to have made over $100,000 (71% vs. 55%) and significantly more likely to have made over $200,000 (31% vs. 18%). The percentage of macro-loan respondents with an annual income of less than $100,000 decreased relative to the pilot period (25% vs. 16%). Notably, respondent income varied significantly by loan type, with micro-loan respondents being significantly more likely than macro-loan respondents to fall within the income thresholds between $0 and $100,000. Inversely, macro-loan respondents were significantly more likely than micro-loan respondents to fall within the income thresholds above $100,000.

Table 22. 2022 Annual Income Among Survey Respondents

| 2022 Annual Household Income | Macro-loan | | | Micro-loan (n=60) (d) |
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Less than $25,000	0%	3%	1%	12%[c]
$25,000 to less than $35,000	2%	0%	1%	10%[c]
$35,000 to less than $50,000	3%	1%	2%	12%[c]
$50,000 to less than $75,000	5%	5%	5%	22%[c]
$75,000 to less than $100,000	9%	5%	7%	18%[c]
$100,000 to less than $150,000	18%	23%	21%[d]	8%
$150,000 to less than $200,000	22%	14%	17%[d]	5%
$200,000 or more	31%[b]	18%	24%[d]	3%
Don't know	0%	1%	1%	0%
Prefer not to say	11%	30%[a]	22%[d]	10%

Source: Macro-loan and Micro-loan participant surveys
Question: What was your annual household income from all sources in 2022 before taxes?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The average number of household occupants at the time of the survey was significantly greater for micro-loan respondents than macro-loan respondents, with macro-loan respondents averaging almost three and micro-loan

respondents averaging almost four. No significant difference in occupancy existed based on whether the macro-loan respondent installed a fuel substitution measure.

The team also asked respondents whether they qualified for or received state or government assistance, such as MediCal, the CalFresh/SNAP/Food Stamp Program, CalWorks, CARE/FERA, or some other assistance program. As seen in Table 23, micro-loan respondents were significantly more likely than macro-loan respondents to indicate they received or qualified for assistance (62% vs. 9%). Macro-loan respondents who installed a fuel substitution measure were significantly less likely to indicate receiving or qualifying for assistance than those who did not install a fuel substitution measure (5% vs. 13%). The percentage of macro-loan respondents who received/qualified for state/government assistance (9%) increased relative to the pilot period (6%).

Table 23. Receipt of or Qualification for State/Government Assistance Among Survey Respondents

Qualify for or Receive State or Government Assistance	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Yes	5%	13%a	9%	62%c
No	95%b	84%	89%d	33%
Don't know	0%	4%	2%	3%
Prefer not to say	0%	0%	0%	2%

Source: Macro-loan and Micro-loan participant surveys
Question: Does your household qualify for or receive any state or government assistance, such as MediCal, the CalFresh/SNAP/Food stamp program, CalWorks, CARE/FERA, or some other type of welfare program?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

HOME OWNERSHIP

As seen in Table 24, nearly all macro-loan respondents owned the property upgraded using GGH financing at the time of the upgrade. Macro-loan respondents were significantly more likely than micro-loan respondents to have owned and lived at the property (92% vs. 62%). Conversely, micro-loan respondents were significantly more likely than macro-loan respondents to indicate they were a tenant at the time (38% vs. 1%).

Table 24. Home Ownership Status Among Survey Respondents

Home Ownership	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Owned and lived there	97%b	89%	92%d	62%
Owned but rented to someone else	2%	4%	3%	0%
Owned but vacant	2%	4%	3%	0%
Owned but allowed someone else to live there	0%	3%	1%	0%
I was a tenant	0%	1%	1%	38%c

Source: Macro-loan and Micro-loan participant surveys
Question: Which of the following best describes your relation to the property at the time [of your home upgrade/you purchased the energy savings products]?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

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. 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 25, 13% of macro-loan borrowers from the evaluation period were in the most vulnerable census tracts according to their CalEnviroScreen Score (above the 75th percentile, those with the highest 25% of scores for pollution burden and socioeconomic vulnerability). A further 23% of macro-loan borrowers were in the second most vulnerable census tracts. The distribution of macro-loan borrowers by CalEnviroScreen Score was similar to that of the pilot period. Compared to macro-loan borrowers, a larger percentage of micro-loan borrowers were in the most vulnerable census tracts (30%).

Table 25. CalEnviroScreen Scores Among Borrowers

| Vulnerability | CalEnviroScreen Score (Percentile) | Evaluation Period (July 2018 – June 2023) | | Pilot Period (July 2016 – July 2018) |
		Macro-loan (n=3,320)	Micro-loan (n=567)	Macro-loan (n=212)
Least Vulnerable	0 – 25	30%	9%	33%
	26 – 50	34%	25%	33%
	51 – 75	23%	36%	21%
Most Vulnerable	76 – 100	13%	30%	13%

Source: CAEATFA data

6.2.3   CREDIT ENHANCEMENTS FOR UNDERSERVED CUSTOMERS

The GGH Program LLR contribution (i.e., the percentage of the original and eligible loan amount CAEATFA puts into the LLR) is set at 20% of the loan value for underserved borrowers and 5%–11% for other borrowers, mitigating a portion of lender risk to incent lending to underserved borrowers.[24] The higher contribution to the LLR, often referred to as credit enhancement in this report, is available to borrowers identified as meeting at least one of the GGH Program's underserved criteria: borrower FICO credit score is below 640 (i.e., credit-challenged); property is in an LMI census tract; or household income is LMI (<120% AMI).

Between July 2018 and June 2023, CAEATFA provided the enhanced 20% LLR contribution for 1,966 of the 3,320 macro-loan borrowers (59%) and 482 of the 567 microloan borrowers (85%). Table 26 shows that most macro-loans provided with the enhanced 20% LLR contribution were in an LMI census tract. In contrast, most macro-loans with an 11% LLR contribution were not in an LMI census tract. Although most micro-loan 20% credit enhancement recipients were located in an LMI census tract, 15% of micro-loan borrowers in non-LMI census tracts also received the enhanced 20% LLR contribution.

Table 26. GGH Program Loans by LMI Tract and Credit Enhancement Level

| Credit Enhancement | Percentage of GGH Loans | LMI Census Tract | |
		Yes	No
Macro-loan (n=3,320)			
Underserved – 20% LLR contribution	59%	56%	3%
Not Underserved – 11% LLR contribution	41%	1%	40%
Micro-loan (n=567)			

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[24] California Code of Regulations Title 4 Business Regulations, Division 13. 2015.

Credit Enhancement	Percentage of GGH Loans	LMI Census Tract	
		Yes	No
Underserved – 20% credit enhancement	85%	71%	14%
Not Underserved – 11% LLR contribution	15%	<1%	15%

Source: CAEATFA data.

Note: Orange areas denote areas of potential misalignment between credit enhancement level and borrower characteristics.

Table 27 shows that most macro-loan recipients who received the 20% credit enhancement had a credit score above 640, and many had a very good or exceptional FICO score. Only 26 macro-loans (1%) were provided to recipients with a FICO score between 580 and 640, and they were provided with 11% LLR contribution. The majority of micro-loans that received an enhanced 20% LLR contribution were provided to individuals with a credit score of 580 to 640. None of the micro-loans provided to individuals with a FICO score of 580 to 640 received an 11% LLR contribution.

Table 27. GGH Loans by FICO Score and Credit Enhancement Level

Credit Enhancement	Percentage of GGH Loans	FICO Credit Score					
		580–640 (Fair)	641–700 (Fair/Good)	701–760 (Good/Very Good)	761–820 (Very Good/ Exceptional)	821+ (Exceptional)	NO FICO
Macro-loan (n=3,320)							
Underserved – 20% LLR contribution	59%	3%	10%	17%	23%	7%	<1%
Not Underserved – 11% LLR contribution	41%	1%	5%	12%	17%	6%	0%
Micro-loan (n=567)							
Underserved – 20% LLR contribution	85%	50%	21%	12%	2%	<1%	0%
Not Underserved – 11% LLR contribution	15%	0%	8%	5%	2%	<1%	0%

Source: CAEATFA data.

Note: Orange areas denote areas of potential misalignment between credit enhancement level and borrower characteristics.

As shown in Table 28, 14% of macro-loan borrowers received a 10% credit enhancement but had a DTI ratio of less than 25% (i.e., they were considered less risky lenders). Additionally, 19% of macro-loan borrowers received a 20% credit enhancement but had a DTI ratio of 25% to 35%. This range is considered to carry only "some" risk. Inversely, 6% of macro-loan borrowers received an 11% enhancement despite carrying the "most" risk according to their DTI ratio.

Table 28. GGH Loans by DTI Ratio and Credit Enhancement Level

Credit Enhancement	Percentage of GGH Loans	DTI Ratio			
		Under 25% (Less Risk)	25-35% (Some Risk)	36-45% (More Risk)	46-55% (Most Risk)
Macro-loan (n=3,320)					
Underserved – 20% LLR contribution	59%	14%	19%	17%	9%
Not Underserved – 11% LLR contribution	41%	11%	14%	10%	6%

Source: CAEATFA data.

Note: Orange areas denote areas of potential misalignment between credit enhancement level and borrower characteristics. DTI ratios were not tracked for micro-loan borrowers.

6.3   EXTERNAL FINANCING QUALIFICATIONS

6.3.1   COMPARISON WITH LENDERS' SIGNATURE LOANS

EE measures with deep savings potential often require high upfront costs, creating a barrier to adoption. The GGH Program aims to increase the adoption of EE measures by (1) ameliorating the credit constraints associated with high upfront costs of some EE upgrades, (2) reducing interest rates, and (3) reducing monthly payments. The LLR contribution decreases the risk associated with offering borrowers unsecured EE loans and, in doing so, allows lenders to increase their loan disbursements, extend loan terms, and decrease interest rates.

Each of the participating macro-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 macro-loan borrower, lenders provided CAEATFA with a comparative estimate of the terms of an alternative signature loan without the GGH Program. A comparison of features of the GGH Program loans with the signature loans is presented in Table 29.[25] Lenders' average macro-loan interest rates were up to 8.4 percentage points lower than their average signature loan interest rate, averaging 5.3 percentage points less across lenders. Lenders' average GGH payback periods were also longer than the average payback periods for their signature loans (apart from Travis Credit Union). Lenders' average macro-loan payback periods were up to 100 months longer than their average signature loan payback period, averaging 33 months longer across lenders. Almost all macro-loans had a lower calculated monthly payment than comparable signature loans. Lenders' average calculated monthly payments for GGH loans were up to $220 less than their average signature loan monthly payment, averaging $172 less across lenders.

Table 29. Comparison of Loans: GGH Macro-loan Versus Signature Loan

Credit Union	# of Macro-loans	Interest Rate			Loan Payback Term (Months)			Monthly Payment		
		GGH	Signa-ture	Difference	GGH	Signa-ture	Difference	GGH	Signa-ture	Difference
California Coast Credit Union	1,455	4.9%	12.7%	-7.8%	100	56	44	$270	$445	-$175
First US Community Credit Union	694	4.4%	9.6%	-5.2%	87	55	33	$262	$373	-$110
Matadors Community Credit Union	563	5.5%	10.9%	-5.4%	122	60	63	$247	$467	-$220
Travis Credit Union	510	5.0%	6.0%	-1.0%	134	136	-2	$196	$209	-$14
Desert Valleys Federal Credit Union	47	5.5%	13.6%	-8.1%	107	59	48	$205	$390	-$185
Valley Oak Credit Union	36	7.1%	11.1%	-4.0%	85	59	26	$222	$325	-$102
Eagle Community Credit Union	12	6.1%	14.5%	-8.4%	120	60	60	$210	$418	-$208
Pasadena Service Federal Credit Union	3	8.0%	11.7%	-3.7%	160	60	100	$184	$402	-$218
Overall	3,320	5.6%	10.8%	-5.3%	100	67	33	$219	$391	-$172

Source: CAEATFA tracking data.

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[25] These estimates are available for 3,178 of the 3,320 macro-loans.

Data on signature loans was not uniformly available for micro-loans. One Finance (the GGH program's initial micro-loan lender) did not provide estimates for signature loans. The Lewis and Clark Bank (the current micro-loan 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 micro-loans in the tracking data was the lowest rate offered through the Eco Financing product of the channel partner and does not appear to vary by participant FICO score range. As such, the current signature micro-loans interest rates and monthly payments are equal to or lower than the GGH loans, but this is not indicative of the Program`s efficacy in in lowering financing barriers or costs.

6.3.2   ALTERNATIVE FINANCING OPTIONS

The evaluation team reviewed available EE-specific financing in California, finding a notable lack of private, unsecured EE loans outside the GGH Program. Among the common mechanisms for financing EE improvements in existing residential properties are California's Property Assessed Clean Energy (PACE) Programs; however, unlike GGH loans, PACE loans are secured and tied to the property where the improvement was completed. The PACE loans place a lien on the property, and borrowers are expected to repay their loan using their property tax bill. Borrowers also accept the full risk of repercussions if they are unable to do so, a risk that disproportionately affects underserved customers. Additionally, whereas GGH loans are available to homeowners and renters, only homeowners can participate in PACE Programs.

Figure 12 compares the GGH Program to three PACE Programs in California across five key loan term specifications: type (secured/unsecured), payback period, interest rate, DTI ratio eligibility, and FICO score eligibility. Notably, unlike the GGH Program, which has a minimum FICO score requirement of 580, the secured PACE loans do not have a minimum credit score requirement. The PACE Programs do not specify a maximum DTI ratio; however, a 2023 Consumer Financial Protection Bureau report suggested that PACE lenders nationwide were generally less willing to offer a loan to those with DTI ratios of more than 40%.[26] In contrast, the GGH Program considers borrowers with DTI ratios up to 55%. Secure loans, such as PACE, place risk on the borrowers while unsecured loans place risk on the lender; as such, unsecured lenders rely upon borrower information like DTI ratio and FICO score to determine creditworthiness. Although unsecured loans often have higher interest rates than secured loans, GGH macro-loan interest rates are comparable to the interest rates the secured PACE Programs offer.

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[26] McAlister, Siobhan and Ryan Sandler. 2023. "Property Assessed Clean Energy (PACE) Financing and Consumer Financial Outcomes."

Figure 12. Loan Terms of GGH Compared to PACE Programs

GGH Macro-loan	Home Energy Renovation Opportunity (HERO) Loan	CaliforniaFIRST Loan	yGrene Loan
• **Type:** Unsecured • **Payback Period:** 1 to 15 years • **Interest Rate:** 3% to 9% • **DTI Ratio:** 55% or less • **FICO Score:** 580 or greater	• **Type:** Secured • **Payback Period:** 5 to 25 years • **Interest Rate:** 2.99% to 8.99% • **DTI Ratio:** No maximum specified, lender typically hesitant if in excess of 40% • **FICO 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% • **FICO Score:** Not an eligibility criterion	• **Type:** Secured • **Payback Period:** Up to 30 years • **Interest Rate:** As low as 3.99% (maximum not specified) • **DTI Ratio:** No maximum specified, lender typically hesitant if in excess of 40% • **FICO Score:** Not an eligibility criterion

The GGH Program's loan terms are more favorable than the typical, non-EE-specific unsecured loan. Whereas unsecured loans typically require borrowers to have a minimum credit score of 610 and a DTI ratio of 40% or less, the GGH Program broadens eligibility to those with a minimum credit score of 580 and a maximum DTI ratio of 55%. Unsecured loans typically have a two- to seven-year payback period; however, while the GGH Program allows up to 15 years. Additionally, the range of interest rates for GGH macro-loans is lower than the average unsecured loan interest rate.

6.3.3   ALTERNATIVE FINANCING TERMS AND ELIGIBILITY

As part of the participant surveys, the evaluation team asked respondents about the likelihood they would have qualified for any other type of financing based on their credit score and income. As shown in Table 30, micro-loan respondents were significantly more likely than macro-loan respondents to indicate they would have been "somewhat" or "very" unlikely to qualify for other financing (18% vs. 3% and 12% vs. 1%). Macro-loan respondents were also more certain of their ability to qualify for other financing. They were significantly more likely to indicate they would have been "very" likely to qualify for other financing than micro-loan respondents (87% vs. 20%). Among macro-loan respondents, those who installed a fuel substitution measure were more likely to indicate they were "very" likely to qualify for other financing compared to those who did not install a fuel substitution measure (94% vs. 81%).

Table 30. Likelihood of Qualifying for Other Financing Based on Credit Score and Income

| Likelihood of Qualifying for Other Financing Based on Credit Score and Income | Macro-loan | | | Micro-loan (n=60) (d) |
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Very likely	94%[b]	81%	87%[d]	20%
Somewhat likely	5%	14%[a]	10%	50%[c]
Somewhat unlikely	0%	5%	3%	18%[c]
Very unlikely	2%	0%	1%	12%[c]

Source: Macro-loan and Micro-loan participant surveys
Question: What do you think is the likelihood you would have qualified for any other type of financing based on your

Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked all respondents except those who indicated they were "very" unlikely to have qualified for other financing whether they thought other financing options would have offered an interest rate lower than, similar to, or higher than the interest rate of their GGH loan. As seen in Table 31, only 2% of macro-loan respondents and 8% of micro-loan respondents thought another type of financing they may have qualified for would have a lower interest rate. The majority (73% of macro-loan respondents and 60% of micro-loan respondents) thought the interest rate of other loan products would be higher. Interestingly, compared to macro-loan respondents, micro-loan respondents were significantly less likely to think the interest rate of non-GGH financing would be higher (73% vs 60%) and significantly more likely to think it would be lower (8% vs. 2%).

Table 31. Interest Rate of Hypothetical Other Financing Compared to GGH/Eco Financing

| Interest Rate of Hypothetical Other Financing Compared to GGH/Eco Financing | Macro-loan | | | Micro-loan (n=53) (d) |
	Fuel Substitution (n=64) (a)	No Fuel Substitution (n=79) (b)	Total (n=143) (c)	
Lower interest rate	3%	1%	2%	8%c
Similar interest rate	19%	29%	24%	32%
Higher interest rate	78%	70%	73%d	60%

Source: Macro-loan and Micro-loan participant surveys
Question: If you had been able to qualify for another type of financing, do you think the interest rate would have been lower than, similar to, or higher than the interest rate for your [GoGreen Home/Eco Financing] Loan?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

Approximately 26% of macro-loan respondents (n=144) indicated they sought other financing options before using a GGH loan. Of micro-loan respondents (n=60), 61% indicated they explored other purchasing options prior to purchasing equipment from the Enervee/SoCalGas Marketplace. Of the micro-loan respondents who explored other purchasing options, 65% explored purchasing options that offered financing.

The team asked respondents who explored other financing options if they found any they would have qualified for but did not use. As shown in Table 32, a large percentage of macro-loan and micro-loan respondents indicated they found other financing option(s) that they could qualify for but did not use (64% and 77%, respectively).

Table 32. Found Other Financing Options They Qualified For But Did Not Use

| Found Other Financing They Would Have Qualified For But Did Not Use | Macro-loan | | | Micro-loan (n=26) |
	Fuel Substitution(n=22)	No Fuel Substitution(n=34)	Total (n=56)	
Yes	68%	62%	64%	77%
No	14%	24%	20%	12%
Don't know	18%	15%	16%	12%

Source: Macro-loan and Micro-loan participant surveys
Question: Did you find any other financing options you would have qualified for [but did not use]?
Note: Results are based on two-sided tests. Tests revealed no significant differences.

Of the 36 macro-loan and 20 micro-loan respondents who indicated finding another financing option they would have qualified for but did not use, no macro-loan respondents and only one micro-loan respondent indicated the other financing option had a lower interest rate than their GGH loan. One-third of the macro-loan respondents (12 of 36) and

two micro-loan respondents indicated that the other financing they qualified for had a longer loan payback term than their GGH loan.

The evaluation team asked respondents what they would have done if all other financing options they found required a higher monthly payment. As seen in Table 33, macro-loan respondents were significantly more likely than micro-loan respondents to indicate they would have done the same despite the higher payment (31% vs. 7%). Conversely, micro-loan respondents were more likely than macro-loan respondents to indicate they would not have used financing at all (30% vs. 15%) or done something smaller/cheaper to reduce the monthly payment (35% vs. 19%).

Table 33. Action if All Other Financing Options Would Have Required a Higher Monthly Payment

| Action if All Other Financing Options Would Have Required a Higher Monthly Payment | Macro-loan | | | Micro-loan (n=60) (d) |
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Not used financing at all	17%	13%	15%	30%c
Done a much smaller project/purchased much cheaper equipment to significantly reduce the monthly payment	18%	19%	19%	35%c
Done a somewhat smaller project/purchased somewhat cheaper equipment to slightly reduce the monthly payment	26%	15%	20%	22%
Done the exact same project/purchased the exact same equipment with a higher monthly payment	26%	35%	31%d	7%
Don't know	12%	18%	15%d	7%

Source: Macro-loan and Micro-loan participant surveys
Question: If all the other financing options you could find would have required a higher monthly payment, would you have...?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

7.   PROGRAM ENERGY SAVINGS

The purpose of this chapter is to verify whether the GGH Program produces energy savings, by assessing the following:

- Customer meter data provided by the utilities to conduct a consumption analysis and understand how much energy savings the GGH Program produced, including electric and gas savings, taking into account fuel shifting from gas to electric, per participant and overall;

- Differences in energy savings achieved across subpopulations of interest, such as climate zone, loan size, loan recipient type (LMI), presence of solar generation, and presence of fuel substitution, provided participation levels and available data allow for such comparisons;

- Energy savings from other loan programs and comparing the EM&V results to that of the GGH Program;

- The influence of the GGH Program on customer decision-making and relative influence of financing and rebates, where applicable;

- Source energy and CO_2 emission reductions from financed projects (including fuel substitution measures).

The evaluation team conducted a consumption analysis of macro-loans and a deemed savings review for micro-loans to verify program energy savings. The evaluation team used self-report survey data to conduct a program influence analysis and estimated emissions reduction using CPUC's Fuel Substitution Technical Guidance for Energy Efficiency.

7.1 EVALUATED SAVINGS SUMMARY

The estimated first-year gross energy savings and greenhouse gas (GHG) emission reductions from EE projects and measures financed through the GGH Program from July 2018 to June 2023 are presented in Table 34. The total estimated electricity savings was 555.58 MWh, and the total gas savings was 80,739.50 therms. These energy savings were associated with GHG emission reductions of 575.87 Metric Tonnes of CO_2. Macro-loan projects drove 97% of the GGH Program's savings and emission reduction impacts.

Table 34. Energy Savings and GHG Reductions from the GGH Program, 2018–2023

Metric	EEEMs through Macro-loans	EEEMs through Micro-loans	Total
Total annual electric energy savings (MWh)	538.18	17.40	555.58
Total annual gas savings (therms)	78,424.50	2,315.00	80,739.50
GHG emission reductions (Metric Tonnes of CO_2)	559.12	16.75	575.87

7.1.1 ENERGY SAVINGS FROM MACRO-LOANS

The evaluation team used linear fixed effects (LFE) models with pooled participants to estimate energy savings from macro-loans. The pooled model with LFE methods controls for exogenous factors that impact energy consumption over time.[27] Total electric and gas savings reflect the population of participants with electric and gas service from an IOU. Both electric and gas savings are inclusive of all participants, regardless of whether or not the installed measures impact the fuel source. Unless specifically indicated, all impacts reflect weather-normalized savings.[28] The evaluation team developed electric savings separately for net-metered (those with solar panels on their home) and non-net-metered participants. Table 35 summarizes the gas and electric energy savings achieved from projects financed through macro-loans of the GGH Program during the evaluation period.

Table 35. Summary of Macro-Loan Electric and Gas Savings

Statistic	Result
Electric Savings	
Participant count	2,353
Average per participant annual energy savings (kWh)	228.72
Total energy savings (MWH)	538.18
Gas Savings	
Participant count	3,076
Average per participant annual energy savings (therms)	25.50
Total energy savings (therms)	78,424.50

Table 36 presents per-participant annual baseline energy consumption, energy savings, and percent of energy savings compared to baseline consumption. Participants with net metering from solar panels delivered considerably deeper electric energy savings than participants without net metering (588.11 kWh vs. 111.42 kWh). The baseline energy

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[27] Details of the consumption analysis methods are included in Appendix A.
[28] Savings were normalized using CALEE2010 weather normal.

usage of participants with net metering is considerably lower than that of participants without.[29] Overall, electric participants saved 3% of the baseline consumption. Gas energy savings represented 5.7% of the baseline usage.

Table 36. Per Participant Baseline Consumption, Energy Savings, and Savings as a Percent of Baseline Consumption

Savings Type	Participant Count	Per Participant Annual Baseline Energy Consumption	Per Participant Annual Energy Savings	90% Confidence		Energy Savings as a Percent of Baseline Consumption
				Lower	Upper	
Electric (kWh)	2,353	7,502.99	228.72	74.90	403.54	3.0%
Net metering	579	4,486.20	588.11	246.61	929.62	13.1%
No net metering	1,774	8,487.62	111.42	18.86	231.84	1.3%
Gas (therms)	3,076	448.04	25.50	19.02	31.97	5.7%

In addition to developing total energy savings, the evaluation team also developed estimates of gas and electric energy savings by IOU, participant LMI status as per tracking data, DAC status, and known fuel substitution status, data permitting. For electric participants, these additional analyses were performed for non-net-metered participants only. Net-metered participant subpopulations were too small to allow for additional subgroup analysis. Not all models resulted in statistically significant estimates of energy savings. Table 37 presents the modeled electric savings estimates by subgroups of interest, whereas gas savings estimates are in Table 38.

Compared to overall program savings per participant, PG&E and non-LMI participants achieved higher electric savings (111.42 kWh for non-net-metered participants overall vs. 194 kWh for PG&E and 179.29 kWh for non-LMI). The models for other utilities and the LMI segment did not render statistically significant results; however, it is reasonable to assume that the energy savings for those subgroups are lower than the program average. As expected, known fuel-substitution increased electric usage by 6.4% from baseline but reduced gas by about 44% from baseline.

Table 37. Per Participant Electric Baseline Consumption, Savings, and Savings as a Percent of Baseline Consumption by IOU, LMI, and DAC Status (Non-Net-Metered Participants Only)

Segment	Participant Count	Per Participant Annual Baseline Energy Consumption (kWh)	Per Participant Annual Energy Savings (kWh)	90% Confidence		Electricity Savings as a Percent of Baseline Consumption
				Lower	Upper	
IOU						
PG&E	1,112	8,644	194.60	53.30	335.90	2.3%
SCE	554	**	**	**	**	**
SDG&E	108	**	**	**	**	**
LMI						
LMI	944	**	**	**	**	**
Non-LMI	830	9,224.14	179.29	22.77	335.81	1.9%
Known Fuel Substitution						
Fuel Substitution	244	8,576.61	-550.26	-1,050.96	-49.55	-6.4%

Segment	Participant Count	Per Participant Annual Baseline Energy Consumption (kWh)	Per Participant Annual Energy Savings (kWh)	90% Confidence		Electricity Savings as a Percent of Baseline Consumption
				Lower	Upper	
No Known Fuel Substitution	1,531	8,469.14	179.24	76.67	281.81	2.1%

**Energy savings estimates are not statistically significant.

[a] LMI status as recorded in the program tracking data.

PG&E participants, non-LMI participants, and participants outside DACs achieved deeper gas savings (Table 38). Known fuel substitution also resulted in considerably deeper savings, which is not surprising, given that electrification of major energy-using systems, such as HVAC and water heating, eliminates the need to use gas for heating and water heating needs.

Table 38. Per Participant Gas Baseline Consumption, Savings, and Savings as a Percent of Baseline Consumption by IOU, LMI, and DAC Status

Segment	Participant Count	Per Participant Annual Baseline Energy Consumption (Therms)	Per Participant Annual Energy Savings (Therms)	90% Confidence		Gas Savings as a Percent of Baseline Consumption
				Lower	Upper	
IOU						
PG&E	2,121	450.82	31.88	23.89	39.87	7.1%
SoCalGas	842	451.72	13.38	2.67	25.66	3.0%
SDG&E	113	**	**	**	**	**
LMI						
LMI	1,786	428.59	24.40	16.16	32.65	5.7%
Non-LMI	1,290	473.78	26.82	16.46	37.18	5.7%
DAC*						
DAC	560	**	**	**	**	**
Non-DAC	2,058	449.37	30.55	21.83	39.28	6.8%
Known Fuel Substitution						
Fuel Substitution	270	436.35	191.01	166.49	215.54	43.8%
No Known Fuel Substitution	2,706	449.45	7.26	0.99	13.54	1.6%

**Energy savings estimates are not statistically significant.

7.1.1.1 COMPARISON OF ENERGY SAVINGS ACROSS MACRO-LOAN PARTICIPANTS

In this section, we present the analysis of the results of participant-specific pre-post energy models. Analysis of individual participant energy savings and baseline consumption patterns provides insights into the variation in energy savings across participants. The savings values presented in this section should be considered only to compare the magnitude of differences between subgroups.

Figure 13 presents the distribution of participants across three saver categories: positive, neutral, and negative (i.e., participants whose energy usage increased in the year following the program participation). More than half (61%) of participants with electric service and the same share of participants with gas service achieved reductions in energy

usage following the installation of financed projects with macro-loans. For over a third of participants, however, energy consumption increased following the installation of the measure.

Figure 13. Gas and Electric Saver Segment Distribution
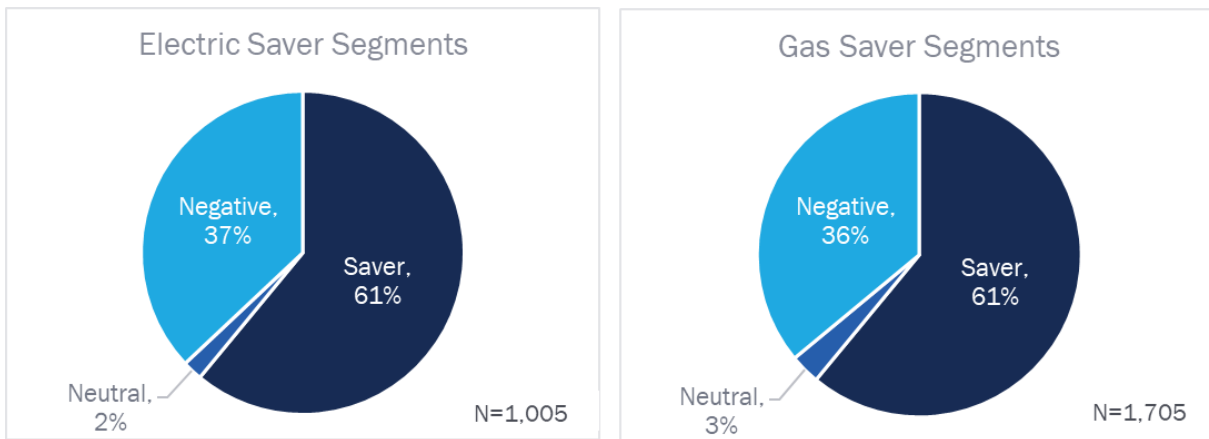
Individual pre-post models do not fully account for or control for the presence of exogenous and non-routine events. To ascertain the presence of these, the evaluation team conducted follow-up interviews with negative savers (n=13). Some of these participants reported non-routine changes to their energy consumption, including being able to use a heating or cooling system when there was none before, an increase in number of people living under the same roof, or purchasing an electric vehicle. While these exogenous changes do not explain all of the negative savings observed through the individual pre-post models, they likely account for some.

KNOWN FUEL SUBSTITUTION STATUS AND ENERGY SAVINGS

Figure 14 and Figure 15 provides the breakdown of the electric and gas saving categories based on their known fuel substitution status. As expected, the individual model results show that known fuel substitution participants were more likely than their respective counterparts to report an increase in electricity usage and a decrease in gas usage. A review of measures adopted through the program and analysis of savings estimates suggests that adoption of fuel substitution behaviors may not be fully documented or tracked as part of the program tracking data, and as a result, it is difficult to isolate all participants who electrified their energy-using systems. For instance, the evaluation team found that among 581 participants with both gas and electricity savings estimates and without known fuel substitution, 131 participants increased electricity consumption and decreased gas consumption after participation in the GGH Program.

Figure 14. Electric Saver Segment Distribution by Known Fuel substitution Status
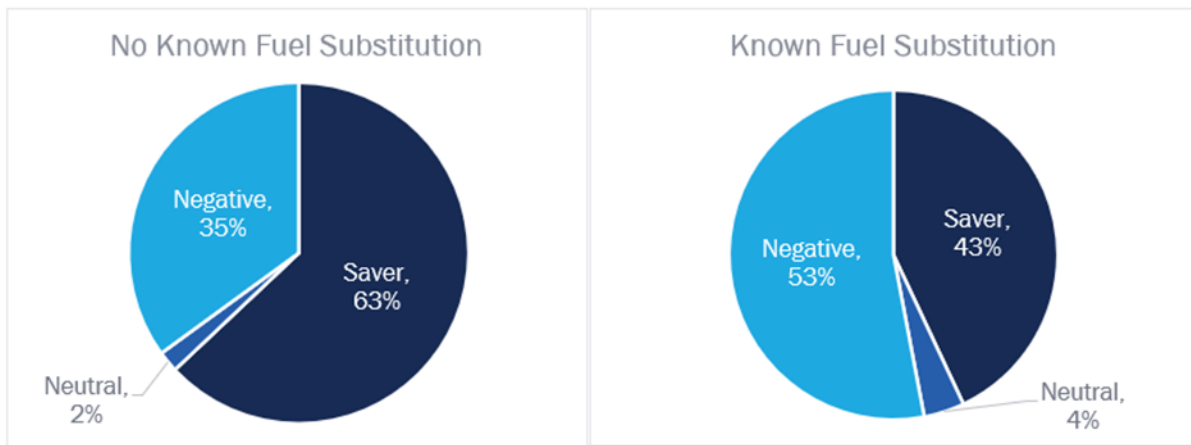
Figure 15. Gas Saver Segment Distribution by Known Fuel substitution Status
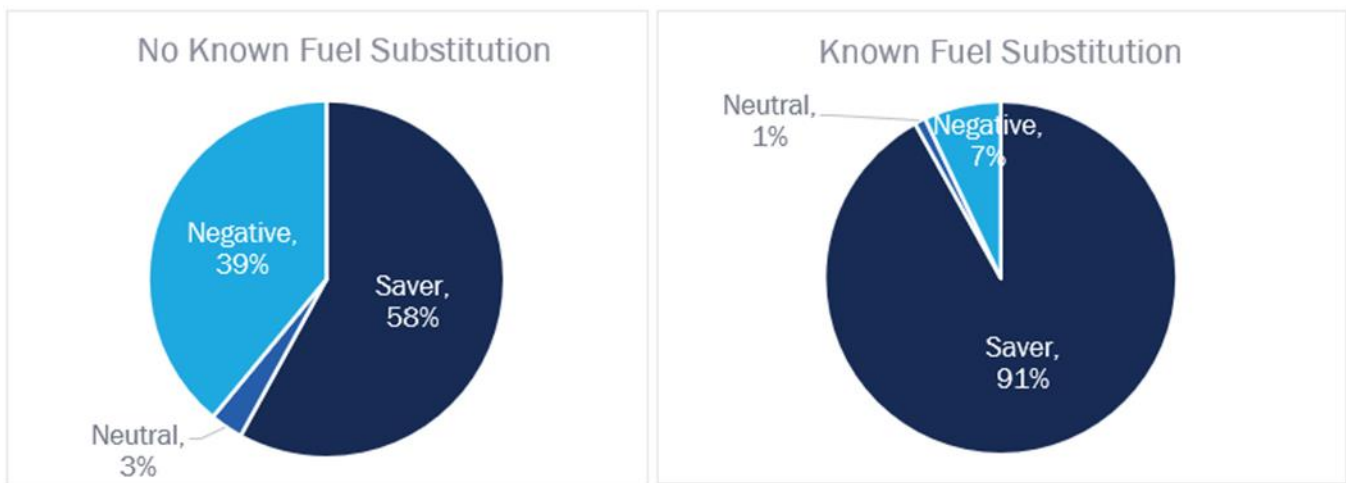
PRESENCE OF NET METERING AND ENERGY SAVINGS

Participants with net metering status on electric AMI data, identifying the presence of solar, are much more likely to be positive electric savers and deliver larger energy savings per participant (Table 39). Notably, negative savers with net metering are more likely to deliver deeper negative savings than participants without net metering; however, the magnitude of the difference is not as pronounced as that among positive savers.

Table 39. Comparison of Electric Saver Distribution and Savings by Presence of Solar

Saver Type	Participants Without Net Metering		Participants with Net Metering	
	% of Participants	Average Per-Participant Daily Energy Savings (kWh)	% of Participants	Average Per-Participant Daily Energy Savings (kWh)
Positive	60%	4.12	64%	8.30
Neutral	3%	-0.01	1%	-0.07
Negative	37%	-3.71	35%	-5.44

Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to the ones from the pooled models presented in the section above. They are used to explore the magnitude of differences across the various segments.

The estimated baseline energy usage of participants with solar is much lower than participants without solar. Most of the gap is likely due to solar generation. Since we do not observe solar generation, we present results separated by participants with and without solar. This helps us further understand the drivers of higher rate of savers as well as deeper savings among net metered participants, we explored the following:

- Measure adoption among participants with and without net metering and project sizes
- Location of participants with and without net metering in terms of climate zones
- Composition of participants with and without net metering on a variety of known data, such as credit score and incidence of participants being in DAC tracts

Figure 16 describes each key electric saver segment: positive savers with and without net metering and negative savers with and without net metering. Neutral savers are not included in the analysis due to the small size of the segment.

As can be seen in the graphic, a variety of characteristics differentiate the various saver segments:

- **Baseline** usage. Positive savers are more likely to have higher average baseline usage than negative savers. This is true for positive saver segments with and without net metering. Notably, the baseline usage of participants with and without net metering should not be compared directly, as the baseline usage of participants with net metering does not include solar generation data used to meet the energy needs at the time of production. It is possible and, in fact, likely that participants with net metering have higher baseline usage than participants without net metering. Across all segments, as the baseline usage increases, so do the positive savings.

- **Measures adopted.** Energy savings vary depending on the measures adopted. Notably, positive savers with HVAC, weatherization, and water heating measures achieve deeper savings than participants with cool roof and fenestration measures. Negative savers with no net metering are achieving deeper negative savings upon installing HVAC and water heating measures, which could be tied to fuel substitution. Due to small population sizes, energy savings by end use are uncertain for the participants with net metering. They, therefore, could not be explored in greater detail.

- **Loan amount.** Participants with net metering, positive or negative savers, averaged higher loan amounts than participants without net metering. This signals larger project sizes among participants with net metering.

- **FICO score.** Negative savers, with or without net metering, are more likely to have slightly lower FICO scores; however, energy savings achieved by negative savers do not vary meaningfully according to the FICO score category. Positive savers with net metering are more likely to have higher FICO scores, and participants with higher FICO scores are more likely to achieve deeper positive savings. Interestingly, the energy savings of participants without net metering decreased as their FICO scores increased.

- **DAC status.** Positive savers with net metering have the least incidence of participants in DACs. Additionally, the energy savings of DAC and non-DAC participants are relatively similar. Among positive savers without net metering, DAC participant savings are lower than non-DAC participant savings.

- **Fuel substitution.** Negative saver segments are more likely to have known fuel substitution measures than positive saver segments. Among negative saver segments, participants with known fuel substitution achieve deeper negative savings than those without known fuel substitution. Interestingly, positive savers with and without net metering with known fuel substitution are more likely to deliver deeper positive savings. This is likely because positive savers with known fuel substitution undertake larger projects with multiple end uses.

Figure 16. Electric Saver Characterization

Positive Savers No Net Metering — 51% Percent of Participants with Electric Accounts

	10th	25th	Median	75th	90th	Average
Avg Baseline (kWh)	13.45	17.55	24.92	32.32	41.73	26.27
Avg Daily Savings (kWh)	0.66	1.28	2.82	5.24	9.54	4.12
% Savings	5%	7%	11%	16%	23%	16%

Incidence of Financed Enduses / Avg Daily kWh Savings:
Enduse	Incidence	Avg Daily kWh Savings
HVAC	59%	4.53
Cool Roof	19%	2.92
Windows/doors	19%	3.75
Weatherization	18%	4.28
Water Heating	3%	5.89
Appliances	1%	**

FICO Score / Avg Daily kWh Savings:
FICO Score	Percent	Avg Daily kWh Savings
580-640	3%	5.19
641-700	16%	4.76
701-760	33%	4.32
761-820	36%	3.97
821+	12%	2.85

Average Loan Amount $16,994

	DAC Status Yes	DAC Status No	Fuel Substitution Yes	Fuel Substitution No
Percent of Participants	19%	81%	7%	93%
Average Daily kWh Savings	3.71	4.11	5.82	3.99

Positive Savers Net Metering — 10% Percent of Participants with Electric Accounts

	10th	25th	Median	75th	90th	Average
Avg Baseline (kWh)	4.93	8.84	15.46	29.89	37.66	19.16
Avg Daily Savings (kWh)	1.33	2.79	5.81	11.64	19.32	8.30
% Savings	27%	32%	38%	39%	51%	43%

Incidence of Financed Enduses / Avg Daily kWh Savings:
Enduse	Incidence	Avg Daily kWh Savings
HVAC	81%	8.42
Cool Roof	7%	**
Windows/doors	8%	**
Weatherization	15%	7.19
Water Heating	2%	**
Appliances	0%	NA

FICO Score / Avg Daily kWh Savings:
FICO Score	Percent	Avg Daily kWh Savings
580-640	2%	**
641-700	12%	6.93
701-760	29%	8.55
761-820	45%	8.66
821+	12%	8.04

Average Loan Amount $18,219

	DAC Status Yes	DAC Status No	Fuel Substitution Yes	Fuel Substitution No
Percent of Participants	8%	92%	12%	88%
Average Daily kWh Savings	8.15	8.51	11.53	7.84

Negative Savers No Net Metering — 31% Percent of Participants with Electric Accounts

	10th	25th	Median	75th	90th	Average
Avg Baseline (kWh)	11.31	14.83	21.02	28.29	36.60	23.08
Avg Daily Savings (kWh)	-8.42	-4.77	-2.50	-1.02	-0.41	-3.71
% Savings	-75%	-32%	-12%	-1%	-4%	-16%

Incidence of Financed Enduses / Avg Daily kWh Savings:
Enduse	Incidence	Avg Daily kWh Savings
HVAC	54%	-4.10
Cool Roof	27%	-3.31
Windows/doors	17%	-3.83
Weatherization	18%	-4.10
Water Heating	5%	-5.81
Appliances	1%	**

FICO Score / Avg Daily kWh Savings:
FICO Score	Percent	Avg Daily kWh Savings
580-640	6%	-3.79
641-700	19%	4.37
701-760	31%	-3.24
761-820	35%	-3.98
821+	9%	-2.83

Average Loan Amount $17,836

	DAC Status Yes	DAC Status No	Fuel Substitution Yes	Fuel Substitution No
Percent of Participants	17%	83%	13%	87%
Average Daily kWh Savings	-3.40	-3.85	-5.96	-3.37

Negative Savers Net Metering — 5% Percent of Participants with Electric Accounts

	10th	25th	Median	75th	90th	Average
Avg Baseline (kWh)	1.84	4.64	11.14	17.44	24.35	11.92
Avg Daily Savings (kWh)	-10.79	-7.22	-4.14	-1.70	-0.59	-5.44
% Savings	-588%	-155%	-37%	-10%	-2%	-46%

Incidence of Financed Enduses / Avg Daily kWh Savings:
Enduse	Incidence	Avg Daily kWh Savings
HVAC	68%	-5.18
Cool Roof	13%	-**
Windows/doors	15%	**
Weatherization	13%	**
Water Heating	6%	**
Appliances	2%	**

FICO Score / Avg Daily kWh Savings:
FICO Score	Percent	Avg Daily kWh Savings
580-640	0%	N/A
641-700	26%	-4.33
701-760	36%	-5.92
761-820	28%	-5.62
821+	9%	**

Average Loan Amount $19,362

	DAC Status Yes	DAC Status No	Fuel Substitution Yes	Fuel Substitution No
Percent of Participants	15%	85%	28%	72%
Average Daily kWh Savings	-4.93	-5.56	-6.52	-5.01

** Results not shown due to small sample sizes

Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to those from the pooled models presented in the section above. They are used to explore the magnitude of differences across the various segments.

Given large differences in energy savings between positive savers with and without net metering, we explored those saver segment distributions and end use installation by climate zone. The results, presented in Table 40 below, suggest that the difference in HVAC measure installation by climate zone is one of the drivers of differences in energy savings.

More specifically, positive savers with net metering are more likely than positive savers without net metering to be located in climate zones with greater need for heating and cooling, as evidenced in higher average heating degree days (HDD) and cooling degree days (CDD). Further, positive savers with net metering located in climate zones with greater need for heating and cooling are also more likely to update their HVAC systems as part of the GGH Program, thus tapping into deeper energy savings. This interaction of participant location in terms of climate zones and differences in HVAC system replacement is a likely driver of the higher savings among participants with net metering.

Table 40. Relationship of Electric Energy Savings with Climate Zones and HVAC Measure Incidence

| Climate Zone | Average Weather | | % Distribution of Participants | | Incidence of HVAC Measures | | Average Per-Participant Daily Savings (kWh) | |
	CDD	HDD	Positive Savers - No NEM	Positive Savers - NEM	Positive Savers - No NEM	Positive Savers - NEM	Positive Savers - No NEM	Positive Savers - NEM
Climate zone 2	*0.85*	*10.10*	*1%*	*4%*	*100%*	*75%*	*9.75*	*6.58*
Climate zone 3	*0.14*	*7.66*	*1%*	*0%*	*80%*		*4.72*	
Climate zone 4	*0.60*	*8.30*	*1%*	*1%*	*43%*	*100%*	*1.47*	*4.47*
Climate zone 6	*0.65*	*3.85*	*1%*	*0%*	*33%*		*4.32*	
Climate zone 7	*0.47*	*5.21*	*1%*	*2%*	*67%*	*0%*	*4.50*	*8.30*
Climate zone 8	0.67	4.03	6%	0%	48%		3.49	
Climate zone 9	1.35	4.99	8%	0%	43%		3.41	
Climate zone 10	2.33	6.36	12%	2%	50%	100%	4.44	9.32
Climate zone 11	2.56	8.11	13%	32%	69%	94%	4.34	6.44
Climate zone 12	1.76	8.05	29%	36%	82%	86%	4.24	9.29
Climate zone 13	3.79	6.26	23%	23%	43%	61%	4.22	9.67
Climate zone 14	*4.09*	*7.60*	*3%*	*0%*	*54%*		*2.26*	
Climate zone 15	*7.27*	*3.02*	*1%*	*0%*	*50%*		*6.25*	
Climate zone 16	*2.21*	*10.90*	*1%*	*0%*	*14%*		*2.94*	

Note: Light grey italicized cells contain very small population counts, and, as such, the results should be treated with caution.
Energy savings values are reflective of the post-period weather profile. The savings values should not be compared to the ones from pooled models presented in the prior section and are used to explore the differences across the various segments.

Table 41 summarizes gas saver segments and their associated savings. As can be seen in the table, nearly two-thirds of participants with gas accounts deliver positive savings, while just over one-third deliver negative savings. Nearly two-thirds of gas participants deliver positive savings, while over a third deliver negative savings. Aside from baseline usage, negative savings do not appear to be driven by any of the key observable characteristics.

Table 41. Gas Saver Distribution

Saver Type	% of Participants	Average Per-Participant Daily Energy Savings (Therms)
Positive	61%	0.44
Neutral	3%	−0.001
Negative	36%	−0.24

Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to the ones from the pooled models presented the section above and are used to explore the magnitude of differences across the various segments.

Figure 17 characterizes positive and negative gas savers. Neutral savers are not included in the analysis due to the small size of the segment. As can be seen in the graphic, the two segments have similarities and differences:

- **Baseline usage.** The average baseline usage of the positive gas savers is 15% higher than that of the negative gas savers. As the positive saver baseline usage increases, so do gas savings. Similarly, the negative savings decrease as the negative saver baseline usage increases.

- **Loan amount.** Loan amounts of negative gas savers are considerably lower than those of the positive savers, signaling more measures installed and a broader amount of energy-saving updates.

- **Measures adopted.** While negative savers are more likely to have installed HVAC measures as part of the financed projects and are less likely to have installed other measures, the magnitude of negative savings does not vary by installed measure. Among positive savers, HVAC, weatherization, and water heating measures achieve the highest savings.

- **FICO score.** Among the saver segment, participants with higher FICO scores achieve higher savings. Higher incidence of HVAC and insulation measures likely contribute to the savings differences.

- **Fuel substitution.** Positive savings are driven in part by fuel substitution. Gas savings from known fuel switchers are nearly three times higher than those from their counterparts. Negative savers are almost never fuel switchers.

- **DAC status.** Negative and positive savers are similar in terms of their DAC status. However, gas savings vary depending on whether or not participants are in DACs. More specifically, among positive savers, participants in DACs deliver lower savings than those who are not in DACs. Among negative savers, however, the differences in savings by DAC status are negligible.

Figure 17. Gas Saver Segment Characterization
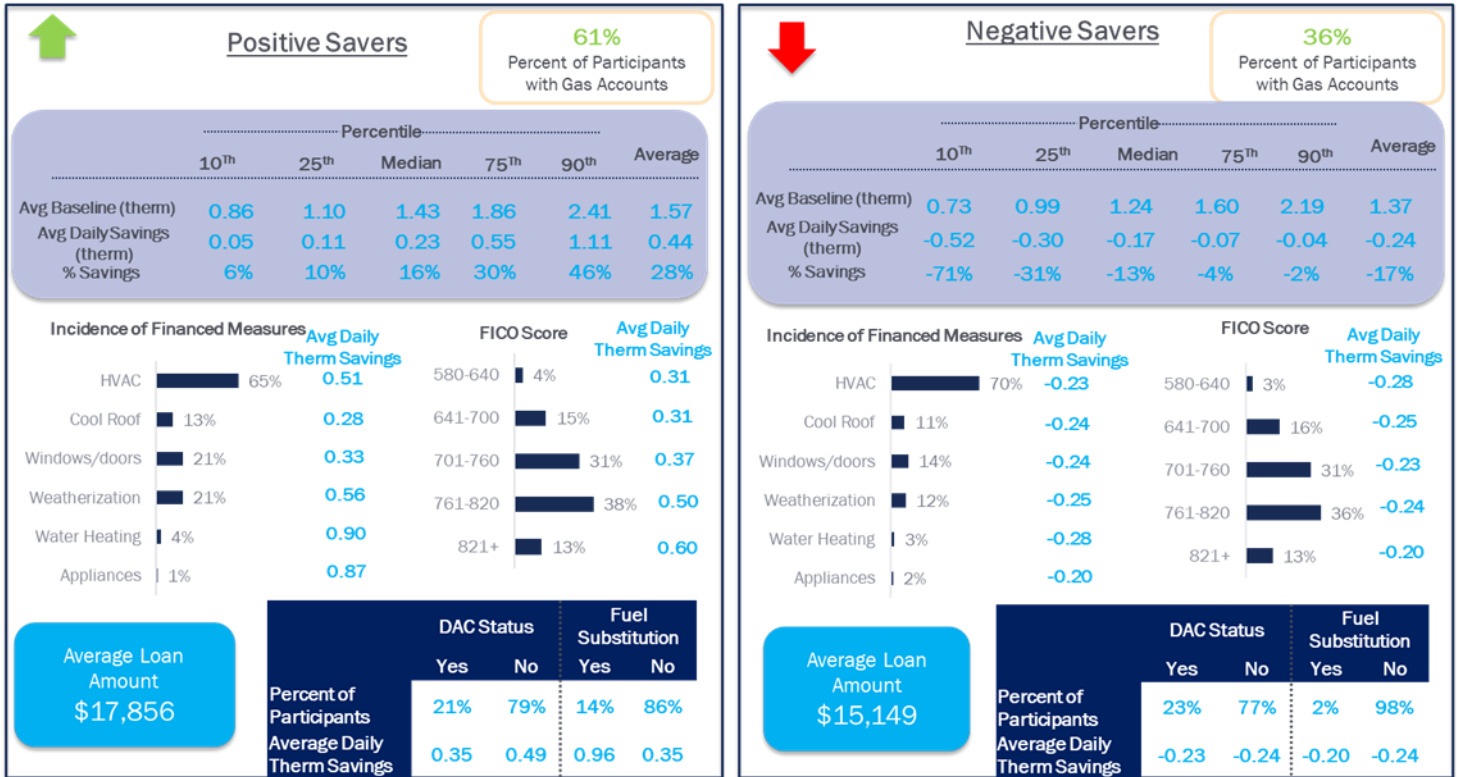
Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to those from the pooled models presented in the section above and are used to explore the magnitude of differences across the various segments.

Table 42 presents the electric saver distribution and average daily electric savings per participant by IOU. In addition, the table summarizes the incidence of adoption for the various end uses by each IOU. As can be seen in the table, PG&E has the highest share of positive savers, while SDG&E has the lowest. Resultantly, average per-participant savings are highest for PG&E and lowest for SDG&E. Differences in HVAC measure adoption likely contribute to the differences in savings by the IOU.

Table 42. Electric Saver Segment Distribution and Average Per Participant Daily Energy Savings by IOU

Column	PG&E	SCE	SDG&E
Electric Saver Segment Composition			
Positive	63%	59%	36%
Neutral	3%	2%	4%
Negative	35%	39%	61%
Average Per Participant Daily Electric Savings (kWh)			
All	1.85	0.71	0.11
Positive	5.14	3.88	5.90
Neutral	-0.01	-0.03	-0.03
Negative	-4.01	-3.97	-3.29
Average Per Participant Loan Amount	$16,838	$18,755	$18,345
Incidence of End Uses			
HVAC	66%	49%	36%
Cool roof	18%	25%	36%
Windows/doors	13%	26%	25%
Weatherization	14%	24%	11%
Water heating	3%	3%	7%
Appliances	1%	2%	4%

Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to those from the pooled models presented in the section above and are used to explore the magnitude of differences across the various segments.

Table 43 presents gas saver distribution and average per participant daily gas savings by IOU. In addition, the table summarizes the incidence of the adoption of various end uses by each IOU. As with the electric savings, PG&E has the highest share of positive gas savers, while SDG&E has the lowest. Because of that, average per-participant gas savings are highest for PG&E and lowest for SDG&E. Differences in HVAC measure adoption likely contribute to the differences in savings by the IOU.

Table 43. Gas Saver Segment Distribution and Average Per Participant Daily Energy Savings by IOU

	PG&E	SoCalGas	SDG&E
Gas Saver Segment Composition			
Positive	61%	62%	62%
Negative	36%	35%	35%
Neutral	3%	3%	4%
Average Per Participant Daily Gas Savings (Therms)			
All	0.21	0.11	0.06
Positive	0.48	0.33	0.25
Neutral	-0.001	-0.001	-0.003
Negative	-0.23	-0.26	-0.28

	PG&E	SoCalGas	SDG&E
Average Per Participant Loan Amount	$15,678	$19,557	$17,990
Incidence of End Uses			
HVAC	75%	48%	31%
Cool roof	7%	24%	35%
Windows/doors	15%	26%	27%
Weatherization	15%	26%	19%
Water heating	3%	5%	8%
Appliances	1%	3%	0%

Note: Energy savings are reflective of the post-period weather profile. Savings should not be compared to those from the pooled models presented in the section above and are used to explore the magnitude of differences across the various segments.

7.1.2 ENERGY SAVINGS FROM MICRO-LOAN

The GGH Program offers micro-loans to participants for household appliances, including clothes washers, clothes dryers, dishwashers, ovens, ranges, refrigerators, and smart thermostats. Table 44 summarizes the total energy savings by measure, showing the program saved 17,402 kWh, 2.70 kW, and 2,315 therms for the 755 appliances purchased through the California Enervee Marketplace. The Appendix A includes more details regarding the deemed savings application methodology.

Table 44. Micro-Loan Total Energy Savings

Measure	Measure Quantity	Program Gross Savings		
		kWh	kW	Therms
Clothes Dryer (Electric)	12	693	0.17	-6
Clothes Dryer (Gas)	220	-209	N/A	731
Clothes Washer	229	14,351	2.30	907
Convection Gas Oven	178	N/A	N/A	450
Dishwasher	66	881	0.22	174
Induction Range or Cooktop	5	-1,095	N/A	72
Refrigerator	39	1,867	0.00	-34
Smart Thermostat	6	915	N/A	21
Total	755	17,402	2.70	2,315

Source: 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).

7.2 EMISSIONS REDUCTION

The evaluation team emulated procedure 2.2 of the CPUC Fuel Substitution Calculator v2 to calculate the emission reductions achieved from electricity and gas savings during program years 2018–2023. 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 adding the two to arrive at the total emissions reductions, two methane leakage percentages are applied to each emissions reduction quantity: one for upstream methane leakage from power plants (adds about 5% to emissions reductions) and one for residential behind-the-meter leakage (adds about 4% to emissions reductions). The sum of the resulting emissions reductions after the methane leakage percentages are applied is the total emissions reductions in metric tons of CO_2. Further detailed emission reduction calculation methodology and assumptions are in Appendix A.

CO_2 emission reductions associated with first-year annual energy savings are presented in Table 45. Unsurprisingly, EEEMs installed using macro-loans accounted for most of the emissions reductions. Gas savings associated with the program achieved much deeper emissions reductions. Gas savings associated with EEEMs installed using macro-loans accounted for 79% of the emission reductions achieved through the GGH Program.

Table 45. Emission Reduction from Energy Savings

EEEMs Installed Using:	tCO$_2$ Reductions from Gas Savings	tCO$_2$ Reductions from Electricity Savings	Total
Micro-loans	13.43	3.31	16.75
Macro-loans	455.12	104.00	559.12
Total	468.55	107.32	575.87

7.3 BENCHMARKED PROGRAM SAVINGS

The GGH Program is one of the few programs that deploy LLR to encourage residential EE projects. However, a sizeable number of programs around the United States have promoted residential EE projects through financing to ameliorate high up-front costs of EE projects with deeper savings. In addition, the GGH Program has started facilitating micro-loans for smaller EE projects, typically appliance purchases. As such, benchmarking program savings from the GGH Program against other financing programs is challenging, and results should be interpreted with caution. Among many other factors, differences in measure mix, program delivery and implementation, evaluation methodology, participant period under evaluation, and differences in climate could result in differences in estimated savings.

The NYSERDA OBR project encouraged measures similar to the EEEMs in the GGH Program. The NYSERDA OBR project led to an estimated net electricity savings of 3%. The estimated gas savings are 13%. However, the comparability NYSERDA OBR estimated savings with the GGH program savings is somewhat limited since the NYSERDA OBR impact evaluation methodology drops some participating houses with weak relationship between weather and energy use, and unusually high consumption. Both these methodological choices is likely to increase the estimated savings. In addition, the NYSERDA OBR evaluation period was much earlier, thus reductions in savings from natural increase in energy efficiency is expected. With similar measures, the Michigan saves program estimated combined energy bills (electricity and gas) savings of 4%. However, their evaluation methodology is unknown.

The Missouri Pay As You Save (PAYS) program is another OBR program with comparable measure mix. However, they do not specifically encourage fuel substitution or fuel substitution. Their per participant ex post electricity saving, estimated using a TRM based engineering approach, is 31% of pre-installation electricity usage. This number is substantially higher than estimates obtained from approaches that utilize a consumption analysis with comparison groups. As per

the NYSERDA OBR evaluation estimates, the net electric savings per participant when using an approach similar to the approach in 7.1.1 is 17% of the program reported ex ante usage.

Table 46 compares the evaluated energy savings from EEEMs installed using macro-loans from the GGH Program to financing programs with a similar list of EEEMs. Savings from micro-loans are not compared since they make up a much smaller share of the evaluated savings (<3%). Moreover, the TRM-driven estimation of smaller appliances is not comparable to savings estimation for EEEMs, which are expected to lead to much deeper energy savings.

The GGH Program saved 3% of electricity and 5.7% of gas relative to per-participant pre-installation baseline usage. This represents much deeper gas savings and fewer electricity savings than the Pilot evaluation. The differences are likely due to two reasons. First, the pooled model-based consumption analysis of this evaluation uses future GGH Program participants as the comparison group. The REEL evaluation used matched participants who were not part of the GGH Program as the comparison group. Thus, the methodology of the REEL evaluation estimates gross savings (i.e., the sum of savings due to EEEMs) and the effect of selection into the program of participants who are eager to save energy. In contrast, by conducting a within-program comparison, this evaluation controls for the selection effect and brings estimates close to net savings. Second, more fuel-substituting EEEMs were installed during this evaluation period. Thus, the electricity savings are expected to be lower, and gas savings are expected to be higher.

The NYSERDA OBR project encouraged measures similar to the EEEMs in the GGH Program. The NYSERDA OBR project led to an estimated net electricity savings of 3%. The estimated gas savings are 13%. However, the comparability NYSERDA OBR estimated savings with the GGH program savings is somewhat limited since the NYSERDA OBR impact evaluation methodology drops some participating houses with weak relationship between weather and energy use, and unusually high consumption. Both these methodological choices is likely to increase the estimated savings. In addition, the NYSERDA OBR evaluation period was much earlier, thus reductions in savings from natural increase in energy efficiency is expected. With similar measures, the Michigan saves program estimated combined energy bills (electricity and gas) savings of 4%. However, their evaluation methodology is unknown.

The Missouri Pay As You Save (PAYS) program is another OBR program with comparable measure mix. However, they do not specifically encourage fuel substitution or fuel substitution. Their per participant ex post electricity saving, estimated using a TRM based engineering approach, is 31% of pre-installation electricity usage. This number is substantially higher than estimates obtained from approaches that utilize a consumption analysis with comparison groups. As per the NYSERDA OBR evaluation estimates, the net electric savings per participant when using an approach similar to the approach in 7.1.1 is 17% of the program reported ex ante usage.[30],[31]

Table 46. GGH Program Savings (Macro-loans) Compared to Similar Programs

	The GGH Program	REEL	NYSERDA OBR	Missouri PAYS	Michigan Saves
Participation period under evaluation (inclusive of end-points)	July 2018– June 2023	June 2016– June 2018	January 2014– September 2016	January 2021– December 2022	January 2022– December 2022
Electricity Savings Per Participant	3%	12.8%	3%	31%[b]	4%[c]
Gas Savings Per Participant	5.7%	2.6%	13%[a]	Not evaluated	4%[c]

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[30] In Opinion Dynamics experience, ex ante values are often developed using an approach similar to Engineering analysis approach.

[31] Reported ex ante saving is 1,786 kWh, whereas net saving is 295 kWh. (Table 6 of "HPwES On Bill Recovery Impact Evaluation." West Hill Energy & Computing. 2019).

	The GGH Program	REEL	NYSERDA OBR	Missouri PAYS	Michigan Saves
Impact estimation method	Consumption Analysis with Pooled Model (own-comparison group)	Consumption Analysis with Pooled Model (matched comparison group with non-participants)	Consumption Analysis with Pooled Model	Engineering Analysis using Missouri and other TRMs	Unknown
Likely interpretation	Between net and gross impact	Gross impact	Between net and gross impact	Savings not verified through a consumption analysis	Unknown
Source	This Report	REEL Impact Evaluation, 2020[32]	HPwES On Bill Recovery Impact Evaluation, 2019[33]	Impact Evaluation Report, 2022[34]	Michigan Saves Website[35]

[a] Not net gas savings.

[b] Pre-install usage data estimated using billing data for a random subset of 20 participants.

[c] 4% saving in gas and electricity bills.

7.4 PROGRAM INFLUENCE

The participant surveys explored how the availability of financing influenced respondents' decisions to complete a home upgrade project or purchase energy-efficient equipment. Because the GGH Program does not claim energy savings, the evaluation team did not calculate a net-to-gross ratio to discount energy savings. Rather, the evaluation team qualitatively assessed the program influence on customer decision-making.

7.4.1 PROGRAM INFLUENCE ON DECISION-MAKING

The evaluation team asked participant survey respondents if they decided to do a home upgrade/purchase EE products before or after they knew about financing options. As shown in Table 47 micro-loan respondents were statistically more likely than macro-loan respondents to have decided after learning about financing (63% vs. 31%). Inversely, macro-loan respondents were statistically more likely than micro-loan respondents to have decided before learning about financing (68% vs. 32%).

Table 47. Timing of Learning About Financing Relative to Decision to Do Project/Purchase Equipment

Decided to Do Home Upgrade/Purchase Equipment Before or After Learning About Financing	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Before	62%	73%	68%[d]	32%
After	37%	27%	31%	63%[c]
Don't know	2%	0%	1%	5%[c]

Source: Macro-loan and Micro-loan participant surveys

Question: Did you decide to [do a home upgrade/purchase the energy saving products from the Enervee or SoCalGas Marketplace]

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[32] "Residential Energy Efficiency Loan Assistance Pilot: Final Impact Evaluation Report." Opinion Dynamics. 2020.

[33] "HPwES On Bill Recovery Impact Evaluation." West Hill Energy & Computing. 2019.

[34] "Ameren Missouri Program Year 2022 Annual EM&V Report Volume 2: Residential Portfolio Report." Opinion Dynamics. 2023.

[35] "By the numbers." Michigan Saves, https://annualreport.michigansaves.org, Accessed March 15. 2024.

before you knew about financing options or afterward?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The participant surveys included questions that explored what respondents would have done without financing. The team asked respondents how likely they would have been to undertake their home upgrade project/purchase EE products if financing were not available. As shown in Table 48, 54% of macro-loan respondents and 61% of micro-loan respondents said they would have been unlikely to do their project/purchase EE products without financing.

Table 48. Likelihood of Undertaking Project/Purchasing Products Without Financing

Likelihood of Undertaking Project/Purchasing EE Equipment Without Financing	Macro-loan			Micro-loan (n=60)
	Fuel Substitution (n=65)	No Fuel Substitution (n=79)	Total (n=144)	
Very likely	14%	24%	19%	15%
Somewhat likely	29%	22%	25%	22%
Somewhat unlikely	18%	20%	19%	18%
Very unlikely	37%	34%	35%	43%
Don't know	2%	0%	1%	2%

Source: Macro-loan and Micro-loan participant surveys
Question: Without financing, how likely would you have been to [undertake this project/purchase energy savings products]?
Note: Results are based on two-sided tests. Tests revealed no significant differences.

The team asked all respondents when they would have undertaken their home upgrade project/purchased EE products if financing had not been available. As seen in Table 49 approximately 64% of macro-loan and 62% of micro-loan respondents would have done their project/purchased the equipment later than they did if the financing was not available. A further 6% and 7% of macro-loan and micro-loan respondents, respectively, never would have done the project/or purchased the equipment.

Table 49. Timing of Undertaking Project/Purchasing Products Without Financing

When Respondents Would Have Undertaken Project/Purchased EE Equipment Without Financing	Macro-loan			Micro-loan (n=60)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
At the same time or sooner	20%	22%	21%	17%
Within six months	17%	9%	13%	17%
Within a year	9%	13%	11%	20%c
Within a year and a half	3%	5%	4%	5%
Within two years	15%	13%	14%d	5%
Two years or longer	20%	23%	22%	15%
Never	5%	6%	6%	7%
Don't know	11%	10%	10%	15%

Source: Macro-loan and Micro-loan participant surveys
Question: Without any financing, WHEN would you have [undertaken this project/purchased the energy savings products] (compared to when you actually [undertook this project/purchased the equipment] with financing)?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked respondents to consider the likelihood they would have done a project/purchased equipment that cost less than they did absent financing. As seen in Table 50, 53% of macro-loan respondents and 66% of micro-loan respondents indicated they would have been likely to do something cheaper absent financing. Micro-loan respondents were significantly more likely than macro-loan respondents to indicate they would have been "very" likely to do something that cost less absent financing (43% vs. 30%).

Table 50. Likelihood of Undertaking a Project/Purchasing Equipment that Cost Less Without Financing

Likelihood of Doing a Project/Purchasing Equipment That Cost Less Without Financing	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Very likely	34%	27%	30%	43%c
Somewhat likely	22%	24%	23%	23%
Somewhat unlikely	2%	13%a	8%	13%
Very unlikely, I would have done the same project	35%	24%	29%	18%
Don't know	8%	13%	10%d	2%

Source: Macro-loan and Micro-loan participant surveys
Question: Without any financing, what is the likelihood that you would have [done a project that would have cost less than the project you did/purchased a less expensive equipment]?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked respondents, who indicated that absent financing, they would have been likely to have done a project/purchased equipment that cost less than what they did with financing, to consider the efficiency level of the cheaper equipment they would have installed. As shown in Table 51, 14% of macro-loan respondents and 25% of micro-loan respondents were unsure what they would have done. Approximately 52% of macro-loan respondents and 43% of micro-loan respondents indicated they would have purchased equipment that only met minimum efficiency standards or purchased no equipment at all.

Table 51. Efficiency of Equipment Purchased in Hypothetical Where Financing Was Unavailable

Efficiency of Cheaper Equipment Participants Would Have Purchased	Macro-loan			Micro-loan (n=40)
	Fuel Substitution (n=36)	No Fuel Substitution (n=40)	Total (n=76)	
The minimum efficiency standards or building code	28%	35%	32%	20%
Would not have installed any equipment	17%	23%	20%	23%
The same or higher efficiency equipment but less in quantity	22%	13%	17%	20%
Above the minimum efficiency standards or building code but lower efficiency than what you installed	22%	13%	17%	13%
Don't know	11%	18%	14%	25%

Source: Macro-loan and Micro-loan participant surveys
Question: For this question, please think of a hypothetical scenario where financing was not available for your [home upgrade project/equipment purchase]. Without any financing, would you have installed equipment that was...?
Note: Results are based on two-sided tests. Tests revealed no significant differences.

REASONS FOR SELECTING GGH/ECO FINANCING

In addition to exploring the overall influence of financing, the participant surveys explored why participants chose to use GGH/Eco Financing specifically.

The team asked respondents to recall how they first learned about the GGH Program. As seen in Table 52, most macro-loan respondents first learned about GGH from their contractor (63%) and most micro-loan respondent first learned about GGH from the Enervee or SoCalGas Marketplace website (72%). Among macro-loan respondents, those who installed a fuel substitution measure were significantly more likely than those who did not install a fuel substitution measure to have first learned about GGH from a contractor (72% vs. 54%). In February 2022, CAEATFA signed a Memorandum of Agreement with Energy Solutions, the implementer of the TECH Clean California Initiative (TECH), a market transformation program designed to accelerate adoption of commercially available, low-emissions space- and water-heating equipment (i.e., fuel substation equipment).

Table 52. How Participants First Learned About GGH/Eco Financing

| First Learned About GGH Via | Macro-loan | | | Micro-loan (n=60) (d) |
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
The Enervee or SoCalGas Marketplace website	N/A	N/A	N/A	72%
Digital marketing: emails or search engine ads	N/A	N/A	N/A	15%
Contractor	72%[b]	54%	63%	0%
Did my own research	18%	22%	20%[d]	5%
Bank or Lender	5%	9%	7%	5%
A website (Other than Enervee or SoCalGas Marketplace)	3%	8%	6%	3%
Friend, family member, or acquaintance	0%	6%	3%	0%
Other advertisement	2%	1%	1%	0%

Source: Macro-loan and Micro-loan participant surveys
Question: How did you FIRST learn about the [GoGreen Home/Eco Financing] Loan?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked macro-loan respondents who first heard about the GGH Program from a source other than their contractor (n=54) if their contractor told them about any financing options other than the GGH Program. Of these macro-loan respondents, 7% did not use a contractor for their home upgrade project, and 6% did not know. Approximately 43% indicated that their contractor informed them of other financing options, and the remaining 44% did not hear about other financing from their contractor.

The team asked all shoppers (defined as respondents who first learned about GGH/Eco Financing from independent research or indicated they sought other financing options) why they chose to use GGH/Eco Financing. As seen in Table 53, the two reasons most often cited by shoppers were the low interest rate and the easy process. Responses varied somewhat by loan type; whereas the low interest rate was the most common response for macro-loan respondents, the most common response among micro-loan respondents was the easy process. Macro-loan respondents were significantly more likely than micro-loan respondents to indicate they used GGH because of the low interest rate (69% vs. 58%).

Table 53. Reasons for Using GGH/Eco Financing Over Other Financing Options

Reason for Using GGH/Eco Financing	Macro-loan			Micro-loan (n=26) (d)
	Fuel Substitution (n=22) (a)	No Fuel Substitution (n=34) (b)	Total (n=56) (c)	
Low interest rate	51%	73%	69%^{d}	58%
Easy process	33%	51%	48%	77%
No lien/upfront collateral	18%	23%	24%	31%
Long loan term	14%	21%	21%	38%
Do not like large credit card debts	N/A	N/A	N/A	23%
No penalty for paying off early	5%	23%^{a}	18%	N/A
Loan size	3%	3%	4%	N/A
Did not qualify for other financing	0%	2%	1%	N/A
Other reason	8%	2%	5%	8%

Source: Macro-loan and Micro-loan participant surveys
Question: In general, why did you choose to use a [GoGreen Home/Eco Financing] Loan instead of other financing options?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked respondents how they paid for the home upgrade project/EE equipment other than the GGH/Eco Financing loan. Only 4 of the 144 macro-loan respondents indicated they used another type of financing besides their GGH loan. No micro-loan participants used another type of financing, as this was not possible given the loan design.

Of the four macro-loan respondents who used another type of financing, one indicated using a home equity loan/HELOC, one did mortgage refinancing, one used financing from a contractor/manufacturer, and one leveraged on-bill financing. Two of the four indicated they used another type of financing on top of the GGH Program loan because the GGH Program did not cover the entire project costs.

The team asked macro-loan respondents who indicated they used another type of financing in addition to the GGH Program Loan, in the absence of the GGH Program, how likely they would have been to increase the loan amount of the other type of financing they used to pay for their project. Of the four, one indicated they would have been "very" likely, one indicated "somewhat" likely, and the remaining two indicated "very" unlikely.

The team asked (1) non-shoppers (defined as respondents who did not first learn about the GGH Program from independent research and indicated they did not seek out other financing options) and (2) macro-loan participants who used another type of financing and indicated they would have been likely to increase the amount of their non-GGH financing if the GGH Program were not available, whether they would have taken the time to research other options. As seen in Table 54, micro-loan non-shoppers were significantly more likely than macro-loan non-shoppers to indicate they would not have researched other options (29% vs. 7%), suggesting micro-loan respondents would have been less likely than macro-loan respondents to have found other financing absent the GGH Program. Among macro-loan non-shoppers, those who installed a fuel substitution measure were significantly more likely than those who did not install a fuel substitution measure not to research other options absent the GGH Program (23% vs. 2%).

Table 54. Would Non-Shoppers Have Researched Other Financing Options in the Absence of GGH/Eco Financing

Would Non-Shoppers Have Researched Other Financing Options	Macro-loan			Micro-loan (n=34) (d)
	Fuel Substitution (n=44) (a)	No Fuel Substitution (n=45) (b)	Total (n=89) (c)	
Yes	66%	76%	71%^{d}	41%

Maybe	11%	22%	22%	29%
No	23%[b]	2%	7%	29%[c]

Question: If the [GoGreen Home/Eco Financing] Loan was not available, would you have taken the time to research other options?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked macro-loan respondents who indicated their contractor told them about financing options other than the GGH Program: if the GGH loan were unavailable, would they have considered something other than what the contractor offered? Of 23 macro-loan respondents, 9 indicated they would have considered something else, 12 indicated they might have, and 2 indicated they would not have.

The team asked respondents how influential the GGH/Eco Financing loan was on their decision to complete a home upgrade project/purchase EE equipment overall. As seen in Table 55, all micro-loan respondents said Eco Financing was at least "somewhat" influential on their decision to purchase EE equipment from the Enervee/SoCalGas marketplace, with 88% indicating it was "very" influential. Micro-loan respondents were significantly more likely than macro-loan respondents to indicate the GGH was "very" influential; however, only 9% of macro-loan respondents felt it was "not too" or "not at all" influential.

Table 55. Influence of GGH/Eco Financing on Decision to Do Home Upgrade Project/Purchase EE Equipment

Influence of GGH/Eco Financing on Decision to Do Project/Purchase EE Equipment	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Very influential	58%	65%	62%	88%[c]
Somewhat influential	34%	24%	28%[d]	12%
Not too influential	6%	6%	6%	0%
Not at all influential	2%	5%	3%	0%

Question: Overall, how influential was the [GoGreen Home/Eco Financing] Loan you received on your decision to [complete a home upgrade project/purchase the energy saving products]?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

RELATIVE INFLUENCE OF REBATES AND FINANCING

The participant surveys explored how influential the GGH Program was on respondents' decision to do a home upgrade project/purchase EE equipment relative to any rebates they may have used to pay for the project/equipment.

The team asked respondents how they paid for their project/EE equipment other than their GGH loan: 29 macro-loan respondents and five micro-loan respondents indicated using a rebate.[36] Micro-loan respondents (all SCE customers) can only receive rebates from Southern California Gas. Macro-loan respondents reported their rebates were from BayREN, the federal government, Sacramento Municipal Utility District (SMUD), Sonoma Clean Power, PG&E, and the local government.

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[36] Whereas macro-loan participants can identify and use utility/non-utility rebates to apply to their home upgrade project, micro-loan participants can only use rebates that are identified and applied at the point-of-sale on the Enervee/SoCalGas marketplace.

The teams asked these respondents if their GGH loan was more, less, or equally important to their decision to complete a project/purchase EE equipment than the rebate/incentive they received. Of the 29 macro-loan respondents, compared to the rebate, 48% (14 of 29) felt the loan was "significantly" more important, 7% (2 of 29) felt it was "somewhat" more important, 38% (11 of 29) felt it was "equally" important, and 7% (2 of 29) felt it was "less" important. Of the five micro-loan respondents, compared to the rebate, one respondent felt the loan was "somewhat" more important, and the remaining four felt it was "equally" important.

The team asked those who used a rebate in addition to their GGH/Eco Financing loan if they needed both, either, or neither of the funding sources, to be able to do their home upgrade project/purchase EE equipment. Of the 29 macro-loan respondents, 72% (21 of 29) indicated they needed both the loan and the rebate to do their project, 21% (6 of 29) indicated they needed the loan but not the rebate, and 7% (2 of 29) indicated they did not need either. Of the five micro-loan respondents, four indicated they needed both the loan and rebate and the remaining respondent needed the loan but not the rebate.

7.4.2   PERCEIVED INFLUENCE OF UPGRADE PROJECT/EE EQUIPMENT ON ENERGY SAVINGS

The participant survey asked respondents how their utility bill changed, if at all, after completing their GGH-financed project or installing their GGH-financed equipment. As seen in Table 56, macro-loan respondents were significantly more likely than micro-loan respondents to indicate that their utility bill decreased since their GGH Program participation (58% vs. 32%). Likewise, micro-loan respondents were significantly more likely than macro-loan respondents to indicate that their utility bill had not changed (38% vs. 12%).

Table 56. Self-Reported Change in Utility Bill Since GGH Participation

Change In Utility Bill Since GGH-Financed Project/Equipment	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Decrease	63%	59%	58%d	32%
No change	9%	15%	12%	38%c
Increase	14%	12%	13%	7%
Don't know	11%	22%	16%	23%
Prefer not to say	3%	0%	1%	0%

Source: Macro-loan and Micro-loan participant surveys
Question: Have you noticed an increase or decrease in your utility bill since [completing the home upgrade/the purchase of your equipment]?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked those who indicated any change in their utility bill (regardless of its direction) what they felt caused the change. As seen in Table 57, macro-loan respondents were more significantly likely than micro-loan respondents to attribute the change in their bill to the work they completed with GGH financing (79% vs. 52%). Micro-loan respondents were significantly more likely than macro-loan respondents to reference a change in utility rates (35% vs. 17%).

Table 57. Participant-Reported Reason for Change in Utility Bill Since GGH Participation

Reasons for Change in Utility Bill	Macro-loan			Micro-loan (n=23) (d)
	Fuel Substitution (n=54) (a)	No Fuel Substitution (n=54) (b)	Total (n=108) (c)	

The GGH-financed home upgrade project	83%	74%	79%d	52%
Other changes made to the property	15%	20%	18%	9%
A change in utility rates	13%	20%	17%	35%c
The weather	4%	6%	5%	13%
A change in occupancy	4%	2%	3%	9%
Other	4%	6%	5%	0%

Source: Macro-loan and Micro-loan participant surveys
Question: Please describe what you think caused this change.
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

8. PROGRAM PERFORMANCE METRICS REVIEW

The purpose of this chapter is to gauge if Resolution E-4900 metrics remain valid indicators of performance for the GGH Program, if there are new metrics to track, and/or if original metrics should be modified. We first present an assessment of the GGH Program and the REEL Pilot based on a set of metrics that closely aligns with metrics in Res E-4900 (Section 8.1). In Section 8.2, we present further metrics that will be useful in tracking progress of the GGH Program.

8.1 PROGRAM PERFORMANCE METRICS SUMMARY

Table 58 provides a brief assessment of how the GGH Program performed during the evaluation period of July 2018 to June 2023 relative to its performance in the Pilot period (July 2016 – June 2018) across the key metrics outlined by the study's research objectives (see Purpose of the Study).

Table 58. Key Program Performance Metrics Summary[a]

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
Program Scalability			
Growth in the number of loans on a month-by-month basis over the evaluation period	▪ Average number of loans per month: 9	▪ Average number of loans per month: 64	▪ A fix-fold increase number of loans per month
The number of loans made by the program, average loan size, and **total amount of financing generated**	▪ Total program loans: 212 ▪ Average loan size: $17,246 ▪ Total financing generated: $3,656,135	▪ Total program loans: 3,887 (3,320 macro-loans, 567 micro-loans) ▪ Average loan size: $18,253 (macro-loan) $1,498 (micro-loan) ▪ Total financing generated: $61,449,196 ($60,599,987 macro-loans, $849,209 micro-loans)	▪ Significant participation and financing growth ▪ Consistent macro-loan size, given increased construction costs over time
The geographic distribution of loans, including ability to reach new regions of the state especially those with large,	▪ Loan distribution concentrated in Southern California.	▪ Loan distribution expanded to the North Central Corridor and Bay Area due to increased loans from statewide lenders and the introduction of medium-volume regional lenders in those areas.	▪ The program expanded its reach beyond Southern California but has limited reach outside of Southern California, the North Central Corridor, and the Bay Area.

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
underserved populations		▪ About half of loans were distributed to a customer in an underserved census tract.37	▪ A large proportion of GGH borrowers resided outside of undeserved areas.
Loan performance to date in terms of defaults, late payments, and use of loan loss reserve	▪ It was too early to thoroughly evaluate loan performance at the time of the pilot evaluation. ▪ Only one borrower defaulted in the first two years. ▪ A few customers started to make late payments.	▪ *Macro-loan:* Paid in full – 18% Current – 80% Past-Due - <1% Defaulted – 1% ▪ *Micro-loan:* Paid in full – 13% Current – 56% Past-Due – 14% Defaulted – 16% ▪ $453K net payments to lenders to cover defaults.	▪ The incidence of past-due payments and defaults was low among macro-loans but more prevalent among micro-loans.
Participant details including credit scores, loan terms, percent underserved, and percent who may qualify for other private loan options	▪ *Macro-loan:* ▪ FICO Score (580-700) – 24% ▪ Average Loan term – 117 months ▪ Percent underserved – 30% ▪ Percent credit challenged – 4% ▪ Percent who may qualify for other private loans (self-reported): 10%	▪ *Macro-loan:* ▪ FICO score (580-700) – 16% ▪ Average loan term – 106 months ▪ Percent underserved – 59% ▪ Percent who may qualify for other private loans (self-reported) – 4% ▪ *Micro-loan:* ▪ FICO Score (580-700) – 79% ▪ Average Loan term – 60 months ▪ Percent underserved – 85% ▪ Percent who may qualify for other private loans (self-reported) - 30%	▪ There is opportunity for increasing macro-loan participation among lower-income households and households within LMI census tracts.
Program Leveraged by Private Capital and Support			
The number and type of participating financial institutions and program-certified contractors, including an analysis of the distribution of participation across partners	▪ Total participating lenders: 4 ▪ The program enrolled two statewide and two regional lenders. ▪ Participant contractor network: 282 contractors who served most counties in the state.	▪ Total participating lenders: 10 ▪ The program enrolled four new regional macro-loan lenders (two small volume, two medium volume) and two micro-loan lenders (only one micro-loan lender remains part of the program). ▪ Participant contractor network: 959 contractors ▪ concentrated in Southern California, the Northern Central Corridor, and the Bay Area.	▪ Increased lender participation supported loan growth and wider distribution of loan participation ▪ Contractor enrollment increased steadily; however, 43% of contractors have yet to complete a GGH-financed project.
Any changes CAEATFA made from the REEL pilot to attract additional funding for GGH and the total amount of private capital attracted to date	▪ CAEATFA enacted changes to increase loan volume: created consolidated Loss Reserve Accounts, broadened measure eligibility, added	▪ CAEATFA enacted further changes to increase loan volume: streamlined approval process, added leases and service agreements as eligible products, introduced micro-loans, created a Channel Partner role, reduced the minimum net worth eligibility	▪ CAEATFA's efforts generated $61 million in private lending.

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37 Underserved census tracts are designated based on the definition of "underserved community" presented in the CPUC ESJ plan. An underserved community must meet at least one of the following sub-criteria: a "disadvantaged community" as defined by subdivision (g) of Section 75005 of the Public Resource Code; a "low-income community" as defined by paragraph (2) of subdivision (d) of Section 397813 of the Health and Safety code; among the most disadvantaged 25 percent in the state according to CalEnviroScreen; a community in which at least 75 percent of public school students in the area are eligible to receive free or reduced-price meals under the National School Lunch Program; and a community located on lands belonging to a federally recognized California Indian tribe.

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
	option to file UCC-1 fixture filings	requirement, and added the option to establish up to multiple Loss Reserve Accounts.	
Any program modifications CAEATFA implemented to improve consumer protections and attract additional lenders	▪ CAEATFA enacted changes to simplify the participation process for lenders: removing burdensome paperwork, adding statewide EEEMs list, allowing lenders to use census tract to determine LMI status, and decoupling financing eligibility from rebate eligibility.	▪ CAEATFA enacted further changes to simplify participation for lenders: defining more uniform measure eligibility across IOUs and POUs, allowing CAEATFA to accept loan and project information digitally and in batches, and moving project permit verification responsibilities to contractors. ▪ CAEATFA enacted changes to provide additional consumer protections: updating borrower privacy disclosure, adding requirement for lease/service agreement providers to disclose APR or total project cost, requiring lease/service agreement providers to guarantee functionality of equipment if borrower pays ongoing service fee, and providing alternative eligibility requirement for lease/service lenders.	▪ Six new lenders were added to the program. Two of them were micro-loan lenders, a new type of offering for the program.
Any program modifications CAEATFA proposes to implement to improve consumer protections and attract additional lenders	▪ N/A	▪ Addition of solar and battery storage to EEEMs ▪ Implementation of web-based loan and project management system ▪ CAEATFA will run an interest rate buy-down (IRBD) campaign	▪ Addition of solar and battery storage to EEEMs likely to serve a market need ▪ Streamlined process to aid PFIs will help as the program is scaling up
The incidence of early payoffs and the implications of this on savings and annual percentage rate (APR) benefits; and whether customer early repayments alter the attractiveness of participation for lenders	▪ Not evaluated	▪ *Percentage of loans paid off before end of evaluation period:* Macro-loan – 18% Micro-loan – 13% ▪ *Percentage of loan paid off that were paid in the first 30% of the original loan payoff term*: Macro-loan – 74% Micro-loan – 96%	▪ The incidence of early payoff is not moderate, it is more common among micro-loans. ▪ Participating lenders do not have early payoff penalties indicating incidence of early payoff does not impact lender willingness to participate in the program
Whether the incremental funds from additional ratepayer funding were needed to implement GGH, and if so, how much	▪ N/A	▪ $51 million incremental funding requested for CHEEF programs. ▪ $19.7million – $68.7 million forecasted new LLR needed between FY 22-23 to FY 26-27.	▪ Based on the forecasted growth by CAEATFA, the incremental funds are likely required.
Program Reach to Underserved Customers			
Length of time allowed for applicants to pay back the loans	▪ *Average loan payback term:* 117 months	▪ *Average loan payback term:* Macro-loan – 106 months Micro-loan – 60 months	▪ The average loan payback term for macro-loans decreased by almost a year from the pilot period to the current evaluation period.

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
Credit scores of loan participants reported on an aggregate basis	▪ *FICO score of 580 - 640, i.e., credit-challenged: 8%*	▪ *FICO score of 580 -640, i.e., credit-challenged:* Macro-loan – 4% Micro-loan – 50%	▪ Macro-loan reach to credit-challenged borrowers decreased from the pilot period. ▪ Micro-loans had better reach to credit-challenged borrowers than macro-loans.
Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, area median income, or other poverty statistics	▪ *DTI ratio of 36% to 55%: 54%* ▪ *LMI Census Tract, i.e., percentage with tract median income/area median income less than 120%: 49%* ▪ *Most vulnerable census tract according to CalEnviroScreen score: 13%* ▪ *2022 annual income less than $100,000: 25%* ▪ *Received/qualified for state/government assistance: 6%* ▪ *Tenant at property at time of home upgrade: 0%*	▪ *DTI ratio of 36% to 55%: 40%* ▪ *LMI Census Tract, i.e., percentage with tract median income/area median income less than 120%:* Macro-loan – 57% Micro-loan – 71% ▪ *Most vulnerable census tract according to CalEnviroScreen score:* Macro-loan – 13% Micro-loan – 30% ▪ *2022 annual income less than $100,000:* Macro-loan – 16% Micro-loan – 74% ▪ *Received/qualified for state/government assistance:* Macro-loan – 9% Micro-loan – 62% ▪ *Tenant at property at time of home upgrade/EE equipment purchase:* Macro-loan – 1% Micro-loan – 38%	▪ Macro-loan reach to riskier borrowers (according to DTI ratio) decreased from the pilot period. ▪ Macro-loan reach to LMI tracts increased from the pilot period. ▪ Micro-loans had better reach to LMI tracts than macro-loans. ▪ Macro-loan reach to the most vulnerable census tracts was similar to that of the pilot period. ▪ Micro-loans had better reach to the most vulnerable census tracts than macro-loans. ▪ Macro-loan reach to lower-income borrowers decreased from the pilot period. ▪ Micro-loans had better reach to lower-income borrowers than macro-loans. ▪ Macro-loan reach to borrowers receiving/qualifying for state/government assistance increased from the pilot period. ▪ Micro-loans had better reach to borrowers receiving/qualifying for state/government assistance than macro-loans. ▪ Introduction of micro-loans expanded program reach to tenants.
How other entities define "underserved" Californians in comparison to GGH	▪ Not evaluated	▪ *Underserved:* Macro-loan – 48% Micro-loan – 77% ▪ *Disadvantaged communities:* Macro-loan – 23% Micro-loan – 36%	▪ The current definition of underserved used in the GGH program overstates the reach of macro-loans to underserved borrowers compared to other CPUC definitions.
Whether participants would have qualified for existing private energy efficiency loan programs at interest rates and terms that they can afford or would accept	▪ All lenders increased their maximum allowable loan payment term up to 15 years for REEL and reduced their interest rate by 4.6% on average. ▪ *Percentage of respondents who felt they would have been likely to qualify*	▪ Nearly 100% of lender's GGH loans had a lower interest rate and lower estimated monthly payment than their signature loan, 48% had a longer payback term ▪ There is a lack of other private, unsecured EE loans other than GGH loans ▪ *Percentage of respondents who felt they would have been likely to qualify for other financing:* Macro-loan – 97% Micro-loan – 70%	▪ Most macro-loan respondents felt they could qualify for other financing; however, they felt that the terms of other financing they qualified for would be less favorable. ▪ Micro-loan respondents were less likely to feel they could qualify for other financing (but still prominent). ▪ Macro-loan respondents were more likely than micro-loan respondents to say they would

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
	for other financing: 94% ▪ *Percentage of respondents who felt alternative financing they qualified for would have a higher monthly payment:* 75% ▪ *Percentage of respondents who would have done the same project if the monthly payment were higher:* 29%	▪ *Percentage of respondents who thought other financing they would qualify for would have a higher interest rate:* Macro-loan – 73% Micro-loan – 60% ▪ Among respondents who found another financing option they qualified for but did not use, almost none indicated the alternative option had a lower interest rate and few indicated it had a longer payback term. ▪ *Percentage of respondents who would have done the same project if the monthly payment were higher:* Macro-loan – 31% Micro-loan – 7%	have done the same exact project even if the monthly payments were higher.

Program Energy Savings			
Customer meter data provided by the utilities to conduct a consumption analysis and understand how much energy savings GGH produced, including electric and gas savings, taking account fuel shifting from gas to electric, per participant and overall	▪ *Total Electricity savings:* 63.7 MWh ▪ *Total Gas savings:* 1,262 therms	▪ *Per participant electricity savings:* 228 kWh ▪ *Per participant gas savings:* 25.5 therms ▪ *Total Electricity savings:* 556 MWh ▪ *Total Gas Savings:* 80,740 therms	▪ Program savings are mostly driven by macro-loans ▪ Per participant macro-loan electricity savings reduced from 5.4% to 3.0% ▪ Per participant macro-loan gas savings increased from 1.5% to 5.7%
Differences in energy savings achieved across subpopulations of interest, such as climate zone, loan size, loan recipient type (LMI), presence of solar generation, and presence of fuel substitution, provided participation levels and available data allow for such comparisons	▪ Not evaluated during REEL evaluation period	▪ LMI participants do not have differential savings. ▪ Loan size is positively associated with savings. ▪ Fuel substitution projects achieved deep gas savings and emission reduction ▪ The presence of solar generation is associated with greater savings ▪ HVAC measures led to higher energy savings than other measures ▪ Participants in climate zones with greater need for heating and cooling achieved higher savings and installed more HVAC measures.	▪ Fuel substitution, net metering, and project with HVAC measures produced the highest savings.

Metric	REEL Pilot Activity (July 2016 – June 2018)	GGH Program Activity (July 2018 – June 2023)	GGH Program Evaluation Assessment
Energy savings from other loan programs and comparing the Evaluation, Measurement, & Verification (EM&V) results to that of GGH	▪ Electricity savings per participant: 5.7% ▪ Gas savings per participant: 2.6%	▪ Electricity savings per participant: 3% ▪ Gas savings per participant: 12.8%	▪ Energy savings are in line with other evaluations of loan programs once differences in methodologies and measures are considered.
The influence of the program on customer decision-making and relative influence of financing and rebates, where applicable	▪ *Percentage of respondents unlikely to do home upgrade project products without financing: 38%* ▪ *Percentage of respondents who would have undertaken their project later or not at all without financing: 78%* ▪ *Percentage of respondents who were likely to have done something that cost the same if financing were not available: 50%* ▪ 4 of 6 respondents who also used a rebate felt the loan was more important than the rebate. ▪ 5 of 6 respondents who also used a rebate felt they needed both the loan and rebate or just the loan to be able to do their project	▪ *Percentage of respondents unlikely to do home upgrade project/purchase EE products without financing*: Macro-loan – 54% Micro-loan – 62% ▪ *Percentage of respondents who would have undertaken their project later or not at all without financing*: Macro-loan – 70% Micro-loan – 69% ▪ *Percentage of respondents who were likely to have done something that cost less if financing were not available*: Macro-loan – 53% Micro-loan – 66% ▪ *Percentage of respondents who found GGH influential on their decision-making*: Macro-loan - 90% Micro-loan – 100% ▪ 27 of 29 macro-loan respondents and 5 of 5 micro-loan respondents who also used a rebate felt financing was more or equally important than the rebate ▪ 27 of 29 macro-loan respondents and 5 of 5 micro-loan respondents who also used a rebate felt they needed both the loan and rebate or just the loan to be able to do their project.	▪ Financing is influential in customer decision-making ▪ The availability of financing was vital in the decision-making of a large proportion of respondents, more so than during the pilot period. ▪ The availability of financing played a major role in the timing of doing a home upgrade or purchasing EE equipment for a large proportion of respondents. ▪ Respondents who used a rebate in addition to financing felt financing was more or equally important to the rebate. ▪ Respondents who used a rebate in addition to financing needed the financing to complete their project/purchase equipment.
Source energy and CO_2 emission reductions from financed projects (including fuel substitution measures)	▪ Not evaluated	▪ Emissions reduction of 576 Metric Tonnes of CO_2	▪ The program succeeded in achieving deep gas savings, which typically reduces more emissions than electricity savings.

Note: Metrics outlined in Resolution E-4900 are delineated with **emphasized text.**

8.2 PROGRAM PERFORMANCE METRIC CONSIDERATIONS

The metrics outlined in Resolution E-4900 cover a robust group of research objectives that directly align with the GGH Program's goals of growing in size, leveraging private capital/support, reaching underserved customers, and producing energy savings. The evaluation team assessed whether the metrics in Resolution E-4900 remain valid indicators for

assessing the progress towards achieving the Program goals in light of the research activities undertaken in this evaluation.

First, we note that the Resolution does not include metrics to measure the customer experience, which is vital to continually increasing participation. To gather data for new metrics to track, the evaluation team added participant experience questions to the participant survey. Section 8.2.1 documents and discusses customer experience with the GGH program. Second, we offer considerations for modifying existing Resolution E-4900 performance metrics to better track progress towards Program goals given the evolving program context in Table 59.

Table 59. Considerations for Modification of Resolution E-4900 Performance Metrics

| Goal	Metric	CPUC Stated Metric Purpose	Evaluator Considerations
The financing tool is **scalable**	Number of loans made by the Pilot, with breakdown by: ▪ Growth in the number of loans on a month-by-month basis over the lifetime of the Pilot ▪ Total amount of financing generated by the Pilot ▪ Geographic distribution of loans, including ability to reach new regions of the state especially those with large underserved populations	Assessment of whether the GGH program can reach a significant and growing number of Californians	▪ The Program is operating at a larger scale since the passage of Resolution E-5072. As such, June 2020-June 2021 can serve as a better baseline. ▪ Separate tracking for micro- and macro-loan activity.
The financing tool is **leveraged** by private capital and support	Private capital participation in the Pilot, as measured by: ▪ Number of financial institutions participating in the pilot, and types of financial institutions participating (such as credit unions) ▪ Amount of private capital attracted	Assessment of whether these financing tools can become partially or entirely self-supporting, that can reach a point where they depend less or do not depend on the use of ratepayer funds.	▪ Tracking the amount of private capital leveraged per ratepayer-funded i) credit enhancement dollar, ii) credit enhancement dollar expensed, and iii) total ratepayer expenses will help assess self-financing capability of the Program. ▪ Tracking the share of inactive contractors and/or concentration ratio of contractor activity will CPUC and CAEATFA keep pulse of key source of program success: contractor engagement.
The financing tool reaches underserved Californians who would not otherwise have participated in EE upgrades	Analysis of participants in the Pilot, according to: ▪ Credit scores of loan participants reported on an aggregate basis ▪ Length of time allowed for applicants to pay back the loans ▪ Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, area median income, or other poverty statistics ▪ Whether participants would have qualified for existing private energy efficiency loan programs at interest rates and terms that they can afford or would accept	Assess whether i) participants would have taken loans from elsewhere for the same upgrades, ii) hard-to-reach communities were reached.	▪ Separate tracking for micro- and macro-loan activity.

Goal	Metric	CPUC Stated Metric Purpose	Evaluator Considerations
The financing tool produces **energy savings**	Energy savings that resulted, as measured: ▪ Through customer meter data provided by the utilities via Energy Division data request (customer privacy must be maintained) ▪ Through Normalized Metered Energy Consumption (NMEC) analysis, as an option ▪ Comparison of energy savings from other loan programs to that of the pilot, if possible to assess through Evaluation, Measurement, & Verification studies (EM&V)	Assess whether the Program saves energy.	▪ Incorporate GHG savings as a de-jure program goal. ▪ Improve tracking of fuel substituting and fuel switching measures. ▪ Significant differences between NMEC based results and methods using a control group. In line with previous findings, NMEC likely overestimates savings.[38]

8.2.1 PARTICIPANT EXPERIENCE METRICS

The participant survey explored overall satisfaction with the GGH Program and individual program components. As seen in Figure 18, most respondents were highly satisfied with the overall program and individual program components. Notably, 99% of macro-loan respondents and 98% of micro-loan respondents were at least "somewhat" satisfied with the Program overall. The only Program feature where macro-loan and micro-loan respondents differed significantly was the interest rate. Macro-loan respondents were significantly more likely than micro-loan respondents to indicate they were "very" satisfied with the interest rate (78% vs. 65%).

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[38] "CPUC EM&V Group NMEC Accuracy Assessment Results Presentation." Demand Side Analytics. 2021.

Figure 18. Participant Satisfaction with GGH Program Experience
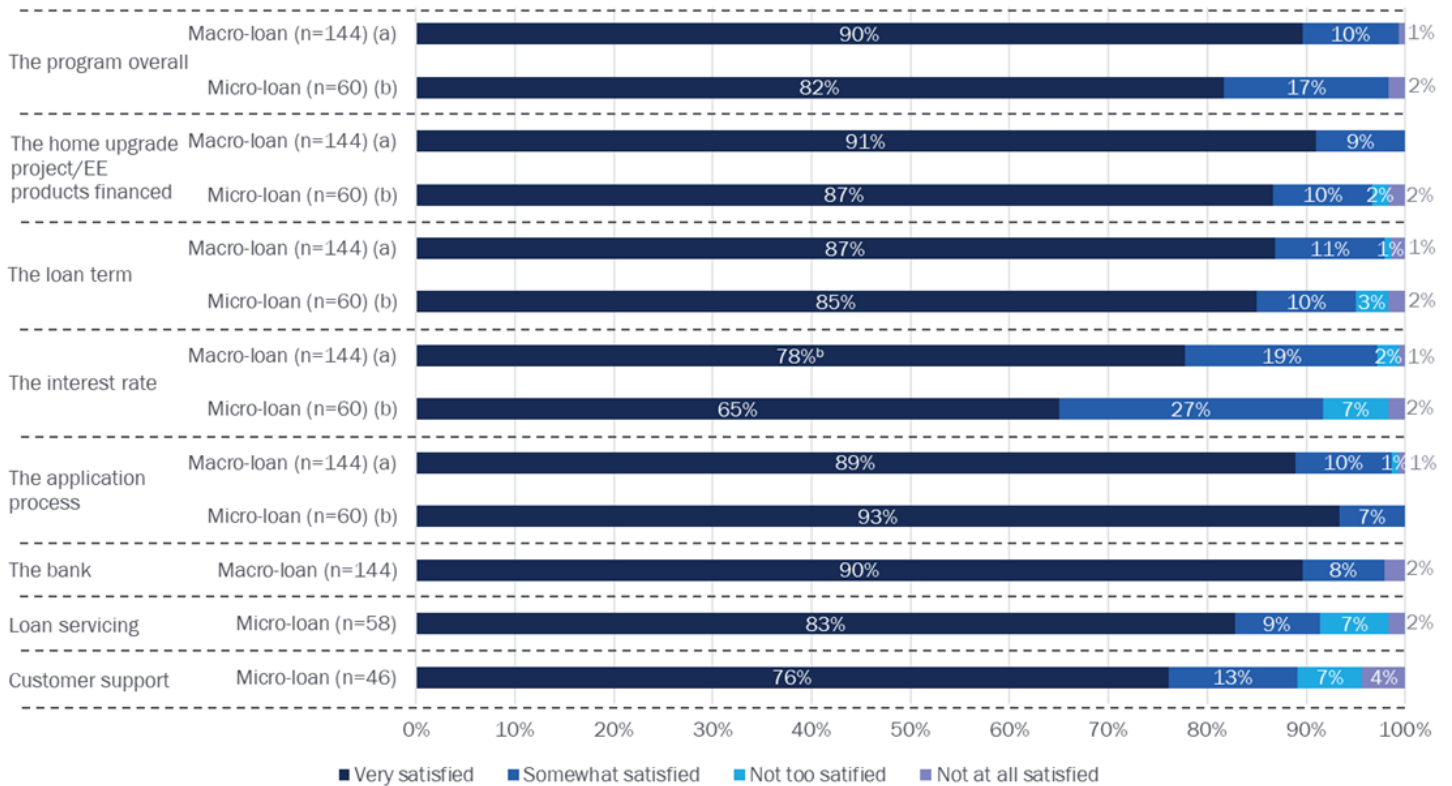
Source: Macro-loan and Micro-loan participant surveys
Question: Thinking about your [GoGreen Home/Eco Financing] Loan experience, how satisfied are you with the following?
Note: Results are based on two-sided tests. a/b indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab

The team asked respondents how likely they are to recommend the GGH Program to others. As seen in Table 60, most respondents indicated they were "very" likely to recommend the program to others. There were no significant differences by loan type; however, among macro-loan respondents, those who installed a fuel substitution measure were more likely than those who did not to indicate they were "very" likely to recommend the GGH Program in the future.

Table 60. Likelihood of Recommending GGH to Others

| Likelihood of Recommending GGH/Eco Financing | Macro-loan | | | Micro-loan (n=60) (d) |
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
Very likely	94%[b]	81%	87%	80%
Somewhat likely	6%	18%[a]	13%	17%
Somewhat unlikely	0%	0%	0%	2%
Very unlikely	0%	1%	1%	2%

Source: Macro-loan and Micro-loan participant surveys
Question: How likely are you to recommend [GoGreen Home/Eco] Financing to others in the future?
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

The team asked respondents who were less than "very" satisfied with the GGH Program overall or were less than "very" likely to recommend the GGH Program in the future what recommendations they had to improve the program moving forward. The team batched respondents' text responses into categories. Of 26 macro-loan respondents, 10 indicated they had no recommendations. Common recommendations included decreasing the interest rate (six respondents), making the application process easier (five respondents), and adding eligible measures (three respondents). Of the 14 micro-loan respondents, three had no recommendations. Common recommendations included improving the billing/payment process (six respondents) and lowering the interest rate (four respondents).

In the participant surveys, the team asked respondents what their largest motivation was for completing a home upgrade project or purchasing energy-efficient equipment. As seen in Table 61, the most common responses for both macro-loan and micro-loan respondents were the need to fix/replace broken equipment and the desire to reduce energy bills. Notably, whereas macro-loan respondents' responses were divided more evenly between response options, 50% of micro-loan respondents indicated the need to replace/fix broken equipment. Additionally, micro-loan respondents were significantly more likely to indicate they had broken equipment in their homes than macro-loan respondents (50% vs. 33%). Among macro-loan respondents, those who installed a fuel substitution measure were significantly more likely to select reducing their energy bill than those who did not install a fuel substitution measure. Those who did not install a fuel substitution measure were significantly more likely than those who did install a fuel substitution measure to indicate their property was uncomfortable (22% vs. 11%) or they needed to make repairs to their home's structure (9% vs. 2%).

Table 61. Biggest Motivator for Completing a Home Upgrade or Purchasing Energy-Efficient Equipment

Primary Motivation	Macro-loan			Micro-loan (n=60) (d)
	Fuel Substitution (n=65) (a)	No Fuel Substitution (n=79) (b)	Total (n=144) (c)	
I had broken equipment in my home that needed to be fixed/replaced	29%	37%	33%	50%[c]
I wanted to reduce my energy bills	31%[b]	16%	23%	32%
My property was uncomfortable, too cold, or too hot	11%	22%[a]	17%	0%
I wanted the property to be more environmentally friendly	23%	13%	17%	12%
I needed to make repairs to my home's structure, such as the roof, flooring, or foundation	2%	9%[a]	6%	0%
I wanted the latest technology for my home	5%	1%	3%	2%
I wanted to improve the property in preparation for selling it	0%	0%	0%	0%
I wanted to improve the property in preparation for renting it	0%	0%	0%	0%
None of these/other reason	0%	1%	1%	5%[c]
Don't know	0%	1%	1%	0%

Source: Macro-loan and Micro-loan participant surveys
Question: Of the listed reasons why you may have chosen to purchase energy savings products, which reason was the MOST IMPORTANT.
Note: Results are based on two-sided tests. a/b/c/d indicates significant differences at a 90% confidence level and 0.10 alpha between the following tests: ab, cd

APPENDIX A. DETAILED IMPACT ANALYSIS METHODOLOGY

The GGH Program provided two types of loans: macro-loans and micro-loans. The average macro-loan amount was $18,253, typically installing EEEMs expected to induce deep savings. On the other hand, micro-loans averaged $1,498 and were used to install appliances. For macro-loans, the evaluation team used a consumption analysis approach to estimate annual first-year energy savings, following the methodology detailed below. Measures provided through micro-loans are expected to lead to a much smaller reduction in energy usage. Under these scenarios, consumption analysis will likely fail to detect savings. As such, we estimated the energy impact of micro-loans through a deemed savings approach detailed in Deemed Savings Analysis (for Micro-Loans).

CONSUMPTION ANALYSIS (FOR MACRO-LOANS)

Opinion Dynamics conducted a consumption analysis using AMI data to determine the overall weather-normalized electric and gas energy savings for participants who installed EEEMs using macro-loans. Consumption analysis is a statistical analysis of energy consumption recorded in utility interval data. Because interval data reflects whole-building energy use, the method is well suited for studying the combined impact of a mix of energy efficiency measures, as well as behavioral changes, at the household level. The evaluation team estimated total program savings by examining variations among participants' daily electricity consumption in the pre- and post-program periods while controlling for weather, seasonal, and other factors. As part of the consumption analysis, the evaluation team pursued two distinct pathways:

- **Pooled modeling pathway.** This pathway aimed at developing robust estimates of gas and electric energy savings and involved statistical modeling of the time series consumption data across a panel of program participants. The modeling efforts included linear fixed effects regression modeling of consumption data pre- and post-participation, controlling for weather, seasonal, and other factors. We used a rolling comparison group to control for exogenous and non-routine changes in energy consumption unrelated to the financed measures.
- **Individual modeling pathway.** This pathway aimed to understand and explore energy savings patterns and drivers of energy savings. This analysis leveraged widely accepted CalTRACK methodologies and code base. It included statistical modeling of each participant's pre- and post-period electric and gas consumption data, thus developing energy savings estimates for each participant.

To support the two modeling efforts, the evaluation team performed the following steps:

- Participant data cleaning and preparation
- Consumption data cleaning and preparation
- Weather data preparation
- Model specification and validation
- Weather normalization of energy savings

We describe each of these steps in the sections below.

PARTICIPANT DATA CLEANING AND PREPARATION

We leveraged participant data from 2018 to 2023 across the four IOUs (PG&E, SCE, SoCalGas, and SDG&E). The participant population consisted of 2,353 electric accounts and 3,072 gas accounts. The participant data underwent thorough cleaning and organization, including classification of the various measures into end uses, exploration of

missing and incomplete records, and validation of participant eligibility. We checked for participants without participation dates and those with participation dates outside of the program period under evaluation and carefully explored available participation dates to identify those that best reflect the program treatment start. This step is particularly important to categorize consumption data into pre- or post-intervention periods accurately. To that end, we used P002-SCOPE OF WORK CERTIFICATION DATE (CD) date field as the field of record best reflective of the financed measure installation. To further avoid the treatment effect appearing in the pre-period or not appearing right away in the post-period, and therefore threatening to bias the savings estimates, the team applied a deadband period of 60 days before and after the P002-SCOPE OF WORK CERTIFICATION DATE (CD) date.

Finally, we identified and removed 113 electric and 111 gas participants whose account numbers did not merge with the consumption data.

CONSUMPTION DATA CLEANING AND PREPARATION

We obtained hourly electric and a mix of hourly and daily gas consumption data. Each dataset underwent distinct data cleaning steps.

ELECTRIC CONSUMPTION DATA CLEANING

For the electric consumption data, the team performed the following steps using hourly data:

- **Explored and removed duplicate records:** We explored and removed exact duplicates. We also explored duplicate intervals with differing usage values and combined them through averaging usage.

- **Explored missing data:** We explored missing usage values and timestamps and flagged days with an incomplete set of hourly data.

- **Explored outliers:** We explored outlier usage at the account as well as interval level and flagged outlier observations and participants for exploration and potential removal from the modeling dataset.

- **Explored and removed zero usage values:** Zero usage values for electricity consumption are unlikely. As such, the team identified and removed intervals with zero usage.

- **Identified and removed participants with changes in solar (net metering) status.** Participants starting or stopping solar generation during pre- or post-period present a large non-routine behavior that may be challenging to control for as part of the analysis. As part of the data cleaning process, the team identified, flagged and dropped participants whose solar generation status had changed in either the pre- or post-participation period.

Following these cleaning steps, we aggregated the hourly data to the daily level by summing usage across all the hours of the day. In cases where 12 or more hours were missing from any given day, we dropped that day from the analysis. In cases where at least 12 but less than 24 hours were present, we imputed average consumption from the existing hours for the missing hours and retained that day in the analysis.

Following data aggregation to the daily level, we checked the data for pre- and post-period sufficiency as well as the presence of adequate weather data coverage. More specifically, we dropped participants without at least 70% of the year of pre- and post-period consumption data coverage. We also dropped participants for whom we have been unable to obtain weather data. Table 62 summarizes the drops made as part of each cleaning step.

Table 62. Summary of Electric Consumption Data Cleaning Results

Drop Reason	Accounts Remaining	Percent of Accounts Remaining
Initial count	2,240	100%
Duplicate records	2,240	100%
Missing data	2,240	100%
Outlier values	2,240	100%
Zero usage values	2,240	100%
Participants with changes in solar status	1,792	80%
Pre- and post-period data sufficiency	1,578	70%
Missing weather data	1,470	66%

GAS CONSUMPTION DATA CLEANING

For the gas consumption data, we performed the following steps using daily data:[39]

- **Explored and removed duplicate records:** We explored and removed exact duplicates. We also explored duplicate intervals with differing usage values and combined them through averaging usage.

- **Explored missing data**: We explored missing usage values and timestamps and flagged days with an incomplete set of hourly data.

- **Explored negative usage values.** We explored the presence of negative usage values. No negative usage values were present in the data.

- **Explored outliers:** We explored outlier usage at the account as well as interval level and flagged outlier observations and participants for exploration and potential removal from the modeling dataset.

- **Explored and removed participants with zero total gas usage:** While zero usage values can occur for gas consumption, especially in the summer months, overall usage of zero for the entire consumption period is unreasonable. As such, we identified and removed participants with overall zero gas usage.

- **Explored pre- and post-period data sufficiency.** We checked the data for pre- and post-period sufficiency. More specifically, we dropped participants without at least 70% of the year of pre- and post-period consumption data coverage.

- **Explored pre- and post-period heating period data sufficiency.** In addition to ensuring sufficient data for the pre- and post-period, we checked the data for the winter season data sufficiency in the pre- and post-period. Given that most consumption occurs in the winter months, it is important to ensure data sufficiency during that period. As such, we dropped participants who did not have at least 75% of the winter season (months of December, January, and February) in the pre- and post-period.

- **Explored missing weather data.** We identified and dropped participants for whom we could not obtain weather data.

- Following consumption data cleaning, we retained 66% of electric participants and 70% of gas participants.

Table 63 summarizes the drops made as part of each cleaning step.

---

[39] The hourly data for SoCalGas was aggregated to the daily level prior to performing the cleaning steps. The hourly data was mostly complete and required limited imputations of the missing intervals prior to rolling the data up to the daily level.

Table 63. Summary of Gas Consumption Data Cleaning Results

Drop Reason	Accounts Remaining	Percent of Accounts Remaining
Initial count	2,961	100%
Duplicate records	2,961	100%
Missing data	2,961	100%
Negative usage values	2,961	100%
Outlier values	2,959	99%
Zero total usage	2,950	99%
Pre- and post-period data sufficiency	2,243	76%
Missing weather data	2,086	70%

WEATHER DATA PREPARATION

To include weather patterns in our modeling efforts, we used daily weather data from numerous weather stations across the state, utilizing the site closest to each participant's geographic location. By using multiple sites, we increased the accuracy of the weather data associated with each account. We obtained these data from the National Climatic Data Center (NCDC).

The daily data are based on hourly average temperature readings from each day. For the pooled modeling efforts, we calculated CDD and HDD for each day (in the analysis based on average daily temperatures, using the same formula used in weather forecasting).[40] We merged daily weather data into the consumption dataset.

We relied on CZ2010 weather normal data when developing weather-normalized estimates of energy savings.[41]

MODEL SPECIFICATION AND VALIDATION

INDIVIDUAL MODEL SPECIFICATION AND VALIDATION

We leveraged daily CalTRACK methods and associated code base to develop individual participant energy savings. CalTRACK methods are a set of methods for estimating avoided energy use related to the implementation of one or more energy efficiency measures. CalTRACK methods yield whole-building site-level savings outputs. CalTRACK models are founded in literature and draw upon best practices developed as part of the PRISM, Uniform Methods Project for Whole Home Building Analysis and California Evaluation Project. The modeling process includes modeling sites as base load, heating load, and cooling load, with heating and cooling load assumed to have a linear relationship with heating

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[40] A "degree-day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65°F (HDD) and 75°F (CDD). (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by two.) If the mean temperature for the day is five degrees higher than 75°F, then there have been five cooling degree-days. On the other hand, if the weather has been cool, and the mean temperature is, say, 55°F, then there have been 10 heating degree-days (65 minus 55). "Degree Days," National Weather Service, https://www.weather.gov/ffc/degdays.

[41] CZ2010 typical year files cover the period from 1998 to 2009, constituting a 12-year record. These files served as the standard weather data for Title 24 compliance calculations in California from 2010 to 2022. The collection includes 86 CZ2010 files, each representing a distinct weather station in California. These files are structured to incorporate statewide "typical months" as mandated by the California Energy Commission. Weather User Guide.pdf (calmac.org)

and cooling demand, as approximated by heating and cooling degree days, beyond particular heating and cooling (for electric consumption data only) balance points. Models for each participant are fit to baseline data in the 365 days immediately prior to the intervention start date. The modeling process involves the following steps:

- Select and qualify balance poring for candidate models for each period and meter. As part of this step, we deployed and developed the optimal balance point for each degree day covariate using CalTRACK grid search methodology.

- Compute design matrices. Using average usage per day as the dependent variable and CDDs and HDDs as independent variables, we computed the design matrix for each model.

- Fit and qualify all candidate models. We fit daily consumption data using ordinary least squares using models with HDD and CDD, HDD only, CDD only and intercept only.

- Select the best candidate model. Models with positive parameter estimates and the highest adjusted R-squared were selected as the final model for each participant.

Following the modeling process, we further scrutinized the selected models across multiple model fit statistics, including CVRMSE and R-squared of the best-fitting models. We dropped participants from further analysis in cases where the final models had R-squared values of less than 35% and a CVRMSE of less than 40%.

POOLED MODEL SPECIFICATION AND VALIDATION

We performed pooled modeling using daily consumption data. We specified an LFER model in a pre-/post-design that incorporates weather and interaction terms that show the effect of weather in the post-installation period. The fixed effect for the model is set at the account level, which allows us to control for all household factors that do not vary over time. In the process of determining the appropriate model for the analysis, we specified a range of models, from simple pre-post to more complex models incorporating a variety of terms and controls.

We judged our final models on several criteria. Primarily, we aimed to use a model that explained as much about changes in the dependent variable as possible. The most direct measure of this is the adjusted R-squared, which gives an estimate of how much the model explains the difference between post-period usage and the baseline. We also compared the Akaike Information Criterion (AIC) values of each model specification within the same sample. The AIC provides a measure of relative quality between models; a lower value indicates a relatively more efficient model. This method inherently incorporates explained variation as well as how many variables we use to achieve that level.

We specified electric models separately for participants with and without solar. In addition, we specified distinct models by DAC, LMI, and fuel substitution status. Finally, we developed separate models by IOU. On the gas side, in addition to the overall program-level model, we specified distinct models by DAC, LMI, and fuel substitution status, as well as by IOU. Equation 1 and Equation 2 contain the final model specifications.

Equation 1. Final Electric Model Specification

$$
\begin{aligned}
kWh_{it} = {} & \alpha_i + \sum_{t=1}^{12} \beta_{month} month_t + \beta_{CDD} CDD_{it} + \beta_{HDD} HDD_{it} + \beta_{Post} Post_{it} + \beta_{Post\ HVAC} Post_{it} * HVAC_i \\
& + \beta_{Post\ CDD\ HVAC} Post_{it} * CDD_{it} * HVAC_i + \beta_{Post\ HDD\ HVAC} Post_{it} * HDD_{it} \\
& * HVAC_i + \beta_{Post\ BE} Post_{it} * BE_i + \beta_{Post\ CDD\ BE} Post_{it} * CDD_{it} * BE_i + \beta_{Post\ HDD\ BE} Post_{it} * HDD_{it} \\
& * BE_i + \varepsilon_{it}
\end{aligned}
$$

Where:

- kWh_{it} = Consumption (kWh) for account i at time t (all 24 hours)

- α_i = Account-specific intercept for account i
- $month_t$ = Set of 12 indicator variables for the month of the year; January is the reference month
- CDD_{it} = Daily cooling degree days for account i at time t
- HDD_{it} = Daily heating degree days for account i at time t
- $post_{it}$ = Indicator variable for the post-participation period (coded "0" in the pre-participation period, coded "1" in the post-participation period)
- $HVAC_i$ = Indicator variable for HVAC measures received after participating in the program (coded "0" if not received, coded "1" if received)
- $Post\ HVAC_i$ = HVAC measure indicator interacted with the post-participation period
- $Post\ CDD_{it}\ HVAC_i$ = HVAC measure indicator interacted with the post-participation period and daily cooling degree days
- $Post\ HDD_{it}\ HVAC_i$ = HVAC measure indicator interacted with the post-participation period and daily heating degree days
- BE_i = Indicator variable for Building Envelope measures received after participating in the program (coded "0" if not received, coded "1" if received)
- $Post\ BE_i$ = BE measure indicator interacted with the post-participation period
- $Post\ CDD_{it}\ BE_i$ = BE measure indicator interacted with the post-participation period and daily cooling degree days
- $Post\ HDD_{it}\ BE_i$ = BE measure indicator interacted with the post-participation period and daily heating degree days
- β_x = Model coefficients
- ε_{it} = Error term

Equation 2. Final Gas Model Specification

$$therms_{it} = \alpha_i + \sum_{t=1}^{12} \beta_{month} month_t + \beta_{HDD} HDD_{it} + \beta_{Post}\ Post_{it} + \beta_{Post\ HDD} Post_{it} * HDD_{it} + \varepsilon_{it}$$

Where:

- $therms_{it}$ = Consumption (Therms) for household i at time t (all 24 hours)
- α_i = Account--specific intercept for account i
- $month_t$ = Set of 12 indicator variables for the month of the year; January is the reference month
- HDD_{it} = Daily heating degree days for account i at time t
- $post_{it}$ = Indicator variable for the post-participation period (coded "0" in the pre-participation period, coded "1" in the post-participation period)
- $Post\ HDD_{it}$ = Daily heating degree days interacted with the post-participation period
- β_x = Model coefficients
- ε_{it} = Error term

The final model summaries are presented in Table 64 and Table 65

Table 64. Final Electric Model Summaries

Model Type	Modeled Participants	Modeled Baseline	Modeled Savings	Standard Error	Statistically Significant Savings	Adjusted R-Squared
Participants with net metering	266	12.28	1.61	0.57	Yes	0.52
Participants without net metering	1204	23.24	0.31	0.18	Yes	0.67
PG&E	775	23.68	0.53	0.24	Yes	0.67
SCE	393	22.90	-0.11	0.26	No	0.66
SDG&E	36	17.79	-0.14	0.70	No	0.88
LMI	692	21.74	0.17	0.24	No	0.65
Non-LMI	512	25.27	0.49	0.26	Yes	0.69
DAC	233	22.58	0.28	0.35	No	0.64
Non-DAC	737	22.74	0.19	0.24	No	0.67
Known fuel substitution	122	23.50	-1.51	0.83	Yes	0.58
No known fuel substitution	1082	23.20	0.49	0.17	Yes	0.68

Table 65. Final Gas Model Summaries

Model Type	Modeled Participants	Modeled Baseline	Modeled Savings	Standard Error	Statistically Significant Savings	Adjusted R-Squared
All	2086	1.23	0.07	0.01	Yes	0.51
PG&E	1410	1.24	0.09	0.01	Yes	0.53
SoCalGas	634	1.24	0.04	0.02	Yes	0.48
SDG&E	42	0.85	-0.05	0.04	No	0.42
LMI	1189	1.17	0.07	0.02	Yes	0.51
Non-LMI	897	1.30	0.08	0.02	Yes	0.51
DAC	368	1.21	0.03	0.03	No	0.53
Non-DAC	1321	1.23	0.09	0.02	Yes	0.50
Known fuel substitution	202	1.25	0.57	0.04	Yes	0.47
No Known fuel substitution	1884	1.23	0.02	0.01	No	0.52

DEEMED SAVINGS ANALYSIS (FOR MICRO-LOANS)

The evaluation team applied the following method(s) to arrive at the deemed savings for EEEMs installed using micro-loans, as presented in Table 66.

- *Identify deemed savings source.* The evaluation team referenced the California Technical Forum (Cal TF) electronic technical reference manual (eTRM). The eTRM is an online repository for all statewide prescriptive measures and provides deemed energy savings for variations of project and measure specifics, 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 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)

  - Measure-specific factors that informed the average deemed savings, included the following:

    - Clothes Dryer: Size (standard and compact); ENERGY STAR® model.

    - Clothes Washer: Configuration (top loading and front loading); Offering (not common area); ENERGY STAR model.

    - Refrigerator: Size (standard); Configuration (bottom freezer, top freezer, side-by-side); ENERGY STAR model.

Table 66. Micro-Loan Deemed Savings

Measure	Units	Per Measure Savings		
		kWh	kW	Therms
Smart Thermostat	Thermostats	152.43	N/A	3.58
Clothes Washer	Washers	62.67	0.010	3.96
Clothes Dryer (Electric)	Dryers	57.73	0.014	(0.49)
Refrigerator	Refrigerators	47.87	N/A	(0.87)
Dishwasher	Dishwashers	13.35	0.003	2.63
Induction Range or Cooktop	Ranges	(219.00)	N/A	14.30
Clothes Dryer (Gas)	Dryers	(0.95)	N/A	3.32
Convection Gas Oven	Ovens	N/A	N/A	2.53

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.*
Source: California Technical Forum (Cal TF) Electronic Technical Reference Manual (eTRM).

EMISSIONS REDUCTION METHODOLOGY

Reductions in emissions were calculated by following procedure 2.2 of the CPUC Fuel Substitution Calculator v2. We estimated the emissions reductions from electricity savings by applying the annual conversion factors (tCO_2/MWh) presented in

Table 67 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 67. Annual Factors and Share of Total Electricity Savings, 2018–2024

Year	Annual Factor	Share of Electricity Savings in Year (EEEMs Installed Using Macro-loans)[a]	Share of Electricity Savings in Year (EEEMs Installed Using Micro-loans) [b]
2018	0.202	2%	0%
2019	0.198	8%	0%
2020	0.193	11%	0%
2021	0.189	18%	5%
2022	0.184	26%	76%
2023	0.171	31%	15%
2024	0.178	4%	3%

[a] Called Share of Savings in t (Macro) in equations
[b] Called Share of Savings in t (Micro) in equations

Other key parameters are presented in Table 68.

Table 68. Key Parameters Used in GHG Emission Reduction Calculation

Name	Value	Units/Description
Ton to Tonne	1.10231	short tons/metric tonne
MMBtu to Therms	0.1	MMBtu/therm
Btu to Therm	100000	Btu/therm
Btu to kWh	3413	Btu/kWh
Natural Gas Carbon Content	0.0585	short tons/MMBtu
Natural Gas Carbon Content	0.005307037	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 EEEMs installed using macro-loans, $Emissions\ Reductions\ (Macro)_t$, is given by:

Equation 3. Year-Wise Emission Reduction from EEEMs Installed Using Macro-loans

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

The emissions reduction in year t, from electricity savings resulting from EEEMs installed using micro-loans, $Emissions\ Reductions\ (Macro)_t$, is given by:

Equation 4. Year-wise emission reduction from EEEMs installed using macro-loans

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

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

Equation 5. GHG Reductions from Electricity Savings of the Program

$$\sum_{t=2018}^{2024} Emissions\ Reductions\ (Macro)_t + Emissions\ Reductions\ (Macro)_t$$

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 is the sum of GHG reductions from electricity savings and gas savings.

PARTICIPANT SURVEYS

SAMPLING AND COMPLETES

In January 2024, the evaluation team fielded two surveys with GGH Program participants, one targeted at macro-loan borrowers and one targeted at micro-loan borrowers. The primary goals of the surveys were to understand the influence of the GGH/Eco Financing loan on participants' decisions to complete home upgrades/install EE equipment (as well the influence of GGH/Eco Financing relative to other sources of funding), collect information about their households, and understand any non-routine adjustments participants made to their homes or behaviors after the home upgrade/equipment installation.

Tracking data for the GGH Program included records for 3,320 macro-loans and 567 micro-loans distributed during the evaluation period. There were no cases of a single address receiving both a macro-loan and micro-loan in the sample frame; however, the team identified duplicate addresses that received multiple of the same type of loan at different times. The team removed 36 duplicate addresses from the sample frame, keeping the more recent record. Given that the outreach strategy was email only, the team removed 966 records without an email on file. The final sample frame included 2,325 macro-loans and 560 micro-loans.

The evaluation team sent email outreach to a random sample of 1,198 macro-loan borrowers, including 388 who installed a fuel substitution measure and 810 who did not install a fuel substitution measure. The macro-loan survey achieved 144 completes and a response rate of 13%. The micro-loan survey was conducted as a census, with all 560 unique micro-loan participants receiving an invitation. The micro-loan survey achieved 60 completes and a response rate of 12%.[42]

Table 69 details the sample frame, sample contacted, and final completes for both the macro-loan and micro-loan survey efforts.

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[42] The evaluation team used the Response Rate 3 (RR3) method recommended by American Association for Public Opinion Research (AAPOR). RR3 excludes partially completed survey from the numerator and includes estimated number of eligible sample in the denominator.

Table 69. GGH Participant Survey Sample Frame

	Macro-loan			Micro-loan		
	Sample Frame	Sample	Completes	Sample Frame	Sample	Completes
Fuel Substitution	388	388	65	NA	NA	NA
No Fuel Substitution	1,937	810	79	550	550	NA
Total	**2,325**	**1,198**	**144**	**550**	**550**	**60**

DATA CLEANING AND ANALYSIS

The team cleaned the survey data outputs to facilitate analysis, standardizing variables and categorizing open-ended responses when appropriate. We then generated descriptive statistics for all questions. We completed two-sided statistical tests on key survey questions to compare (1) macro-loan respondents to micro-loan respondents and (2) macro-loan respondents who installed a fuel substitution measure as part of their GGH-financed project to macro-loan respondents who did not install a fuel substitution measure. We completed statistical tests at a 90% confidence level with a 0.10 alpha. We note statistically significant relationships in tables/figures via superscripts and in supporting text.

APPENDIX B.   RESOLUTION E-4900 METRICS

In 2017, the CPUC established specific metrics for evaluating the success of the EE Financing Pilots, as shown in Table 70.

Table 70. EE Financing Pilot Metrics

Goal	Metric	CPUC Comments
The financing tool is **scalable**	Number of loans made by the Pilot, with breakdown by: ▪ Growth in the number of loans on a month-by-month basis over the lifetime of the Pilot ▪ Total amount of financing generated by the Pilot ▪ Geographic distribution of loans, including the ability to reach new regions of the state, especially those with large underserved populations	Data should be presented to show whether these financing tools can reach a significant and growing number of Californians
The financing tool is **leveraged** by private capital and support	Private capital participation in the Pilot, as measured by: ▪ Number of financial institutions participating in the Pilot and types of financial institutions participating (such as credit unions) ▪ Amount of private capital attracted	Data should be presented to indicate whether these financing tools can become partially or entirely self-supporting (i.e., can reach a point where they depend less or do not depend on the use of ratepayer funds)
The financing tool **reaches underserved Californians** who would not otherwise have participated in EE upgrades	Analysis of participants in the Pilot, according to: ▪ Credit scores of loan participants reported on an aggregate basis ▪ Length of time allowed for applicants to pay back the loans ▪ Percentage of participants deemed "underserved" as measured through CalEnviroScreen data, AMI, or other poverty statistics ▪ Whether participants would have qualified for existing private energy efficiency loan programs at interest rates and terms that they can afford or would accept	The "counterfactual" of whether participants would have taken loans from elsewhere for the same upgrades is difficult to demonstrate, but best efforts should be made to provide data showing that hard-to-reach communities were reached. Analysis done by EM&V contractors can also be consulted. Lower-income participants may prefer longer loan payback periods, so the length of time allowed for repayment may offer a proxy for the ability to reach low-income communities
The financing tool produces **energy savings**	Energy savings that resulted, as measured: ▪ Through customer meter data provided by the utilities via Energy Division data request (customer privacy must be maintained) ▪ Through Normalized Metered Energy Consumption (NMEC) analysis, as an option ▪ Comparison of energy savings from other loan programs to that of the pilot, if possible, to assess through EM&V studies	NMEC analysis has not previously been applied to the analysis of financing pilots, and is considered an option here to be used if it can add to the understanding of the results of the pilots

Source: CPUC Resolution E-4900. December 18, 2018.

APPENDIX C. ACRONYMS, ABBREVIATIONS, AND FINANCE TERMS

Table 71. Acronyms, Abbreviations, and Financing Terms

Abbreviation/Acronym/Term	Definition
AMI	Average median income: the midpoint of an area's income distribution
APR	Annual percentage rate: a measure of interest rate plus additional fees charged with the loan
Bridge funding	When a borrower uses financing with the intention of paying the loan back very quickly
CalEPA	California Environmental Protection Agency
EE	Energy efficiency
EM&V	Evaluation, measurement, and verification
Evaluation period	The period covered by the new research detailed in this report: July 2018–June 2023
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CalEnviroScreen	Tool that identifies communities disproportionately burdened by multiple sources of pollution and socioeconomic stressors
CPUC	California Public Utilities Commission
Credit-challenged	Borrowers with a FICO 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
DTI ratio	Debt-to-income ratio:- monthly debt payments divided by your gross monthly income
Default	Borrower fails to make required interest or principal repayments on a debt
EEEM	Eligible energy efficiency measure
FFIEC	Federal Financial Institutions Examination Council
FICO score	Fair, Isacc and Company score, i.e., credit score
GGH Program	GoGreen Home Financing Program
IOU	Investor-owned utility
LLR	Loan loss reserve: ratepayer funds set aside as an allowance for potential uncollected loans and loan payments
LMI	Low-to- Moderate-Income: defined by the GGH Program as census tracts in which the tract median family income does not exceed 120% of the area median family income
Pilot period	The period covered by the previous evaluation of the REEL Pilot: July 2016–June 2018
Private capital	Investment in assets not available on public markets
POU	Publicly owned utility
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
Signature loan	Otherwise applicable loan terms absent GGH Program given borrower characteristics
SoCalGas	Southern California Gas

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