

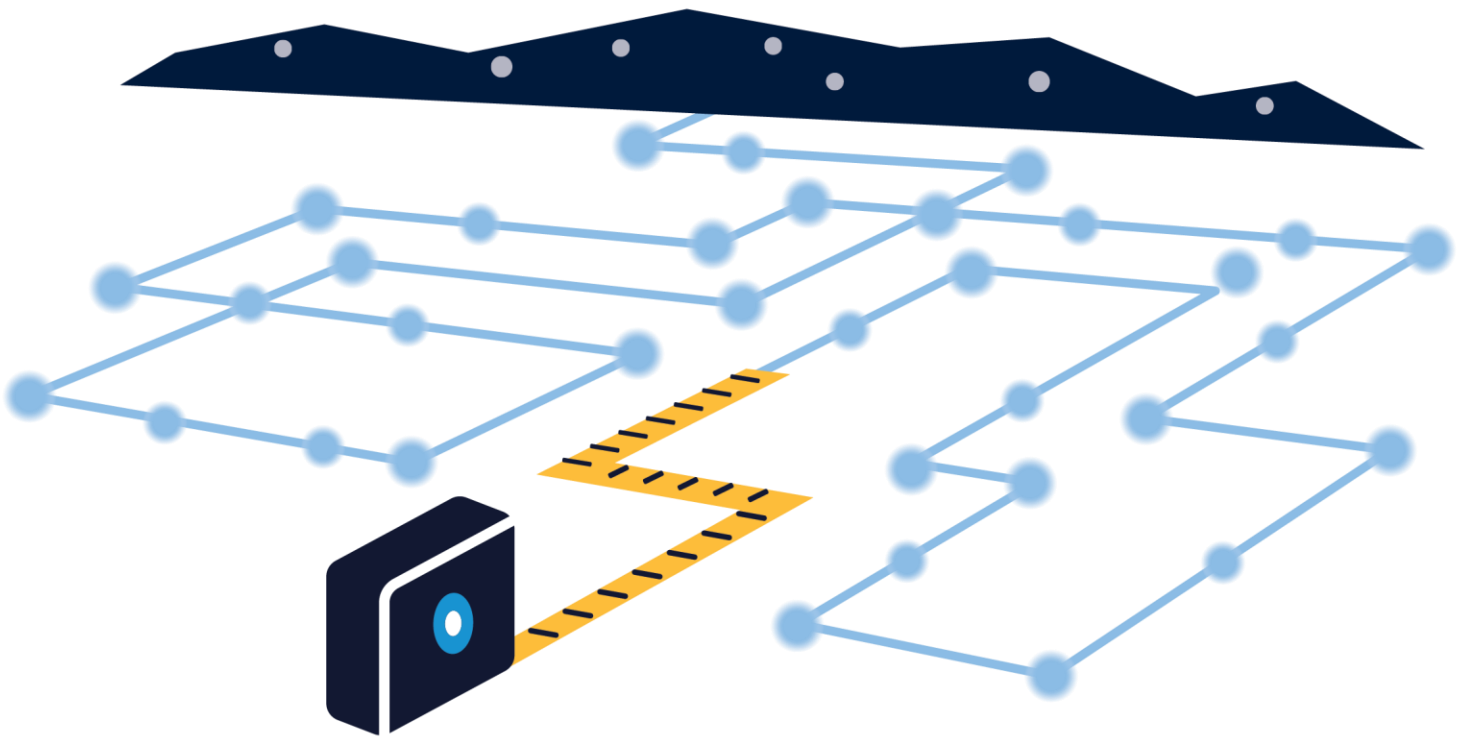


Opinion **Dynamics**



Residential Energy Efficiency Loan Assistance Pilot

Final Impact Evaluation Report



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1. Executive Summary

Introduction to the Residential Energy Efficiency Loan Assistance Pilot

In 2012, the California Public Utilities Commission (CPUC) allocated \$25 million in ratepayer funds to test financing as a mechanism to make energy efficiency (EE) improvements¹ more affordable² to residential homeowners. The CPUC wanted to leverage ratepayer funds to test the capability of a specific financing product – the Residential Energy Efficiency Loan (REEL) Assistance Pilot – to stimulate deeper energy savings than the state has historically achieved through other market incentives, such as rebates.³ The pilot’s primary goals were to attract private capital to increase the volume of EE financing, increase the number of EE upgrades, and attempt to reach residents in low- and moderate-income (LMI) markets. The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) was responsible for implementing the pilot.

The pilot provides lower-cost financing by establishing a loan loss reserve (LLR) as a risk mitigation strategy for lenders who enroll and offer a REEL product to their customers. Lenders can offer loans up to \$50,000 and the LLR can cover up to 90% of potential losses. By mitigating lender risk, the LLR leads to reduced capital costs for borrowers via lower interest rates compared to products otherwise available in the market⁴; lower monthly payments; and broader market coverage in underserved market segments, such as LMI or credit-challenged borrowers. Borrowers living in single-family residences in any of the investor-owned utilities’⁵ (IOUs) territories are required to use at least 70% of their REEL loan to fund eligible energy efficiency measures (EEEMs), which are similar to the measures that qualify for IOU rebate programs. Loans are intended for EE purposes and cannot be used for renewable measures, such as solar generation. The pilot can work in concert with rebate programs, but this is not a requirement; borrowers can receive IOU rebates or opt to only receive financing.

CAEATFA started approving and enrolling lenders in 2015. As an “open-market” program, these lenders are responsible for developing their own origination processes. However, currently, approved lenders are credit unions and none of them rely on contractor-based origination.⁶ In July 2016, the pilot issued its first REEL loan. In November 2018, the CPUC contracted with Opinion Dynamics, Dunskey Energy Consulting, and Ridge & Associates (the evaluation team) to evaluate the first two years of implementation.⁷

Research Objectives and Methods

This evaluation sought to answer the following eight research objectives:

¹ The CPUC provided guidance for, allocated budget to, and ordered implementation of the energy efficiency financing pilots via Ds. 12-05-015, 12-11-015, and 13-09-044 (pg. 114).

² This study does not objectively define “affordability” for customers; instead, it is considered a subjective concept of cost-band beyond which customers feel they cannot venture.

³ D. 13-09-044, pg. 3.

⁴ The REEL regulations state that interest rates on enrolled loans must not exceed 750 basis points over the U.S. Government’s 10-year treasury rate.

⁵ Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), Southern California Gas Company (SCG), and Southern California Edison (SCE).

⁶ Notably, the pilots have enrolled one financial institution (FI) that wants to employ a contractor-based model.

⁷ Defined here as the two years after the issuance of the first REEL loan, namely, July 2016–July 2018.

1. Describe participation in the pilot as of the end of its two-year implementation period to measure the degree to which it was successful in reaching its goals based on metrics adopted in Resolution E-4900. Notably, Resolution E-4900 metrics were established in December 2017, after the pilot was designed and implemented.
2. Determine how much energy savings the pilot produced, including gas and electric savings.
3. Explore the influence of the pilot on customer decision making.
4. Explore the costs versus benefits of the REEL product during the pilot period and compare them to other residential demand-side management (DSM) investments.
5. Gain feedback on the pilot design and implementation model from key stakeholders, including Program Administrators⁸ (PAs), such as IOUs and Regional Energy Networks (RENs); CAEATFA; participating contractors; and lenders.
6. Compare and contrast the pilot implementation model with other models.
7. Explore how the marketplace has changed since the 2012 decision⁹ to fund the pilots. Identify trends, if any, that will help the CPUC reorient strategic EE financing goals.
8. Assess the scalability potential of the pilot.

To achieve these objectives, the evaluation team conducted the following research activities:

- A consumption analysis to estimate average electric and gas savings after completing REEL-funded projects
- A telephone survey with 49 pilot participants to assess the influence of REEL on their home upgrade, to understand property and household characteristics like square footage and income, and to identify any changes to households or properties that might affect savings results
- A web survey with 57 contractors, including 34 who completed a REEL-funded project and 23 contractors who were REEL-certified but had not completed a REEL-funded project, the goal of which was to gain feedback on REEL design and implementation and the impact of the pilot on contractors' businesses
- An analysis of pilot tracking data, participant survey responses, and census data to understand the characteristics of pilot participants
- An analysis of participant survey responses on pilot influence to understand how participants' projects would have changed, or if they would have occurred at all, without the pilot
- In-depth interviews with CAEATFA, EE PAs, and enrolled lenders to gather feedback on the current pilot and how the EE financing market has transformed since the pilot was approved
- A review of five similar financing programs for comparison purposes

⁸ Program administrators in the context of this study include PG&E, SCE, SCG, the Bay Area Regional Energy Network (BayREN), the Southern California Regional Energy Network (SoCalREN), and SDG&E.

⁹ D. 12-11-015.

- A cost-effectiveness analysis of the pilot under the current pilot scenario and two potential future scenarios as a ratepayer program and an exploration of the necessary design changes to transition to a self-supporting program without ratepayer funds

More information on the objectives and methods for this evaluation is available in Section 2.3 and Chapter 3, respectively.

Pilot Participation Characteristics

The pilot created a financing tool that is leveraged by private capital and support. The following are some of the key characteristics of the pilot:

- It enrolled four credit unions in the first two years that together distributed loans to 212 residents (or participants) across the state, amounting to \$3.7M in private capital lending.
- Participation was largely concentrated within one lender, California Coast Credit Union, which represented 71% of the private capital attracted, followed by Matadors Community Credit Union with 23%. Both lenders operate throughout the entire state, while the two smaller volume lenders are focused in one specific region.
- The average REEL borrower received a \$17K loan and will be paying \$200 per month for 10 years at 7% interest.
- Approximately one-third of the 212 REEL participants are LMI, based on household income or census track. Further, many participants are “underserved” as defined by CalEnviro Scores (34%). Notably, based on Fair, Isaac and Company (FICO) credit scores of the participants, only 8% might be considered credit-challenged, with FICO scores of 640 or below.
- In its first two and a half years, REEL certified 282 contractors who serve most counties in the state, and, as of June 2019, this number had increased to 340 contractors. Surveys with contractors indicate that the pilot recruited experienced, versatile, and highly qualified contractors who could assist with multiple types of EE upgrades.

Energy Savings and Pilot Influence

After analyzing energy consumption before and after projects that were implemented in the pilot period, participants, on average, saved 12.8% of their gross¹⁰ annual electric usage and 2.6% of their gross annual gas usage, which amounts to 741 kWh and 11 therms, respectively, in annual savings per participant. The electric savings in REEL is similar to the statewide Residential HVAC and Advanced Home Upgrade programs (AHUPs); however, gas savings are remarkably lower. HVAC equipment was by far the most common measure in REEL-funded projects, followed by building shell upgrades, such as insulation; three-quarters of the projects involved replacing central air conditioning, which typically uses electricity as the primary fuel. Participation was also concentrated in parts of Southern California that have heavy cooling loads in summer months.

While there are clearly gross energy savings associated with REEL projects, it is important to explore whether these savings would have naturally occurred in the marketplace without REEL, that is, would customers have paid for the exact same project with other means? If not the same project, would they have done a different

¹⁰ “Gross” savings refers to the total change in energy usage observed post-treatment (i.e., after the project), adjusted for weather.

project or a later project? The counterfactual for this pilot is challenging to measure. One way to measure the net impacts is to analyze the difference in savings between the participating customers and a matched comparison group of similar homes. Based on this approach, if the total net¹¹ savings is divided by the gross savings, it can be surmised that 41% of the electric and demand savings and 54% of the gas savings occurred, at least in part, because of the REEL pilot.

The consumption analysis approach is one way to quantify the counterfactual for the pilot. This evaluation also explored the influence of REEL through a survey of 49 participants. Financing in general is a tool for making home upgrade projects more affordable for a customer by overcoming barriers related to paying with cash up front and translating the total project cost into affordable monthly payments. However, the availability of financing is not usually the impetus for deciding that there is a need to do a home upgrade. The most common motivators among respondents were the desire to reduce energy bills and to increase comfort (more than half of respondents cited one of these). The next most common motivation was to replace broken or failing equipment (20%).

Almost half (49%) of participants said that they used financing because they did not have enough cash on hand to do the project right away. Using a decision tree that provides a framework for measuring attribution for financing (see Section 6.3), the evaluation team estimates that at least 27% of the projects would not have occurred at all if REEL was unavailable. At the other extreme, one-quarter of the projects would likely have occurred without the pilot. The remaining projects were at least partially influenced by REEL. These data from just the first cohort of participants indicate that this pilot has the potential to garner more energy savings for the state than would occur naturally in the marketplace through alternative financing options available to customers.

In the first two years, about one quarter (27%, or 57 of 212) of participants also used a rebate in addition to financing. The evaluation team determined this by cross-referencing REEL and statewide rebate program tracking databases (for example, California Energy and Data Reporting System [CEDARS] data); if this trend continues in the future, impact evaluations that intend to claim savings will need to avoid double-counting savings from both REEL and rebate programs.

More detail on REEL pilot influence is available in Section 6.2.

Costs and Benefits

In its simplest form, a cost-benefit (C/B) ratio is used to define the value of a program intervention versus the cost of that intervention, considered from a variety of perspectives. The C/B ratio is derived by converting the entire stream of current and future costs and benefits into present values. If the benefit is higher than the cost (that is, the C/B ratio is greater than 1.0), the project is considered a good investment.

To explore the pilot's current and potential costs and benefits, the evaluation team applied cost-effectiveness tests for three scenarios:

1. **REEL Pilot:** Based on actual pilot operating expenditures, participation, and savings.

¹¹ "Net" savings refers to the savings that would *not* have occurred without the Pilot loan. In other words, net savings is the attributable Pilot savings after taking into account participant access to other affordable financing, parts of the project that needed to be completed regardless of financing available, the impacts of macroeconomic factors and code changes, or other changes that would have impacted energy usage regardless of the Pilot.

2. **REEL Business as Usual (BAU):** A future scenario with modest savings in expenditures and a modest increase in participation (240 participants per year) over a five-year period.
3. **REEL+:** A future scenario that assumes increased expenditures (additional staff and investments in IT and an on-bill repayment [OBR] option) and a significant increase in participation rates (883 participants per year) over a five-year period.

The evaluation team ran multiple cost-effectiveness tests — Participant Cost Test (PCT), Total Resource Cost Test (TRC), Societal Cost Test (SCT), and Program Administrator Cost Test (PAC) — for each scenario and found that:

- The REEL model as it is currently structured carries a heavy administrative weight that affects the ability to operate cost-effectively. Administration and LLR management costs make up a significant portion of the costs (30%–40% and 25%–35% of total annual costs, respectively).
- Except for the REEL+ program under the SCT, neither the pilot nor the two future scenarios pass the cost-effectiveness threshold (> 1.0) for any of the TRC, SCT, or PAC.
- The loans are cost-effective for participants using the PCT.
- While the contractor management costs are also high, interviews with CAEATFA, PAs, lenders, and other jurisdictions revealed that this investment is critical to financing program success.

To achieve a TRC threshold of > 1.0 across all tests requires a combination of factors: reducing costs (administration and LLR management fees) *and* increasing benefits (energy savings, accounting for other non-energy benefits (NEBs), and further reductions in the annual percentage rate [APR]). However, the estimated savings per REEL participant are based on the gross savings found in this evaluation; applying net savings would further reduce savings and REEL's ability to achieve cost-effectiveness. Further, REEL offers a variety of social, economic, and environmental benefits that are not fully accounted for in the tests that the evaluation team applied: helping underserved Californians make improvements that increase their comfort, reduce energy poverty, and improve people's health; boosting the value of housing stock; increasing economic opportunities for partners; and accounting for the social cost of carbon. Finding opportunities to reduce costs, applying a longer-term lens to measure market impacts, and reevaluating if and how ratepayer funds can be used to support California's climate-related goals should be considered.

Self-Supporting Program Scenarios

As an alternative, the team assessed the potential for REEL to become a self-supporting program without the need for regular injections of ratepayer funds. This represents a self-supported REEL model that would not be required to track loans and funds for each IOU and would have an LLR that is managed by CAEATFA itself.

The first step was to determine REEL's private/public capital leverage ratio, which gives an indication of the amount of funds that would need to be raised to support the REEL program relative to the overall program loan volume. The team then determined what interest "rate rider" (i.e., an interest rate percentage add-on paid by the borrower on top of usual interest) would be needed to cover the program costs. The interest rate rider would be applied to each loan over its entire repayment term, collected from the lender and remitted to the REEL PA to support the program costs. A high-level estimate was performed for each REEL scenario assuming that the interest rate rider would cover all program administration costs and LLR-covered losses. The calculation assumed that all loans are paid out over their full term and did not account for early repayments. The results of this analysis are presented in Table 1.

Table 1. Self-Supporting REEL Program: Estimated Leverage Ratios and Interest Rate Riders

	REEL Pilot	REEL BAU	REEL+	REEL+ (no master servicer)
Total Portfolio Value (\$M)	\$3.75	\$21.25	\$78.18	\$78.18
Leverage Ratio	1.86	3.08	7.19	8.40
Interest Rate Rider Required	6.20%	3.75%	1.44%	1.14%

From the results in Table 1 above, a few conclusions about REEL's potential as a self-supported program emerge.

- **As program volume increases the potential for a self-supported program becomes more evident.** The leverage ratios rise and the required interest rate riders drop significantly under the REEL+ models, suggesting that if REEL could generate significant volume, it would have a higher potential to be self-supporting.
- **The REEL+ and REEL BAU interest rate riders are significantly lower than the current average APR reduction of 4.6%.** Under the REEL+ model (with or without the master servicer), the interest rate rider would be less than half the current average APR benefit, suggesting that, even with the rate rider, the program would still pass along significant APR benefits to its customers.
- **While there is the potential to cover REEL's costs via a rate rider, the LLR itself would require further support.** The interest rate riders do cover LLR losses but were not designed to provide the funds needed to establish the initial LLR pool itself. Under the REEL+ model, with steady annual volumes, the evaluation team estimates that the LLR would ramp up to nearly \$15M within 10 years, as the loan pool expands year by year, and then grow more slowly thereafter as the LLR revolves. This initial pool of LLR funds would need to be supplied to CAEATFA in the initial years, like the Property Assessed Clean Energy (PACE) LLR that it currently operates.

How REEL Compares to Other Statewide Financing Programs

The evaluation team compared REEL to five similar financing programs in other jurisdictions (New York, Michigan, Oregon, Connecticut, and Colorado) to extract insights on best practices. These other programs all offer financing to residential customers, aim to support EE upgrades, have statewide coverage, incorporate credit enhancement features, and have varying lender partnership models (single- or multiple-lender models). The following key themes emerged when comparing REEL to other statewide financing programs:

- All other programs analyzed include both EE and renewable energy (RE) measures, typically solar panels and/or battery storage systems.
- REEL incurs significantly higher costs for LLR and lender management than other programs, likely because of complex setup and reporting requirements.
- REEL can seize opportunities to continue to iterate and adapt LLR and underwriting practices to improve program accessibility to underserved markets, for example, to further reduce the APR.
- Most programs find success with multiple local community lenders that include both statewide and local lenders. This ensures that statewide coverage and local lenders provide added benefits (more in tune with community needs and offering face-to-face interactions versus online services).

- Investments in training contractors are critical as they are a driving force behind marketing and quality.

Stakeholder Perspective on REEL

Below is a summary of key stakeholders' (lenders, CAEATFA, and PAs) perspectives on REEL design and implementation.

Lender Perspective on REEL

The evaluation team interviewed seven participating lenders¹² that produced the following key themes:

- Lenders would not be able to offer the same interest rates, terms, and loan amounts without the LLR. Lenders agreed that REEL was supporting those who would otherwise not have access.
- Lenders reported high satisfaction with REEL and CAEATFA. Lenders reported that CAEATFA is great to work with, very hands-on, and accessible. All lenders hoped REEL would continue and planned to participate.
- REEL is labor intensive. Lenders reported that the time to book REEL loans is much greater than other loan products and that a dedicated staff with knowledge of REEL guidelines and requirements is necessary.
- Lenders can easily find REEL-certified contractors, but the contractors need a lot of hand-holding when they do a REEL loan for the first time.
- There are opportunities to improve marketing. Utility bill inserts tend to drive most applications. After the pilot period, one lender mentioned that it got 10–15 applications within a week of utility bill inserts. Lenders expressed frustration with the manpower required for loan eligibility inspections and manual reporting. Lenders suggested more automation and a reduction in reporting frequency, from monthly to quarterly.

Contractor Perspective on REEL

- Surveys with REEL-certified contractors revealed that a majority of them (61%) are satisfied with the REEL pilot overall. Contractor feedback on various specific pilot components was overall positive, and they indicated that the key program design elements do not need improvement. The most common area of improvement contractors suggested was marketing support (51%).
- Among the 57 contractors surveyed, 72% are out there promoting REEL to their customers in addition to other financing options. REEL was the most commonly promoted, followed by PACE (63% of contractors are promoting PACE).
- Survey results indicate that the most common reasons that some contractors are not promoting REEL now to their customers are perceptions that REEL requires too much of the contractors' administration and sales time, few of their customers would be interested in REEL, they prefer other types financing, and the project requirements for REEL are too restrictive.

¹² Four were participating during the pilot evaluation period; three enrolled after.

CAEATFA and PA Perspective on REEL

Interviews with staff from CAEATFA, IOUs, and RENS produced the following key themes:

- Most PAs suggest that REEL's multi-lender implementation model provides the benefit of offering borrowers choice and the ability to work directly with lenders statewide.
- REEL's status as a pilot is hindering growth. CAEATFA reported that it was challenging to recruit larger lenders to a pilot program because they do not want to invest the time and money to set up a new lending product (which can be costly to train staff and implement) that may exist over a short timeframe.
- Investing in IT infrastructure may improve the contractor and customer experience and reduce administrative costs associated with verifying customer eligibility. CAEATFA believes REEL getting to scale will require an IT investment and enrolling a large lender, retail installment contracts (RICs), or a single originator that could standardize application processing and approval and sell to the secondary market.
- There is demand for EE financing and, as PACE declines, there are opportunities for REEL to fill the market gap. However, REEL needs to expand the eligible measures list and reduce barriers to make inroads. Although new state PACE regulations have resulted in declining PACE volumes, REEL is not growing at the same rate to fill the gap. PACE allowed for RE, EE, and other measures. Allowing REEL to become a more comprehensive solution may increase participation.
- Offering EE loans (even with low interest rates) was not viewed as a solution for truly low-income borrowers. There is hesitancy to offer financing to low-income customers that could potentially add financial stress to this population, and many PAs favor other no-cost options available to low-income homeowners (for example, Direct Install programs, Energy Savings Assistance Program [ESAP], and California Alternate Rates for Energy [CARE]).

Scalability Potential

Figure 1 below shows the number of enrolled loans (columns) and the average enrollment rate (blue and gray lines) in each quarter. As shown, participation in the pilot grew steadily over the first years, both in absolute number of loans and enrollment rates, and then picked up pace following the six months after the end of the two-year evaluation period. Notably, the monthly enrollment rate (light blue line) almost tripled in the five months after the pilot period to 25 loans per month.

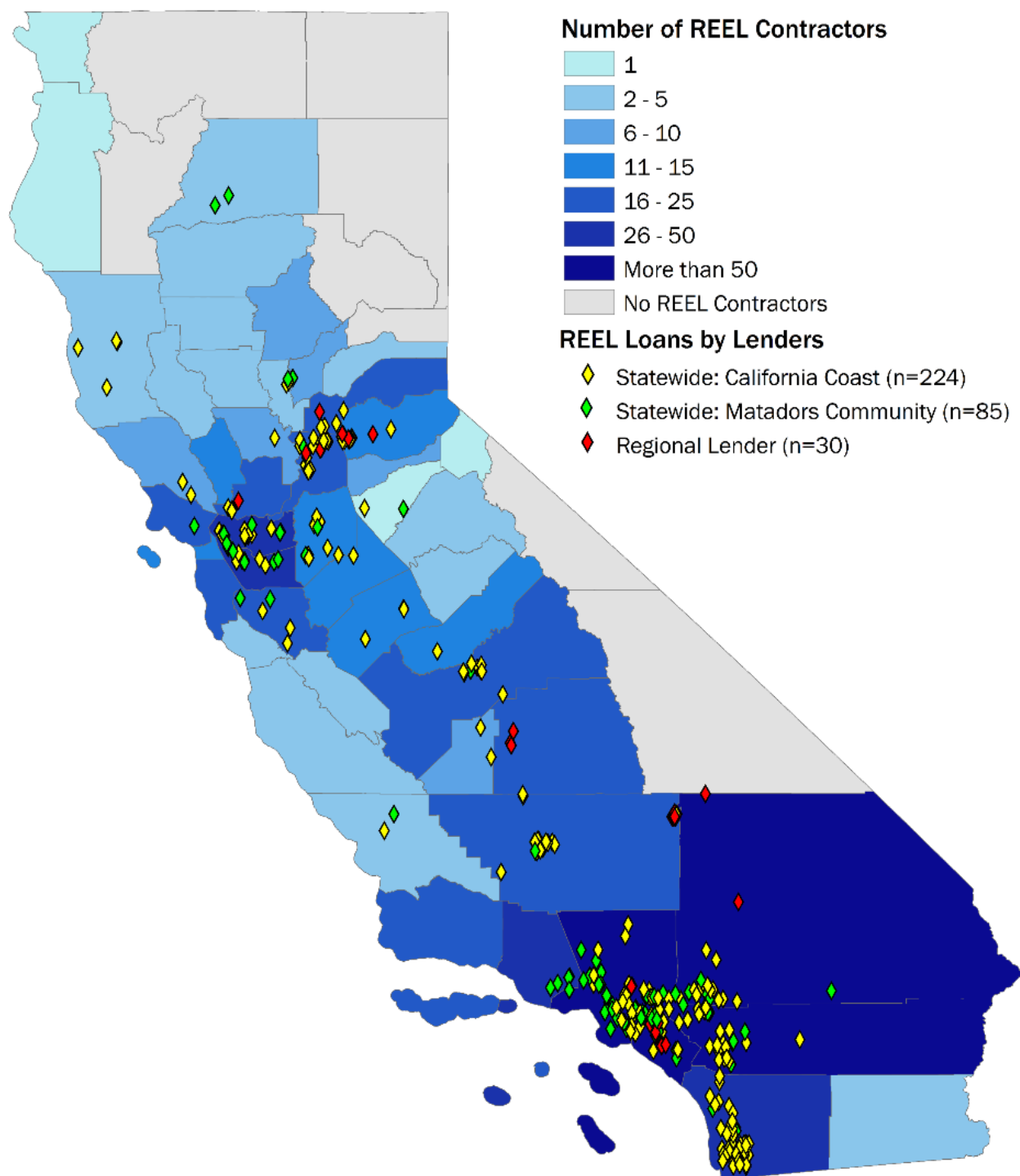
Figure 1. REEL Loan Growth



Note: Number of loans represents the count of loans enrolled on a quarterly basis.

As shown in Figure 2, REEL has a strong foundational contractor and lender network that can reach a wide swath of the state. The contractor pool is also strong based on the number of contractors enrolled, the type of services that they offer, and their self-reported preference for REEL over competing financial products. While these results shown in Figure 2 are encouraging, to achieve scalability the Pilot will need to recruit more, larger volume lenders (i.e., non-credit unions) and convert dormant contractors to active contractors. Survey responses support contractors' preferences for REEL and indicate a high potential for conversion, with 91% of dormant contractors saying that they plan to complete a REEL project in the future

Figure 2. Map of REEL Participation, Lender Activity, and Contractor Territories (2.5 Years into the Pilot)



Note: Based on contractors and loan data, July 2016–December 2018.

Key Conclusions & Recommendations

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
The financing tool reaches underserved Californians who would not otherwise have participated in EE upgrades	<ul style="list-style-type: none"> Allowable loan pay back loans max of 15 years. On average, REEL customers borrowed \$17K; paying \$200/month for 10 years at 7% interest. A third of borrowers are low- to moderate-income (LMI); representing half (51%) of loan volume. A third could be considered “underserved” based on CalEnviroScreen data. Three-quarters have good credit or better (FICO>700) while 8% had fair or worse (FICO<641). Participating lenders did not have an energy-efficiency specific loan product prior to REEL; they did have other, less attractive, unsecured personal loan options Lenders changed existing loan products by specifying energy efficiency, extending terms and increasing amounts that translated into smaller monthly payments for customers. Lenders say they would not be able to offer the same interest rates, terms and loan amounts without REEL. According to borrowers, at least 27% of the projects would not have occurred if REEL were unavailable. At the other extreme, one-quarter of the projects would likely have occurred without REEL. The remaining projects were, at least, partially influenced by REEL. About a quarter of participants used IOU rebates in addition to financing. 	<ul style="list-style-type: none"> The Pilot reached its goal of providing at least one third of loan volume to LMI customers.¹⁴ The Pilot also successfully reached “underserved” customers based on CalEnviroScore data on vulnerable communities. Lending does not appear to be going to customers with poor credit scores. Loan terms are more affordable and accessible than other options. Many borrowers would likely not have qualified for other loans they could afford or would accept. Many of these energy efficiency projects would not have occurred at all without REEL or customers would have piecemealed the upgrades over a longer period of time. 	The Pilot is successfully reaching the underserved.	

¹³ Black font = Resolution E-4900 metric, Blue font = additional metrics for consideration

¹⁴ D. 13-09-044, pg. 33

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
The financing tool produces energy savings	<ul style="list-style-type: none"> Based on consumption analysis of pre/post usage, participants saved an average of 12.8% of their gross annual electric usage and 2.6% of their gross annual gas usage, which amounts to 741 kWh and 11 therms in annual savings per participant. Comparison of energy savings from other programs: electric savings is similar to the state-wide Residential HVAC and Advanced Home Upgrade Programs, however, gas savings are remarkably lower. Net savings, based on difference between participants and a matched comparison group, show that 41% of the electric savings and 54% of the gas savings, occurred, at least in part, because of the Pilot. 	<ul style="list-style-type: none"> The Pilot has measurable gross and net energy savings at the meter level. Comparing the savings to other loan programs is challenging given most others include both energy efficiency and renewables. The Pilot has the potential to garner more energy savings for the state than would occur naturally in the marketplace. 	The Pilot is producing energy savings.	<ul style="list-style-type: none"> Should the Pilot become a full program and start to produce claimable savings, the gross and net savings methods will need to account for the appropriate baseline and avoid double-counting with rebate programs.
The financing tool is scalable: participation (loan volume)	<ul style="list-style-type: none"> 212 total loans in Pilot evaluation period Monthly loan growth rate: first Pilot year, averaged 9 loans/month, then spiked to ~25/month after Pilot period Geographic distribution/ability to reach new regions of the state, esp. those with large underserved populations: Pilot loans spread across state but largely concentrated in Southern California. Four participating lenders in Pilot period have limited ability to reach new regions of the state given physical branches only in Southern California. Recruited network of 282 contractors who serve most counties in state, after Pilot period grew to 340 contractors; the number of contractors and type of contractors are a good fit for energy efficiency projects. Most contractors prefer the REEL loan product over other options; 72% of them are promoting REEL to their customers but many need more marketing support. Lenders can easily find REEL-certified contractors. 	<ul style="list-style-type: none"> Loan growth rate is increasing and can scale further. CAEATFA has built the infrastructure needed to support expanded loan volume, but REEL scalability is limited without enrolling a large lender and/or further investments to streamline loan applications. The contractor pool can meet expanded loan volume but needs more marketing and information support. 	The continued growth in loan volume is encouraging, but some changes are necessary to achieve scalability.	<ul style="list-style-type: none"> If Pilot becomes a full program, make all efforts needed to enroll a large volume lender with physical branches covering more of the state. If Pilot becomes a full program, make all efforts needed to support Retail Installment Contracts (RICs), or a single originator clearing house for all loans regardless of lender. Continue to support contractor information needs as main marketing tool for loans.

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
The financing tool is leveraged by private capital and support	<ul style="list-style-type: none"> • The Pilot enrolled four lenders; two localized credit unions and two that operate statewide, but their branch locations are limited to Southern California. Two more credit unions enrolled after the Pilot evaluation period. • REEL attracted \$3.8M in private capital, supported by \$476K of ratepayer dollars in a loan loss reserve (LLR). • None of the borrowers defaulted on loans in the Pilot evaluation period. 	<ul style="list-style-type: none"> • Pilot only attracted credit union lenders, none of which are considered large volume in the State nor do they have the capability for contractor-based origination. • It is too early to assess loan performance in terms of defaults and “bridge loans”. 	Lender recruitment and loan performance are encouraging thus far, but more implementation time, and subsequent evaluation, is needed to assess loan performance and the long-term viability of private financing support.	<p>Same recommendations as above and:</p> <p>If defaults rates continue to be low, REEL could consider reducing the amount of funds set aside in LLR, thereby increasing leverage ratios.</p> <p>We recommend further evaluation of loan performance after 5½ years of implementation (after the first loan was issued), starting in 2022. This should give sufficient time to assess default rates over a longer economic cycle. It would also allow time to further explore if and how customers are using REEL for “bridge funding” and what the implications of this are on REEL’s savings and APR benefits impacts, and whether customer early repayments alter the attractiveness of REEL for lenders.</p>

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
The financing tool is scalable: Contractor and lender support	<ul style="list-style-type: none"> • REEL is labor intensive for lenders. Lenders report that REEL loan processing time is much longer than other loan products. Lenders need dedicated staff with knowledge of REEL guidelines and contractors need a lot of hand-holding when they are new to REEL • Lenders expressed frustration with the manpower required for loan eligibility inspections and manual reporting; suggesting more automation, and reducing to quarterly reporting from monthly. • Lenders want more marketing support to get more customers, such as bill inserts • Among inactive contractors, reasons for not selling any loans to date mainly pertain to perceptions that REEL is too complicated, there is a lack of customer awareness of REEL, customers preferred to pay cash, contractors have not had the opportunity yet, or they attempted to connect customers with REEL but customers did not qualify. 	<ul style="list-style-type: none"> • The current program model is challenging to scale further for lenders due to loan processing, eligibility inspections, monthly reporting requirements and contractors' lack of knowledge when they process their first loan. Despite these challenges, lenders are committed to the REEL product and want more marketing support to attract even more participants. • The current program model can be further scaled with the current contractor pool. However, actions should be taken to reduce the perceived complexity of REEL amongst contractors and increase market awareness. 	Contractor and lender marketing support should be key areas of focus for the Pilot moving forward.	<ul style="list-style-type: none"> • If the pilot continues, we recommend investments in IT infrastructure to help automate some of the loan processing and reporting requirements, which may improve the lender, contractor, and customer experience and reduce the administrative costs associated with verifying customer eligibility. • If the pilot continues, we recommend continuing efforts to simplify <u>how REEL is presented</u> to both contractors and customers. Pilot contractors and customers could provide compelling testimonials for marketing purposes.

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
The financing tool is scalable: Accounting for the changing policy landscape	<ul style="list-style-type: none"> The CA energy policy landscape has evolved since the Decision was first released to fund the Pilot in 2012, with new assembly and senate bills such as AB 32, AB 811, SB 350, SB 100, and Executive Order B-55-18. There is increased focus on reducing greenhouse gas emissions, encouraging electrification, use of renewables and battery storage. The price of avoiding carbon is increasing. PACE financing is declining in the marketplace. 	<ul style="list-style-type: none"> Since 2012 when the CPUC first decided to fund this Pilot, several factors have emerged that could impact, either directly or indirectly, the demand for and supply of the type of financing that REEL provides as well as its goals, design, and cost-effectiveness. These factors should be considered when determining the future path for REEL. 	The policy landscape has changed significantly since 2012 and updates to interpretations of costs and benefits are needed.	<ul style="list-style-type: none"> We recommend the CPUC take into consideration how much has changed in the California marketplace since the CPUC first decided to test this Pilot in 2012 and what new goals or elements should be added to REEL in terms of how cost-effectiveness is treated, how the program is defined (market transformation, resource/non-resource), and what projects qualify.
The financing tool is scalable: Cost-effectiveness	<ul style="list-style-type: none"> The current implementation model carries significant administrative and loan servicing costs. Specifically, the administration costs (including the master loan servicer) and LLR management account for over half of the TRC and SCT costs. The contractor manager costs are high, but the Pilot administrator, other energy efficiency Program Administrators, lenders, and other jurisdictions revealed this investment is critical to financing program success. The loans are cost-effective for participants using the Participant Cost Test (PCT). REEL future projected cost-effectiveness improves as loan volume increases, approaching a TRC of 1.0 when loan volume exceeds 2,000 per year, which would represent a significantly larger increase in annual volume than CAEATFA has projected. Neither the Pilot nor two future scenarios pass the cost-effectiveness threshold (> 1.0) for any of the Total Resource Cost (TRC), Societal Cost (SCT), or Program Administrator Cost (PAC) tests. 	<ul style="list-style-type: none"> Increasing the loan volume appears to improve the program cost-effectiveness, but because the variable costs are significant, increased loan volume alone would not likely make the program cost effective. While increasing REEL to 2,000 participants per year could eventually improve the TRC to over 0.9, it does not appear to reach a TRC of 1.0 under any reasonable loan volume. REEL carries notable administrative weight, which impacts its ability to operate cost-effectively while also delivering to LMI borrowers. Finding solutions to reduce the administrative cost associated with the contractor management, trustee bank fees and maintaining the master servicer could 	Pilot design changes are necessary to achieve cost-effectiveness. After these changes are made, subsequent evaluation is needed to fully understand the benefits of the Pilots.	While it does not appear that REEL currently operates as a cost-effective program, we recommend extending REEL out by an additional 5½ years from the issuance of the first loan (i.e., to 2022) in order to pursue adjustments that could lead either to it becoming a cost-effective resource or a market transformation program. During this time CAEATFA can pursue efforts to increase the program cost-effectiveness such as offering an expanded set of eligible measures, increase lending to low-FICO participant and/or lower interest rates (thereby increasing APR benefits), grow participation, and improve administrative efficiency (i.e. lower the cost per loan). In parallel, the CPUC can further evaluate the program

Goal	Metric Data ¹³	Assessment	Conclusion	Recommendations
		<p>collectively improve the program cost-effectiveness.</p> <ul style="list-style-type: none"> • Increased annual loan volume could minimize administrative and management costs. • REEL offers a variety of social, economic and environmental benefits that are not fully accounted for in the tests the Evaluation Team applied. 		<p>benefit streams to arrive at more accurate values for the non-energy benefits and carbon reduction impacts. Finally, the additional running time may offer a long enough track record to better assess the potential to spin REEL off as a self-supporting initiative, possibly accessing an endowment for the LLR capital, but generating all administrative costs via a rate rider or participant charges.</p>

2. Pilot Overview and Study Purpose

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

2.1 Pilot Description

The CPUC allocated ratepayer funds to support several EE financing pilots¹⁵ that were designed to test “scalable” products, “leverage” ratepayer funds, and “stimulate deeper EE projects than previously achieved through traditional program approaches (for example, audits, rebates, and information).”¹⁶ The CAEATFA began implementing these pilots in the third quarter of 2014 through a central platform for information on all EE financing pilots called the California Hub for Energy Efficiency Financing (CHEEF).

The first pilot CAEATFA launched was focused on the single-family residential market, known as the REEL Loan Assistance Pilot. Starting in 2015, CAEATFA recruited lenders to provide lower-cost loans for EE projects and contractors to support the pilot. The pilot issued its first loan in July 2016 and completed its two-year pilot period in July 2018. In December 2018, the CPUC identified specific metrics that would help in evaluating the pilot’s performance (see Table 2).¹⁷ Data on these metrics, and more, are included in this report.

Table 2. REEL Pilot Metrics

Goal	Metric	CPUC Guidance
The financing tool is scalable	Number of loans made by the pilot, with breakdown by: <ul style="list-style-type: none"> ▪ 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 	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: <ul style="list-style-type: none"> ▪ Number of financial institutions (FIs) participating in the pilot and types of FIs 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, that is, whether they can reach a point where they depend less or do not depend at all on the use of ratepayer funds.

¹⁵ The CPUC provided guidance for, allocated budget to, and ordered implementation of the EE financing pilots via Ds. 12-05-015, 12-11-015, 13-09-044.

¹⁶ D. 13-09-044, pg. 3.

¹⁷ CPUC Resolution E-4900. December 18, 2018.

Goal	Metric	CPUC Guidance
The financing tool reaches underserved Californians who would not otherwise have participated in EE upgrades	Analysis of participants in the pilot, according to: <ul style="list-style-type: none"> ▪ Credit scores of loan participants ▪ Length of time allowed for applicants to pay back the loans ▪ Percentage of participants deemed “underserved” as measured through CalEnviro data, area median income (AMI), or other poverty statistics ▪ Whether participants would have qualified for existing private EE 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 and analysis done by evaluation, measurement, and verification (EM&V) studies 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 ability to reach low-income communities.
The financing tool produces energy savings	Energy savings that resulted, as measured: <ul style="list-style-type: none"> ▪ 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 	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.

Notably, CAEATFA has adapted the pilot’s design multiple times over the first two and a half years in an attempt to improve implementation processes and grow participation. According to CAEATFA, some of the most impactful changes to the pilot, in terms of driving contractor interest, were changes to EEEMs lists. From inception, REEL had four different EEEMs lists, one for each IOU, that included inconsistent measures. Then, in March 2017, CPUC D. 17-03-026 gave CAEATFA more control over the program design, including the list of EEEMs. After that decision, CAEATFA worked with the IOUs to gradually decouple REEL from the IOU programs and create a single statewide EEEMs list by March 2018.

March 2018 was the last round of design changes to the pilot before the evaluation began. Aside from the EEEMs update, other key changes included two adjustments to the qualification requirements for the 20% “underserved” credit enhancement rate for lenders.

- CAEATFA added a “Credit-Challenged Program,” which was a voluntary “opt-in” program to allow lenders to receive the underserved credit enhancement rate for loans to borrowers with credit scores under 640, if they could prove that this allowed them to offer a better product to a broader set of borrowers. Three lenders opted into the offering.
- CAEATFA added the option of using area median income (AMI) by census tract to qualify for the underserved credit enhancement rate. Loans to borrowers in census tracts with AMI of less than 120% of county or metropolitan statistical area (MSA) median income would receive the underserved credit enhancement rate.

2.2 Pilot Theory and Logic

The pilot provides customers with access to lower-cost financing for eligible EE projects. It is available to single-family residences that are customers of the California IOUs (PG&E, SCE, SCG, and SDG&E). The pilot is administered by CAEATFA through the CHEEF. The CHEEF or “Hub” represents a public-private partnership among California state agencies and the IOUs to help bring together lenders, contractors, and borrowers to facilitate lower-cost financing for EE projects.

CPUC D. 13-09-044 called on CAEATFA and the IOUs to implement a residential financing pilot for the single-family residential market funded with ratepayer dollars.¹⁸ The decision outlined several pilot goals. The evaluation team interprets the decision language as establishing the following primary goals of the pilot:

1. To increase the volume of EE financing to attract capital providers and attract new market participants
2. To increase the number and comprehensiveness of EE projects
3. To reach LMI customers

Secondarily, the pilot also hopes to increase the rate at which contractors can close a sale of EE equipment.

As such, the pilot established an LLR for enrolled lenders who offer loans of up to \$50,000 to single-family residential customers (including residential buildings with four or fewer units, with a \$50,000 loan per unit) to carry out EE upgrades. The LLR can cover 90% of capital losses resulting from charge-offs on enrolled loans, which is intended to help mitigate lender risk and ideally lead to reduced capital costs for borrowers,¹⁹ improved terms, and broader market coverage in the LMI and low-FICO-score segments. At least 70% of the total loan for a given project must be used to pay for EEEMs, which are similar to the measures that qualify for IOU incentive/rebate programs.

REEL has a target of disbursing approximately one-third of the total credit enhancements to serve LMI single-family residents. This is supported through two design features²⁰:

- The LLR contribution for LMI borrowers is set at 20% of the loan principal amount, while it is set at just 11% for other borrowers (to provide a stronger risk mitigation tool for the LMI market).
- Borrowers with FICO scores as low as 580 will be considered for loans under the pilot. However, for applicants with FICO scores between 580 and 640, the lender must verify the borrower’s income as part of the underwriting process. Enrolled lenders are responsible for developing their own origination processes.

The pilot also includes an important investment in contractor training and marketing outreach. While enrolled lenders are responsible for developing their own origination processes, none currently has the capability for

¹⁸ The pilots define single-family residential buildings as those that contain no more than four units. The pilots also include a multifamily unit building financing program, but from a financing perspective this program is better considered in light of the nonresidential market baseline.

¹⁹ The REEL regulations state that interest rates on enrolled loans must not exceed 750 basis points over the U.S. Government’s 10-year treasury rate.

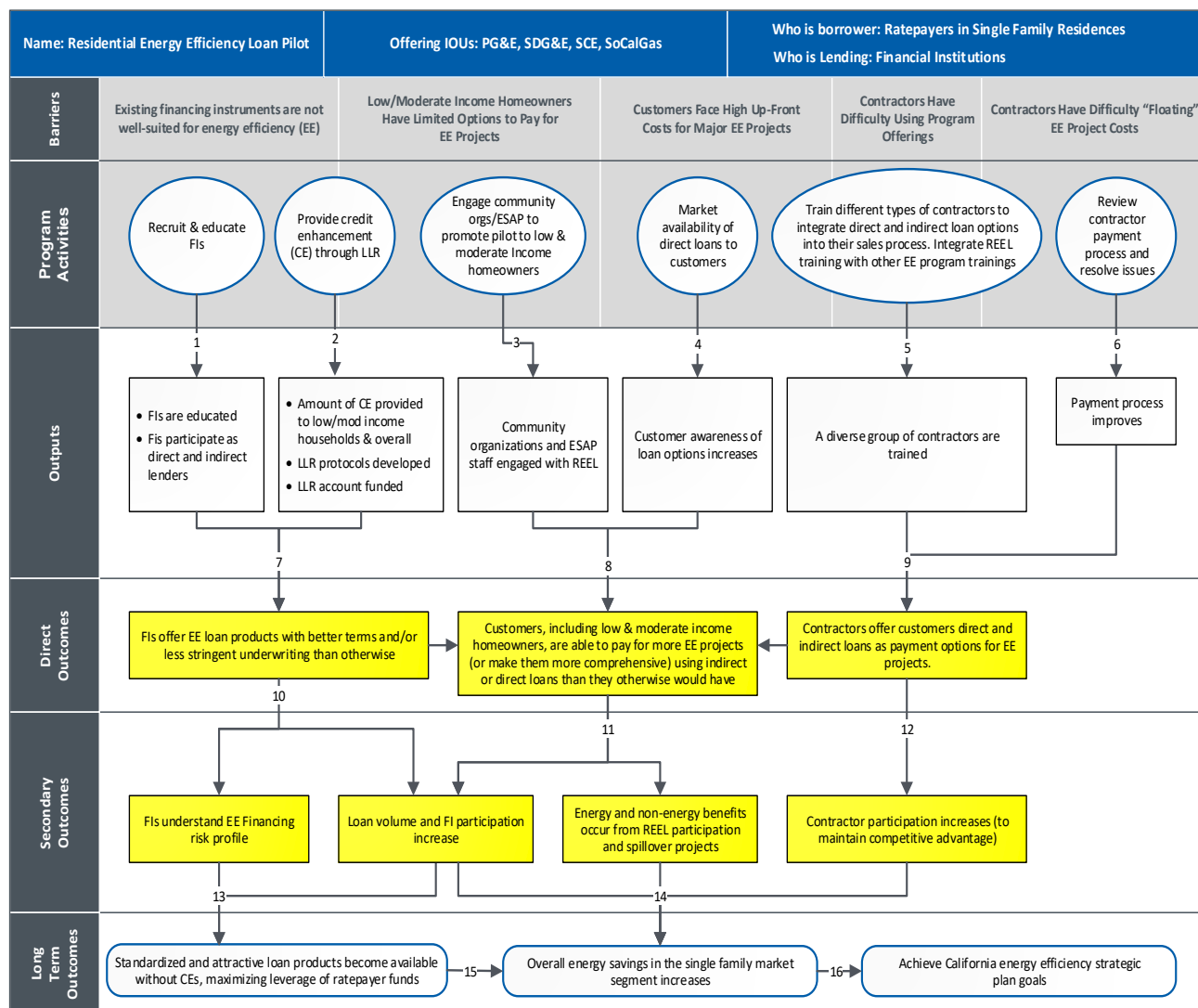
²⁰ California Code of Regulations Title 4 Business Regulations, Division 13. CAEATFA. Regulations Implementing the Residential Energy Efficiency Loan Assistance Program. Effective September 8, 2015. Accessed at : <https://www.treasurer.ca.gov/caeatfa/cheef/reel/regulations/2018/proposed-regulation-text.pdf>. Notably, these regulations are currently under review and program design features may change based on the review.

contractor-based origination.²¹ At least one participating vendor is in the process of setting up an automated process for one contractor, but this had not been implemented at the time of this evaluation.

The REEL program theory and logic is shown in Figure 3. The pilot is designed to ultimately help make EE more accessible to IOU customers in California who do not have the up-front cash to pay for projects. It is important to note that financing is not necessarily the product that the state is encouraging customers to buy; instead, EE is the desired product and financing, like rebates, is the vehicle that helps people pay for the cost of making EE upgrades. As such, the pilot is theoretically designed to address the first cost barrier to EE by offering more-attractive lending terms and rates than other lending products that ultimately translate into an affordable monthly payment for customers. The pilot's lending can make EE more affordable through loans alone or through a combination of REEL loans and rebates. The pilot can work in concert with rebate programs where customers can receive both incentive types for EE upgrades if they meet the eligibility requirements. Alternatively, customers can opt to receive only the financing incentive.

²¹ Notably, the pilots have enrolled one lender that will employ a contractor-based model.

Figure 3. REEL Pilot Program Theory Logic Model



REEL = Residential Energy Efficiency Pilot ESAP = Energy Savings Assistance Program FI = Financial Institution CE = Credit Enhancement LLR = Loan Loss Reserve EE = Energy Efficiency

Direct loans are made by the FI to the customer. Indirect loans are offered by contractors.

After about two years of planning, recruiting, and development, the first REEL loan was issued in July 2016. Between July 2016 and July 2018, the pilot provided loans to 212 customers. To evaluate the pilot's first two years, the evaluation team measured the pilot's direct and secondary outcomes, highlighted in yellow boxes in the Logic Model (Figure 3), and explored if and how the pilot influenced those outcomes. These influential points include:

- Through the LLR, the pilot is expected to encourage lenders to offer loans with better terms and rates than other lending products offered, allowing more customers to pay for EE than they could afford otherwise. The pilot intended to educate lenders, such that they would acquire more knowledge of the EE financing risk profile and start new EE products that would ultimately affect their lending products, loan volume, and viewpoint on the risk profile associated with EE lending.

- The pilot is expected to make EE more affordable to more customers and ultimately garner energy savings that would not have occurred with traditional financing or with a combination of traditional financing and rebates otherwise available in the market. REEL financing should increase the accessibility of EE projects to customers, particularly LMI customers by allowing them to do an EE project at all or by increasing the size of their EE project and/or allowing them to invest in a larger EE project earlier instead of piecemeal over a longer period of time.
- The program theory suggests that contractors have a hard time covering the cost of EE projects before being paid by the customer or helping customers finance EE projects such that they lose EE project opportunities. As such, REEL financing is designed to equip contractors with REEL lending information that they can market to their customers alongside their services. Contractors are expected to market REEL to prospective customers and, if it works as intended, customers will enroll in REEL to afford the projects, and contractors could then view REEL as a way to grow their EE project sales and increase their competitive advantage in the marketplace.

2.3 Purpose of the Study

The overarching goal of this evaluation is to determine how well the pilot achieved or addressed the goals originally set by the CPUC in D. 12-05-015 and reiterated in subsequent proceedings. It is not the goal of this pilot evaluation to determine claimable gross or net savings for the pilot period or to produce ex ante estimates of savings for the pilot. More importantly, this evaluation is geared toward determining how well the pilot performed across several metrics and to provide data to help the CPUC determine if and how a ratepayer-funded financing mechanism for residential customers should continue. As such, this evaluation focuses on the following research objectives:

1. Describe participation in the pilot as of the end of its two-year implementation period to measure the degree to which the program was successful in reaching its goals based on metrics adopted in Resolution E-4900, including:
 - a. The number of loans made by the pilot, average loan size, total amount of financing generated, and geographic distribution
 - b. The number of participating financial institutions (FIs) and REEL-certified contractors (pilot “partners”), including an analysis of the distribution of participation across these partners
 - c. An analysis of participants, including credit scores, loan terms, percent underserved, and percent who may qualify for other private loan options (for example, based on FICO score and income)
2. Determine how much energy savings the pilot produced, including gas and electric savings.
3. Explore the influence of the pilot on customer decision making.
4. Explore the costs versus benefits of the REEL product during the pilot period and compare them to other residential DSM investments.
5. Gain feedback on the pilot design and implementation model from key stakeholders, including PAs, CAEATFA, participating contractors, and lenders.
6. Compare and contrast the pilot implementation model with other models, both nationally and internationally.

7. Explore how the marketplace has changed since the 2012 decision²² to fund the pilots. Identify trends, if any, that will help the CPUC reorient strategic EE financing goals.
8. Assess the scalability potential of this pilot.

2.4 Study Timeframe

This evaluation focuses on pilot operations and performance in its first two years, from July 2016 to July 2018. However, since this evaluation was conducted in the 12 months after this period, the evaluation notes if there are any changes in pilot design or participation after July 2018 that should be taken into consideration.

²² D. 12-11-015.

3. Methodology

This report includes results from a range of data collection and analytical methods, including a consumption analysis, a cost-effectiveness analysis, a secondary data review, and semi-structured interviews and surveys. Table 3 summarizes the specific tasks undertaken to conduct this evaluation. Detailed descriptions of results and methods are available in Chapters 1–10.

Table 3. Summary of Pilot Evaluation Tasks

Evaluation Task	Summary
Consumption Analysis	Applied two different linear fixed effects regression (LFER) approaches: one without a comparison group to estimate the gross savings from the pilot and one with a comparison group to estimate the net savings.
Participant Survey	Telephone survey with 49 REEL pilot participants. The primary goals were to understand the influence of the REEL loan on participants' decisions to complete home upgrades, collect information about their households, and understand any nonroutine adjustments participants made to their homes or behaviors after the home upgrade. The survey was conducted as a census, as the evaluation team attempted to complete a survey with all 212 participants in the pilot.
Contractor Survey	Web survey with 57 REEL-certified contractors (23 of which had yet to complete a REEL project and 34 of which had completed a REEL project). The goals were to gain feedback on REEL design and implementation, determine satisfaction with the pilot, and determine whether the pilot has helped contractors overcome barriers associated with EE projects. This survey was also conducted as a census; the evaluation team invited all contractors who were certified in REEL as of December 2018 to respond to the survey.
Pilot Data Analysis	Combined primary and secondary data to characterize participants in terms of customer characteristics (for example, credit score, income, debt-to-income [DTI] ratio), geographic distribution (for example, climate zone, region), and home upgrade project characteristics (for example, measure type, REEL loan size).
Participant Influence Analysis	Use self-reported assessment of pilot influence from the participant survey to qualitatively understand REEL financing influence versus other financing options available, establish a net-to-gross ratio (NTGR) for the pilot, and understand the relative influence between financing and rebates when customers take advantage of both.
Stakeholder In-Depth Interviews	In-depth semi-qualitative interviews with CAEATFA, PAs (such as IOUs and RENS), and enrolled lenders to assess whether REEL can effectively move from pilot to program sustainably and to gain further insights into how the EE financing market has transformed since the pilot was approved.
Secondary Research	Studied five similar programs to collect insights on three topic areas: LLR management and underwriting practices, management of multiple lenders, and marketing and integration with resource programs.
Cost-Effectiveness Analysis	A C/B analysis of the REEL pilot, assessing a range of relevant quantitative and qualitative C/B metrics, and a comparative analysis of the REEL pilot, two future REEL program rollout scenarios, and other residential DSM initiatives in California.

4. Study Results Summary

This chapter provides a summary response for each of the research objectives. More detailed results by evaluation task are available in Chapters 1 through 10.

4.1 Participation Characteristics and Pilot Accomplishments

Objective 1

Describe participation in the REEL pilot as of the end of its two-year implementation period to measure the degree to which the program was successful in creating a financing tool that is leveraged by private capital, reaching underserved Californians and building a contractor network to introduce financing at the point-of-sale.

Below is overview of pilot accomplishments and participation characteristics that explores two key metrics of the pilot: whether and how the pilot created a financing tool that is leveraged by private capital and support and whether and how it reached underserved Californians.²³

Financing Tool Leveraged by Private Capital and Support

The pilot created a financing tool that is leveraged by private capital and support. It enrolled four credit unions

in the first two years that together distributed REEL loans to 212 participants across the state, amounting to \$3.7M in private capital lending.

Number of Lenders, Participants, and Financing Generated

Participation was largely concentrated within one lender, California Coast Credit Union, which represents 71% of the private capital attracted, followed by Matadors Community Credit Union with 23%. Both credit unions operate throughout the entire state, while the two smaller volume lenders are focused in one specific region. Table 4 shows the number of loans, the amount of private financing, and the ratepayer LLR contribution among the four lenders in the pilot's first two years.

Table 4. Participation Characteristics (Two-Year Pilot Period)

Lender	Type	Date of First Loan	# of Loans	Original Loan Amount (Private Capital)	LLR Contribution	Proportion of Loan Volume Private Capital by Lender (%)
California Coast Credit Union	Statewide	1/13/2017	150	\$2,608,491	\$331,106	71%
Matadors Community Credit Union	Statewide	7/19/2016	50	\$829,341	\$116,711	23%
Desert Valleys Federal Credit Union	Regional	9/11/2017	9	\$167,935	\$22,711	5%
Valley Oak Credit Union	Regional	11/28/2016	3	\$50,368	\$5,293	1%
Total			212	\$3,656,135	\$475,821	100%

Source: CAEATFA tracking data.

²³ Two metrics specified in Resolution E-4900.

Notably, after six more months, the pilot made further progress, enrolling three more regionally focused Credit Unions, accumulating 339 participants and attracting \$5.8M in private capital. Table 5 below shows the accumulated participation after two and a half years.

Table 5. Participation Characteristics (Two-and-a-Half-Year Pilot Period)

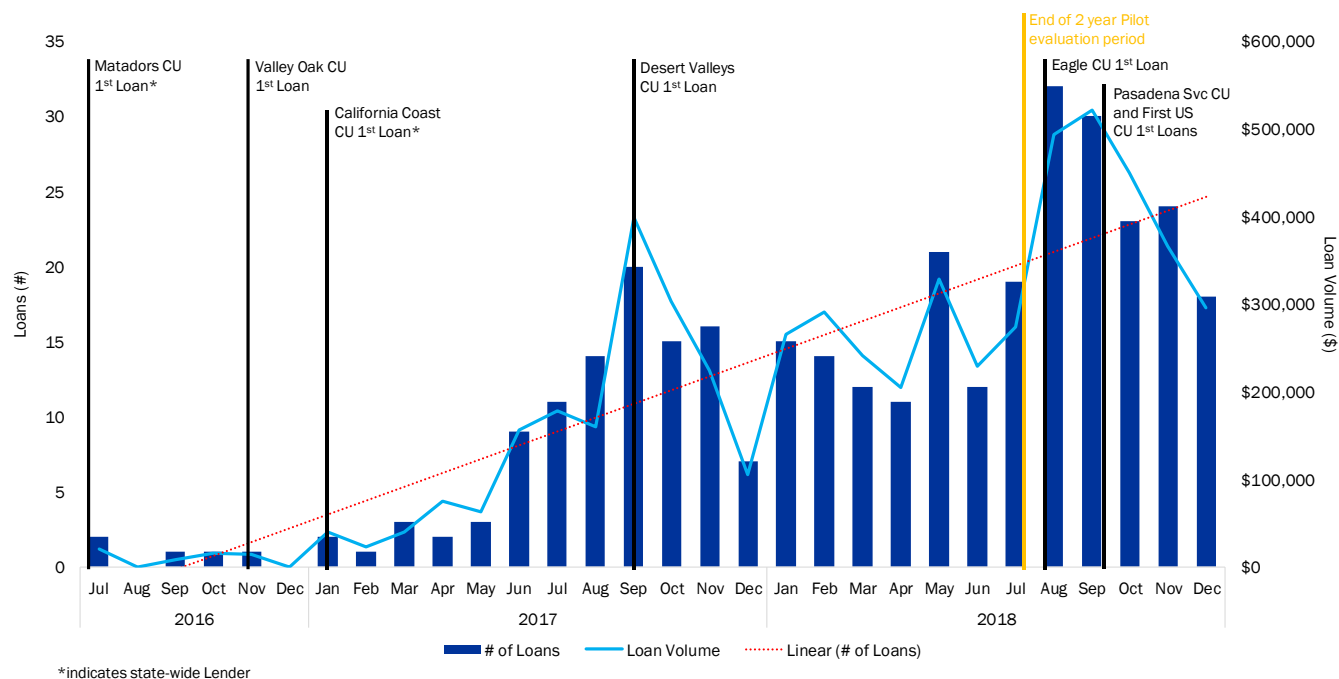
Lender	Type	Date of First Loan	# of Loans	Original Loan Amount (Private Capital)	LLR Contribution	Proportion of Loan Volume Private Capital by Lender (%)
California Coast Credit Union	Statewide	1/13/2017	224	\$3,756,058	\$496,250	65%
Matadors Community Credit Union	Statewide	7/19/2016	85	\$1,560,791	\$227,760	27%
Desert Valleys Federal Credit Union	Regional	9/11/2017	12	\$189,553	\$25,701	3%
First US Community Credit Union*	Regional	9/28/2018	8	\$116,526	\$15,925	2%
Eagle Community Credit Union*	Regional	8/10/2018	5	\$79,337	\$12,615	1%
Valley Oak Credit Union	Regional	11/28/2016	4	\$62,645	\$7,581	1%
Pasadena Service Federal Credit Union*	Regional	9/20/2018	1	\$19,319	\$1,905	0%
Total			339	\$5,784,229	\$787,737	100%

Source: CAEATFA tracking data. * indicates that the lender enrolled and began loans between July and December 2018.

Loan Volume Growth

Lenders joined the pilot at various times, starting with Matadors Community Credit Union, followed by the other large volume lender, California Coast Credit Union, six months later. However, REEL loans really began to ramp up about one year into the pilot and have continued to build momentum (see more on scalability in Section 4.8). Figure 4 shows the growth in loan volume month by month based on data available at the time of this evaluation. Notably, loan volume has grown steadily while experiencing some seasonal fluctuations.

Figure 4. Month-by-Month REEL Loan Growth

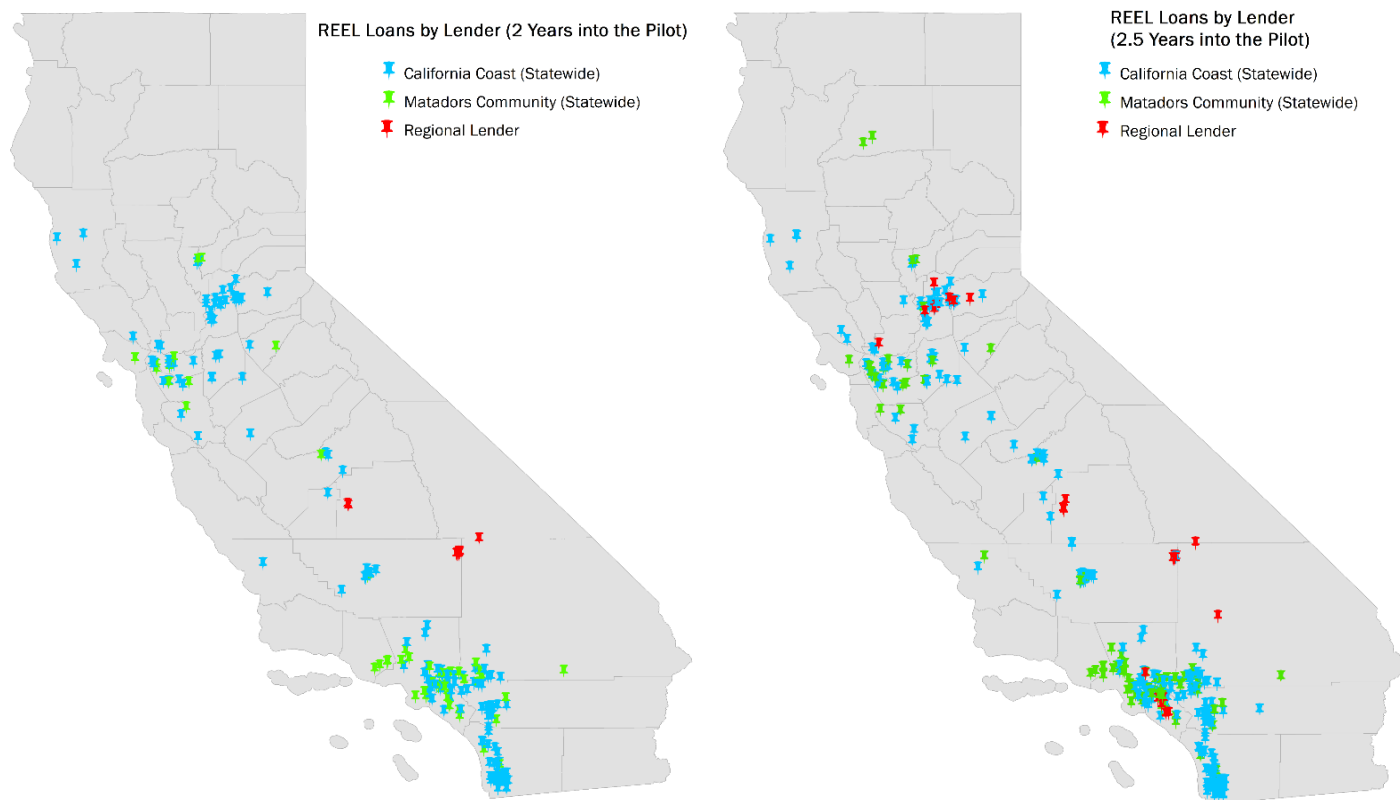


Source: CAEATFA tracking data.

Geographic Distribution

Figure 5 shows the distribution of REEL loans throughout California, distinguishing between the two statewide lenders (California Coast Credit Union and Matadors Community Credit Union) and the regional lenders. While California Coast Credit Union and Matadors Community Credit Union operate statewide, their branch locations are limited to Southern California. The maps show that the majority of the participation in the first two years was in Southern California; however, after two and a half years, there is a larger spread of participation throughout the state.

Figure 5. Geographic Distribution of Loans by Statewide and Regional Lenders



Source: CAEATFA tracking data.

Reaching Underserved Californians

One of the intentions of this pilot was to create a financing product for customers who would not be able to obtain loans elsewhere for EE upgrades. As such, the pilot attempted to target underserved residents by designing a loan product that expanded eligibility to affordable terms. Below is a description of how this pilot enrolled underserved residents in REEL lending in a myriad of ways.

REEL Changed the Lenders' Existing Loan Products

The lenders already had “signature” loan products for residential customers who were unsecured, but most were not focused on EE. REEL allowed lenders to increase loan amounts and terms and reduce their APR. For lenders who participated during the first two years, maximum allowable loan amounts saw increases ranging from \$30,000 to \$47,500, depending on the lender. All lenders increased the maximum allowable loan term from 5–5.5 years for their signature product up to 15 years for the REEL product. The REEL APR charged for borrowing was also reduced by 4.6% on average compared to their signature products. During the pilot period, two-thirds of the loans had longer terms than the lenders' comparable signature products, which created lower monthly payment options. While all lenders indicated REEL made up a very small portion of their total loan portfolio, given its introduction in the market and narrow industry focus, they believed it enhanced their product offering. Most borrowers selected REEL over lender's other similar

products, but one lender reported that, when given the option, 90% of borrowers chose their secured EE/RE loan over REEL because it included solar.

Looking at the loan amounts and terms offered, as shown Table 6, the average loan amount was \$17K, the average loan term was about 10 years, and, on average, customers paid about \$200 per month. While the average interest rate of 7% was attractive, the average term length of 10 years was the driving force behind the lenders' ability to offer customers a more affordable monthly payment than they would have with their signature products.

Table 6. REEL Loan Product Summary – Inception through July 2018 (N=212)

Characteristic	Average	Median	Range
Loan Amount	\$17,246	\$14,174	\$3,366–\$50,000
Interest Rate	6.95%	6.88%	4.50%–8.95%
Loan Term	117 months	120 months	24–180 months
Monthly Payment	\$219	\$181	\$50–\$801

Source: CAEATFA tracking data.

The pilot's design was intended to benefit underserved borrowers by offering more favorable loan terms (for example, longer payback periods or lower interest rates) compared to alternative financing options, such as traditional unsecured term loans. REEL has notable success in this area, while also offering no prepayment penalties or closing costs.

Loan Performance in Pilot Period

Given that most of the 212 loans had only a few months to make payments within the evaluation period and that most loan terms are as long as 10 years, it is too early to assess the loan performance of REEL at this time. However, this evaluation reports on the performance statistics available below to document what is currently known.

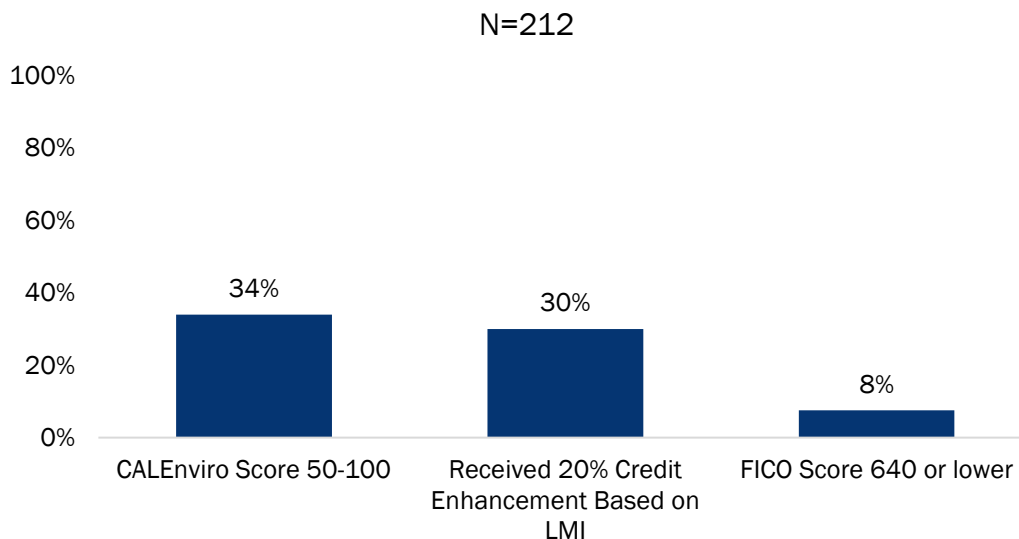
- **Default rate was 0% in pilot period:** No participants defaulted in the pilot period and only one participant defaulted after the first two years (resulting in a direct loss of \$2,250).
- **Bridge funding is minimal so far; 6% are paid off:** Thirteen participants paid the loan in full during the pilot period (with the credit enhancement returned in full to the REEL LLR for future loans). These participants suggest the possibility that the lack of a prepayment penalty and the low monthly payment may encourage some customers who did not truly need the financing to use REEL as “bridge funding” (that is, with the intention to pay the loan back very quickly).
- **Other indicators of loan performance:** In the last month of the pilot period, a few customers started to make late payments, ranging from 1–5 customers per month, mostly in the 30-day late period.

Underserved Status of Pilot Participants

The pilot has also demonstrated clear success in reaching underserved Californians when looking at participant data across numerous indicators. Approximately one-third of pilot loans reached underserved communities according to household income or census tract median income, and these loans represented 51% of total financing in the first two years (approximately \$1.9 million), which surpasses the requirement

set forth in D. 13-09-044.²⁴ Resolution E-4900 also required the pilot to be evaluated according to other “underserved” metrics, such as CalEnviro Score. As shown in Figure 6, among the first 212 participants, approximately one-third could be considered underserved in terms of CalEnviro Scores or the proportion that received a 20% credit enhancement due to LMI status. Going by FICO score alone, only 8% might be considered underserved or credit-challenged. Further details for each of these three indicators of underserved status are discussed below.

Figure 6. Proportion of Pilot Participants that are Underserved (Inception through July 2018)



CalEnviro Score

CalEnviro Scores offer additional insight into how REEL is reaching underserved communities. Table 7 shows that 13% of the participants in the first two years live in the most vulnerable census tracts, with CalEnviro Scores above the 75th percentile (that is, those with the highest 25% of scores for pollution burden and socioeconomic vulnerability), while another 21% live in the second most vulnerable tract, above the 50th percentile.

²⁴ D. 13-09-044, pg. 33.

Table 7. CalEnviro Scores among Participants

Tract	CalEnviro Score (Percentile)	Inception through July 2018 (N=212)	Inception through Dec 2018 (N=339)
Least Vulnerable	1–25	33%	33%
	26–50	33%	29%
	51–75	21%	24%
Most Vulnerable	76–100	13%	14%

Source: CAEATFA data.

Credit Enhancements for Underserved Customers

To mitigate the lender risk to underserved borrowers, the REEL LLR for underserved borrowers is set at 20% of the loan value and 11% for others.²⁵ The pilot dispersed this 20% credit enhancement to borrowers based on whether they met LMI standards or were credit-challenged. These were defined in the following ways.

- **LMI** is defined in two ways in the pilot period:
 - **Lender-reported household income** falls below the LMI threshold for the area in which the borrower resides. However, lenders calculated household income inconsistently, always assumed a household of four, and typically excluded spousal income.
 - **LMI census tract:** The property upgraded with the REEL loan is in a census tract in which the median family income does not exceed 120% of area median family income.
- **Credit-Challenged:** The borrower has a credit score below 640 and the lender participates in the Credit-Challenged Program, which entails additional agreement between CAEATFA and the lender to provide lower rates and longer terms.

The pilot had a target of disbursing approximately one-third of the total credit enhancements to LMI single-family residents.²⁶ As shown in Table 8, it exceeded this target in the first two years by disbursing 41% of the total credit enhancements to underserved residents. Further, one-third of the loans received a 20% credit enhancement due to LMI status in the first two years. Both trends have increased slightly after two and a half years. The CAEATFA's definition of LMI was further validated through a participant survey where the evaluation team found that the self-reported income and household size definition of LMI status for the sample of 49 participants aligned with the LMI status in CAEATFA's tracking records.

Further, none of the 212 participants in the first two years received a credit enhancement because they were credit-challenged; instead, participants received it based on LMI status. However, 8% of participants did have FICO scores below 640. Only one loan in the two-and-a-half-year period qualified for the 20% credit assessment based on FICO score (notably, this customer's property is also in an LMI census tract).

²⁵ California Code of Regulations Title 4 Business Regulations, Division 13. 2015.

²⁶ D. 13-09-044, pg. 33.

Table 8. Credit Enhancements to Underserved

Credit Enhancement Level	% of Loans through July 2018 (N=212)	% of Loans through Dec 2018 (N=339)
Not Underserved: 11% enhancement	70%	62%
Underserved: 20% enhancement	30%	38%
Received because deemed credit-challenged	0%	<1%
Received because LMI based on household income	17%	11%
Received because LMI based on census tract	14%	27%
Total Credit Enhancements	\$475,821	\$787,737
Total Credit Enhancements to Underserved	\$195,766	\$389,091
% of Total Credit Enhancements to Underserved	41%	49%

Source: CAEATFA data.

FICO

Very few of the participants to date can be considered underserved as defined by their FICO score alone. Borrowers with FICO scores as low as 580 are considered for loans under REEL. However, for applicants with FICO scores between 580 and 640, the lender must verify the borrower's income as part of the underwriting process. Based on pilot records, 76% of participants have "good" or "excellent" credit (FICO score above 700), while only 8% had "very poor" or "fair" credit (FICO score below 641).

Debt-to-Income Ratios

Debt-to-income (DTI) ratios are often used to determine creditworthiness or ability to pay. This is not necessarily an indicator of underserved status but is helpful in characterizing who has participated so far. DTI ratios above 36% are often considered riskier borrowers, while DTI ratios above 55% are commonly considered far too risky for any lending, even with REEL support. As shown in the table below, 54% of the participants in the first two years had riskier DTI ratios, between 36% and 55%, and this proportion fell only slightly to 52% after two and a half years. These data suggest that the pilot design is reaching a large proportion of customers with riskier financials who would have likely not received a loan at all or certainly one with less attractive terms than REEL.

Table 9. Debt-to-Income Ratios among Participants

DTI Ratio	Inception through July 2018 (N=212)	Inception through Dec 2018 (N=339)
46%–55%	21%	19%
36%–45%	33%	33%
25%–35%	32%	32%
Under 25%	14%	17%

Source: CAEATFA data.

Product Changes That Could Reach More Underserved Customers

As mentioned above, CAEATFA designates a borrower as potentially LMI based on whether his/her address is located in an LMI census tract as classified by the Federal Financial Institutions Examination Council (FFIEC). FFIEC classifies a census tract as LMI if its median household income is 120% or less than the AMI of the closest MSA or county if no MSA is available. According to this definition, of the 8,068 census tracts in California, approximately 66% of them would be considered LMI (see Table 10 below).

Table 10. Market Size of LMI Census Tracts in California

LMI Status	Census Tracts (Count)	Percent
LMI (120% or less than AMI)	5,325	66%
Not LMI	2,618	32%
Unknown	125	2%
Total	8,068	100%

Some other loan programs in other states have taken further steps to direct financing toward customers most in need that REEL should consider. For example, the New York State Energy Research and Development Authority (NYSERDA), as a direct lender, introduced tiered interest rates, charging higher rates to households with higher income and high credit ratings, while continuing to offer subsidized lending to lower-income/lower FICO applicants. CT Green Bank introduced a “Credit-Challenged Program,” expanding underwriting requirements and loan access to participants with lower scores (FICO < 580). For further improvements, CT is considering the possibility of covering only loans that are not super-prime with the LLR.

REEL-Certified Contractors

The pilot successfully recruited and certified a pool of contractors who serve most counties in the state, and the number of contractors has grown significantly over time. Based on survey responses from 52 of these contractors (n=52), REEL contractors represent a large mix of business sizes. Table 11 and Table 12 summarize the business size (in terms of revenue and number of employees) of the REEL contractors who responded to the survey. Interestingly, one lender interviewed mentioned that larger contractors that have more staff and administrative support are driving applications. It reported that REEL is much more onerous for smaller contractors. Although business size did not vary between active and dormant contractors who responded to the survey, the evaluation team researched the most active REEL contractors to better understand the business make-up of the largest sellers. There are seven contractors (6% of the 119²⁷ who completed REEL loans) who together completed roughly one-third (n=99) of the 339 projects completed in the first two and a half years. All seven of these contractors are larger businesses; they have an established internet presence, dedicated sales and administrative staff (the smallest of these companies appears to have a staff of 11 and the largest a staff of 75), operate in multiple states (two of the seven), and have been in business for at least 15 years.

²⁷ The count of unique contractors is based on unique Contractors State License Board (CSLB) ID and does not include self-installers.

Table 11. REEL Contractors' Gross Annual Business Revenue in California

Response (among valid responses)	Count	Percent
Less than \$100,000	4	8%
\$100,000 to less than \$500,000	12	23%
\$500,000 to less than \$1 million	9	17%
\$1 million or more	27	52%
Total	52	100%

Table 12. REEL Contractors' Business Size

Number of Employees	Total	
	Count	Percent
5 or less	23	40%
6–10	13	23%
11–50	15	26%
51–99	4	7%
100 or more	2	4%
Total	57	100%

Survey data also indicate that the pilot recruited experienced, versatile, and highly qualified residential retrofit contractors into its pool who can assist with multimeasure retrofits. These contractors are typically very experienced with the California residential market (75% have offered residential services for more than 10 years). As shown in Table 13, almost all the contractors offer multiple services.

Table 13. Summary of Contractor Survey Respondent Specialties

Service Offered by Company (n=57)	Total	
	Count	Percent
Do renovations or building additions	27	47%
Weatherize and insulate homes	39	68%
Install windows	31	55%
Install water heating systems	41	73%
Install space heating systems	44	77%
Install space cooling systems, such as air conditioners	50	88%
Install lighting	24	43%
Install solar panels	25	44%
Install swimming pool equipment, such as pool pumps	18	32%

While the lack of an enrollment date prevents the evaluation team's ability to determine the percentage of certified contractors who completed a REEL project during the two-year study period, of the 282 certified contractors listed on the CAEATFA's website in December 2018, fewer than half (a total of 119) completed projects with REEL financing during the first two and a half years. In the first two years, 82 contractors completed at least one project and, among this group, the majority (68%) completed one or two projects. The most projects completed by any one contractor was 28.

4.2 Energy Savings

Objective 2

Determine how much energy savings REEL produced in the pilot period, including gas and electric savings, per participant and overall.

The evaluation team estimated gross and net electric, demand, and gas impacts through a linear fixed effects regression (LFER) analysis of consumption data. The team used two types of LFER: one with participants only and the other with participants and a matched comparison group. The former produces gross impacts and the latter produces impacts that are close to net.²⁸ Chapter 5 provides more detail on the consumption analysis methods and results. Notably,

the cost-effectiveness analysis in this report relied on the gross savings estimates.

The pilot achieved measurable gross and net energy (kWh), demand (kW), and gas (therms) savings in its first two years. As shown in Table 14, the pilot achieved approximately 64 MWh, 7 kW, and 1,262 therms in net savings. Energy savings across fuel types and models are all statistically significant at the 90% confidence level. Participants, on average, experienced gross electric savings of 12.8% and net electric savings of 5.4%.

Table 14. REEL Pilot Gross and Net Savings (First Two Years of Pilot)

Total Participants	Savings	Units	Total Pilot Savings
212	Gross	kWh	157,081
		kW	17
		Therms	2,321
	Net	kWh	63,749
		kW	7
		Therms	1,262

The pilot achieved much higher average per-home electric savings than it did for gas savings. For comparison purposes, REEL average net electric savings per participant derived from the consumption analysis (301 kWh) is very close to what was recently found for the 2017 AHUP (average savings per participant was 371 kWh based on a similar consumption analysis with a comparison group approach).²⁹ Conversely, REEL achieved fairly low average per-home gas savings (6 therms), lower than what was found in the recent Home Upgrade Program (HUP) and Residential HVAC impact evaluations. Home Upgrade achieved 35 evaluated net therms per participant³⁰ and Residential HVAC (specifically furnace replacements) achieved 12 evaluated net therms per participant.³¹

²⁸ The evaluation team's ability to control for self-selection was limited due to a lack of data on customer characteristics.

²⁹ DNV-GL. Impact Evaluation Report Draft - Home Upgrade Program. March 2019. Prepared for the CPUC.

³⁰ Ibid.

³¹ DNV-GL. Impact Evaluation Report Draft - Residential HVAC. March 2019. Prepared for the CPUC.

Table 15. REEL Pilot Average Savings as a Percentage of Annual Consumption (First Two Years of Pilot)

Impacts	Units	Participants in Model	Per-Participant Average Daily Savings	Per-Participant Average Annual Savings	Percent of Average Annual Baseline Consumption
Gross	kWh	157	2.03	741	12.8%
	kW	157	0.08	N/A	6.9%
	Therms	150	0.03	11	2.6%
Net	kWh	157	0.82	301	5.4%
	kW	157	0.03	N/A	2.9%
	Therms	150	0.02	6	1.5%

The pilot's measure mix and geographic spread provide some potential explanations for the savings results. Table 16 summarizes the measure mix of REEL-financed projects in the first two years. Notably, HVAC equipment was by far the most common measure, followed by building shell upgrades. More specifically, 76% of projects replaced central air conditioning or, in very few cases, heat pumps, which typically use electricity as the primary fuel. Replacing a split system (that is, furnace and air conditioner) was very common and as a result about two-thirds (67%) replaced their furnace. However, as previously discussed, REEL projects have typically been in Southern California and the Central Valley, where cooling loads (typically electric) are much greater than heating loads (typically gas). This may explain the difference between gas and electric savings despite the prevalence of furnace replacements.

Table 16. Measure Types Financed by REEL Projects (First Two Years of Pilot)

Measure	Percent of Participants (N=212)
Average number of measures	2
HVAC	
HVAC equipment	69%
Ductwork	27%
Building Envelope	
Windows	33%
Insulation	31%
Air sealing	11%
Cool roof	10%
Radiant barrier	2%
Water Heater	
Water heater	10%
Low-flow shower head or faucet	1.0%

Measure	Percent of Participants (N=212)
Other	
Smart thermostat	5.7%
Lighting	2.4%
Pool products	1.9%
Refrigerator/freezer	1.0%
Dishwasher	1.0%
Clothes washer/dryer	0.5%
Air purifier	0.5%
Other – unspecified	1.0%

Source: CAEATFA tracking data.

Finally, the measure mix provides some insights into the longevity of annual savings. According to the Database for Energy Efficiency Resources³² (DEER), air conditioner and heat pumps (75% of projects) have an effective useful life (EUL) of 15 years, furnaces (67% of projects) have an EUL of 20 years, and the various building shell measures above (up to 33% of projects, depending on the measure) have EULs between 18 and 20 years.

4.3 Pilot Influence on Customer Decision Making

Objective 3

Explore the influence of the pilot on customer decision making to install energy upgrades.

While the evaluation team finds measurable energy savings from this pilot, it is important to explore whether these savings would have naturally occurred in the marketplace with other financial mechanisms available to customers, that is, would customers have taken a different loan instead for the same project? Or would they have paid for the exact same project with other means? Or is there some more nuanced influence of

REEL, such that it did, at least partially, have some level of influence on the size of the project, nature of the project, or timing? Exploring if and how the REEL pilot influenced the energy savings to occur helps determine if this pilot is needed in the marketplace to generate energy savings for the state.

In Chapter 6, the team provides an estimate of the net savings based on the difference in energy usage between pilot participants and a matched comparison group. Based on this approach to exploring pilot influence on savings, if the total net savings is divided by the gross savings, it can be surmised that 41% of the electric and demand savings and 54% of the gas savings occurred, at least in part, because of the REEL pilot.

The consumption analysis approach is one way to quantify the counterfactual for the pilot. This evaluation also explored the influence of REEL through a survey of 49 of the first 212 participants in the pilot. Quantifying the influence of a financing program on customer decision making is very challenging, but the evaluation team attempted an approach in the participant survey to better understand whether participants

³² DEER website. <http://www.deeresources.com/index.php/component/users/?view=login>. 2014 Updated DEER effective useful life table: http://www.deeresources.com/files/DEER2013codeUpdate/download/DEER2014-EUL-table-update_2014-02-05.xlsx.

thought that they would have qualified for other loans at rates and terms they could afford or accept, and whether they would have taken loans from elsewhere for the same upgrades.

Below is a summary of key takeaways from the participant survey regarding participants' need for financing in general and the specific influence of REEL versus other financing options. A topline of all participant survey results can be found in Chapter 8 and more detail on pilot influence is available in Section 6.2.

4.3.1 Motivations for Doing a Home Upgrade Project

While financing is a tool for making home upgrade projects more affordable, it is not usually the impetus for deciding that there is a need to do a home upgrade. As shown in Table 17, the most common motivators among respondents were the desire to reduce energy bills and increase comfort (more than half of respondents cited one of these). The next most common motivation (20%) was to repair existing equipment.

Table 17. Motivations for Home Upgrade

Motivation	Frequency	Percent
Reduce energy bills	14	29%
Comfort (home too hot or cold)	12	25%
Equipment repairs	10	20%
Improved environmental friendliness	6	12%
Home structure repairs	4	8%
Prepare for sale	2	4%
Something else	1	2%
Total	49	100%

4.3.2 Need for Financing in General

Participant survey responses make it clear that the kind of projects respondents completed typically required financing. Almost half (49%) said that they used financing because they did not have enough cash on hand to do the project right away, and another 6% did not want to deplete the cash they had. Many participants reported needing a loan to do any project at all (49%), to do it with the same level of EE (30%), to do the same size project (49%), or to do it sooner than they otherwise would have (39%); 65% needed a loan for at least one of these reasons (see Table 18).

Table 18. Need Financing in General for Energy Upgrades

Need for Financing in General	% of Participants (n=49)
Needed financing for any reason below	65%
Needed financing to do a project at all	49%
Needed financing to do the full size of the project	49%
Needed financing to do the full project at one time	39%
Needed financing to get energy-efficient level	30%

4.3.3 Influence of REEL

The pilot is only one of many possible options for financing a home upgrade project. While some participants may have alternatives, others who have poor credit ratings or substantial DTI ratios may not, or they may have less attractive options.

Survey data showed that most participants did not shop around for loans, which supports the benefit of offering the loan through contractors; the loan is likely to be very attractive to customers because it is convenient. Of the 16 participants in the survey sample who did seek other loans, only 5 (one-third) felt they that could qualify for those other options. Of the 16 who did shop for alternatives, about a third found at least one that they qualified for, but most found that other loans were less affordable than REEL (Table 19). Further, **only 16% of survey respondents thought that they could have qualified for a loan with better terms if they had sought it out.** This supports the argument that the key difference between REEL lending and alternatives is that it extends loan terms for energy upgrades that translate into affordable monthly payments for customers and therefore can encourage more customers to do EE projects than they could otherwise afford.

Table 19. Alternatives Participants Sought before Choosing REEL

Categories	% of Participants (n=49)
Did NOT seek other financing options other than REEL	67%
Did seek other financing options other than REEL	33%
Among Those Who Sought Alternative (n=16)	
Sought and would NOT qualify for alternative financing	11%
Sought and would qualify for alternative financing	5%

While some participants in the survey did shop for alternative loans, they did think that REEL offered the best loan terms that they could find, especially in terms of interest rate and loan duration, both of which affect the monthly payment. The most common reason participants gave for choosing REEL financing related to the favorable terms of the loan (Table 20).

Table 20. Reasons for Choosing REEL (Multiple Response)

Response	Count	Percent (n=49)
Loan Terms		
Low interest rate	26	53%
No lien on house	5	10%
Attractive loan terms (general)	6	12%
Monthly payment	3	6%
Loan duration	3	6%
No prepayment penalty	1	2%
Loan amount	1	2%
No down payment	1	2%

Response	Count	Percent (n=49)
Connection to Contractor or Other Organization		
Contractor recommendation	8	16%
Connected to Credit Union	2	4%
Connected to the CPUC	1	2%
Qualification and Application Process		
Easy qualification	4	8%
Ability to Qualify		
Only financing offered to them	1	2%
Could not qualify for other financing	1	2%
Able to qualify	1	2%
Other – Not Related to REEL		
Rebates available	2	4%
Not enough cash on hand	1	2%
Wanted to save money	1	2%
Interest in EE	1	2%

Perhaps the most telling indicator of how much REEL influenced the energy savings in the pilot is what participants said that they would have done if REEL was not available. Using the decision tree that provides a framework for measuring attribution for financing (see Section 6.3), the evaluation team developed a method to measure the influence of financing in general and the influence of REEL in particular. The team ascertained that at least 27% of the projects would not have occurred if REEL was unavailable. On the other extreme, one-quarter of the projects would likely have occurred without the pilot. REEL at least partially influenced half of the projects. These data from just the first cohort of participants in the pilot indicate that this pilot has the potential to garner more energy savings for the state than would occur naturally in the marketplace through alternative financing options available to customers.

Table 21. REEL Influence on Pilot Projects

Influence of REEL on the Energy Savings from the Pilot	% of Participants (n=49)
REEL had FULL influence: These participants indicated that they would not have done a project at all without REEL.	27%
REEL had NO influence: These participants indicated that they would have done the exact same project with alternative financing.	24%
REEL had partial or ambiguous influence: These participants likely have done a project, but it might have been smaller or less efficient or done later. Some of these participants also had difficulty answering the influence questions and teasing out REEL from financing in general in their decision-making process.	49%

4.4 Pilot Benefits and Costs

Objective 4

Explore the costs versus benefits of the REEL product during the pilot period and compare them to other residential DSM investments.

The evaluation team conducted a comparative C/B analysis of the REEL pilot, assessing a range of relevant quantitative and qualitative metrics. The team then compared the REEL pilot C/B result to those from other program models, including two future REEL program rollout scenarios and other residential DSM financing and rebate-based initiatives in California. These metrics are presented alongside the Resolution E-4900 metrics results to evaluate the pilot impacts and determine the overall

program scalability as a longer-term program or financial product.

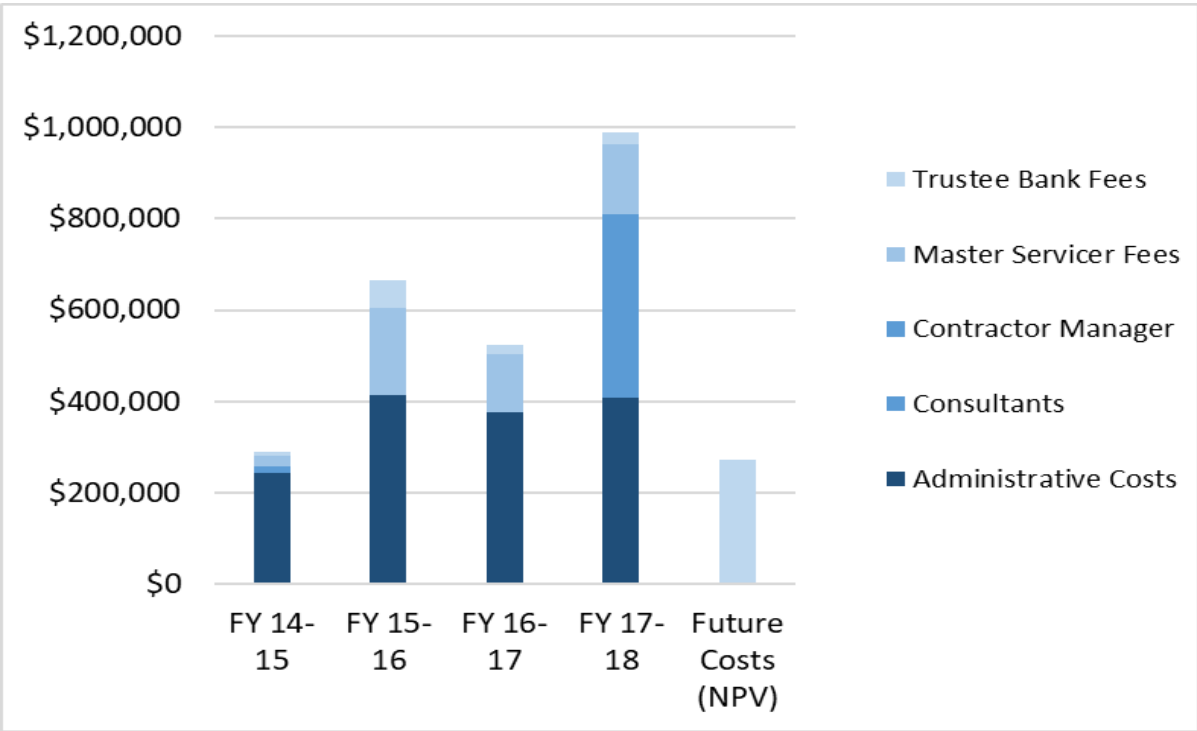
The C/B assessment presented here applies a set of standard efficiency resource program cost-effectiveness tests. While cost-effectiveness testing was not initially included in the Resolution E-4900 metrics, these tests are included alongside a range of other metrics to provide an apples-to-apples C/B comparison of the REEL pilot to other DSM program models. This analysis did not aim to determine if the REEL pilot itself was cost-effective, but instead sought to assess whether the REEL model would **over time** eventually prove to be cost-effective as a resource program supported by ratepayer funds.

To make this assessment, cost-effectiveness tests were applied to the following REEL models:

1. **REEL Pilot:** Based on actual pilot operating expenditures (excluding start-up costs), participation, and estimated average savings per participant for the two-year evaluation period (FY16–17 and FY17–18).
2. **REEL BAU:** A future REEL program scenario that assumes modest savings in expenditures and a modest increase in participation (240 participants per year) over a five-year period.
3. **REEL+:** A future REEL program scenario that assumes increased expenditures (additional staff and investments in IT and an OBR option) and a significant increase in participation rates (865 participants per year) over a five-year period.

Expenditures in the first two years of the pilot (FY14–15 and FY15–16) were designated as start-up costs to build the infrastructure and team needed to design and manage the program and to recruit lenders and contractors. The evaluation period (FY16–17 and FY17–18) includes remaining start-up costs and operating costs associated with the LLR (bank trustee fees, master servicer fees), contractor management, consultants, and administrative costs (operating expenses and equipment, employee benefits and salaries). LLR-related costs (bank trustee fees) occur over the life of the loans and are thus included, discounted to FY17–18 dollars. Figure 7 breaks down how funds were spent since the pilot's inception through the end of the evaluation period.

Figure 7. REEL Pilot Expenditures from FY14-15 to FY17-18



To assess the cost-effectiveness of each REEL model, the evaluation team applied an interpretation of the California Standard Practice Manual³³ (SPM) cost-effectiveness tests that are adapted to include the specific costs and benefits that are relevant to financing programs. The specific financing-related benefits and costs are shown in Table 22.

Table 22. Benefit and Cost Components

Benefits		Costs	
Component	Description	Component	Description
Energy	NEBs from EEEMs	Admin	Program administrative and marketing costs,* including contractor management
Market Trans	Net benefits from market transformation	Part. Cost	Net participant cost
APR Benefits	Reduced APR benefits	LLR Losses	LLR default losses
Other Non-Energy	Other net NEBs (for example, comfort, utility, and environmental externalities) derived from EEEMs, and from the non-EEEM portion of the REEL loans (under the mid and high scenario only).	LLR OppCost	LLR lost opportunity costs (costs for encumbered capital)
		Contractor Costs	Costs principally for contractor training
		Master Servicer + Bank Trustee	Costs from Master Services and Bank Trustee

* Marketing costs do not include expenditures by the marketing service provider, Center for Sustainable Energy.

³³ CPUC. 2001. California Standard Practice Manual Economic Analysis of Demand-Side Programs and Projects.

A comparison of where benefits and costs differ among the three models on an annual basis is shown in Table 23. Specifically, costs differ based on the expected number of participants, wherein an increase in the administration, LLR management, training, and outreach costs would increase incrementally with program participation, based on cost projections provided from CAEATFA. Similarly, the benefits are prorated to program participation, for example, the expected energy savings are directly proportional to the number of participants (that is, no changes in average savings per participant would be expected under increased program volume scenarios).

Table 23. Cost-Benefit Comparison across Three REEL Models

Variables	REEL Pilot (FY 2017-18)	REEL BAU (Program Projection) Annualized	REEL+ (Program Projection) Annualized
Costs (\$M)			
Administration and marketing	0.4	0.5	0.4
LLR Losses + Master Servicer + Bank Trustee	0.2	0.2	0.5
Contractor Management	0.4	0.4	0.4
Benefits			
First year gross savings (kWh)	138,600	177,800	654,300
First year gross savings (Therms)	2,057	2,640	9,713
Number of loans	187	240	883

For each scenario, the evaluation team assessed the program cost-effectiveness, applying a range of benefits values to represent the uncertainty around the potential values and assumptions. The cost-effectiveness test results (Table 24) are then presented as a range, with the “Low” values representing the results obtained when the most conservative benefits assumptions are applied, the “High” values representing the most optimistic benefits assumptions, and the “Mid” values representing the most realistic benefits assumptions (see Appendix B for each scenario assumptions).

Table 24. Cost-Effectiveness Results for the REEL Pilot and Two Future Programs (REEL BAU and REEL+)

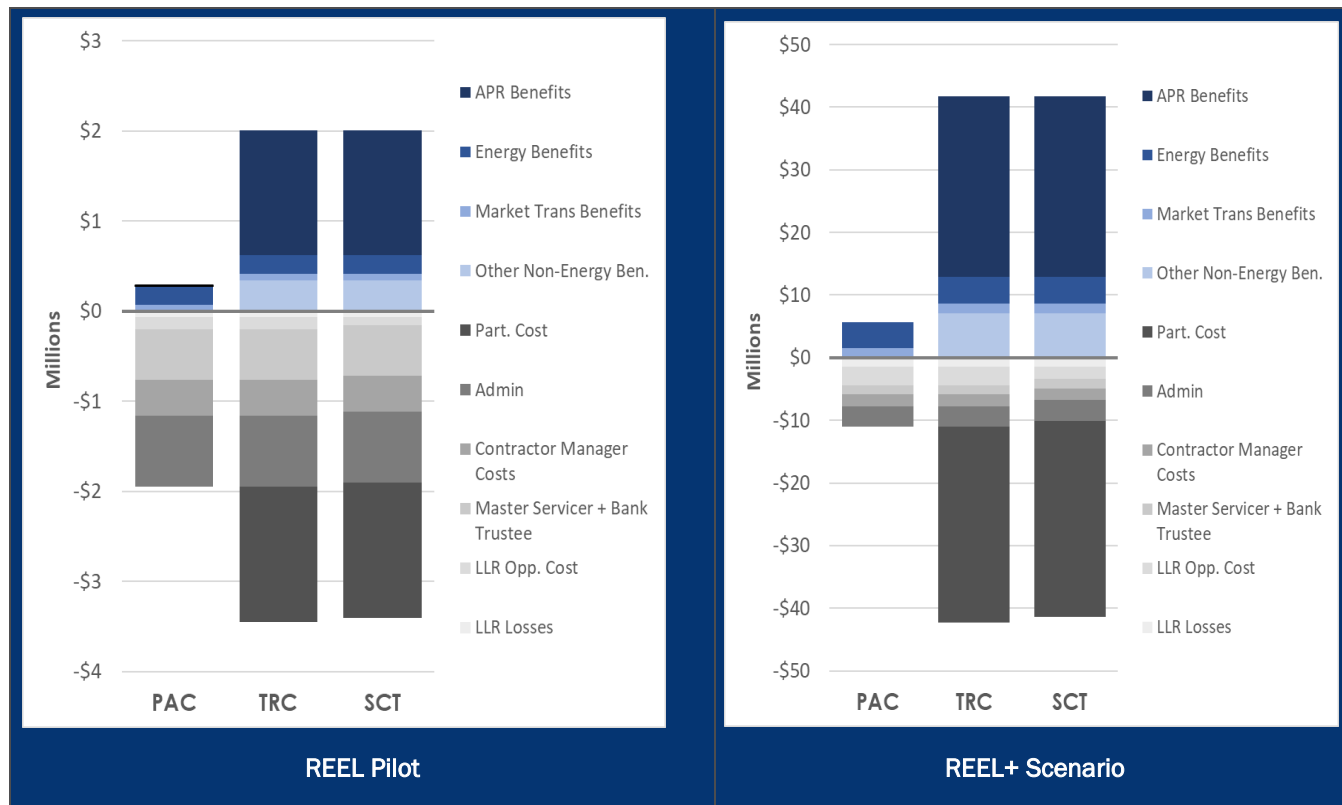
REEL Scenario	Cost-Effectiveness Results (Financing Program Model)*			
	PCT	PAC	TRC	SCT
REEL Pilot excluding start-up costs	1.09 (0.93, 1.29)	0.14 (0.10, 0.18)	0.50 (0.40, 0.59)	0.57 (0.51, 0.66)
REEL BAU excluding start-up costs		0.23 (0.16, 0.31)	0.63 (0.52, 0.78)	0.73 (0.65, 0.88)
REEL+ excluding start-up costs		0.52 (0.33, 0.80)	0.84 (0.68, 1.06)	0.97 (0.86, 1.20)

* The “Mid” scenario results are in bold. The “Low” and “High” scenario results are in parentheses below.

Figure 8 shows that program administration, contractor management, and LLR management costs make up a significant portion of REEL costs. As volume increases under the REEL+ scenario, administration and LLR management costs make up a smaller portion of the overall costs, as these costs are largely fixed. However, they remain sizable and continue to affect REEL’s ability to achieve cost-effectiveness thresholds. Benefits are

largely driven by NEBs, namely, APR reductions accrued by participants, which lead to lower monthly payments and expand access to capital for some borrowers.

Figure 8. Comparison of REEL Pilot and REEL+ Scenario Benefits and Costs



These results provide the following key takeaways.

1. The current administrative costs associated with REEL lead to reduced cost-effectiveness when the program volume is low. If an eventual REEL program could achieve annual volumes on the order of 2,000 loans per year or more, it could approach cost-effective delivery.
2. While contractor management costs are somewhat high, interviews with CAEATFA, PAs, lenders, and other jurisdictions revealed that contractor support is critical to program success.
 - Neither the REEL pilot nor the two future hypothetical program projections pass the cost-effectiveness threshold (> 1.0) for the PAC, TRC, and SCT under the Low and Mid scenarios. The REEL+ program is cost-effective under the TRC and the SCT High scenarios, where the inputs assume a decline in covered losses, increased market effects, a lower discount rate, and a higher value placed on NEBs. However, the evaluation team cautions that the High scenario applies the most optimistic assumptions for all program benefits (such as 100% NEBs adders for EEMs). The High scenario assumptions were intended only to provide an upper limit to the cost-effectiveness results rather than an expected outcome of a future program. As noted above, the Mid scenario is likely the most reasonable forecast.

- The programs are cost-effective from the participant perspective at 1.09. The PCT benefits do not change among scenarios because costs and benefits from the participant perspective are not affected by program volume or administration costs under the current model.
3. The PAC is particularly low. This runs counter to conventional cost-effectiveness expectations, where PAC ratios are typically higher than the TRC and SCT. PAC results are lower in this case as energy savings make up a small portion of the overall benefits and the PAC does not account for the APR reduction, which is by far the largest program benefit, but is only counted in the TRC and SCT because it accrues to the participants only.

To provide context for these results, the evaluation team benchmarked the pilot and two future REEL program projections with other residential DSM investments, including Energy Upgrade California (EUC), the Residential HVAC program, and the Residential Regional Finance Pilots (RFPs) that were funded with the ARRA. While these are not apples-to-apples comparison, given differences in program designs, measure mix, and inputs used in the C/B tests, for example, RFP C/B tests were based on ex ante savings and indicated that ex post savings were on average only 25% of the ex ante savings values.³⁴ However, these comparisons provide some context for comparison, especially in terms of the costs side of the C/B equation. Table 25 presents the cost-effectiveness results.

Table 25. Comparison of Program Cost-Effectiveness Ratios

Cost-Effectiveness Ratios	REEL (Pilot) FY17–18	REEL BAU (Program Projection)	REEL+ (Program Projections)	Regional Finance Pilots 2013–2015	Residential HVAC Program Year 2017	EUC (HUP and AHUP) Program Year 2017
TRC Ratio	0.50	0.63	0.84	0.97–1.40 (0.76–1.16) ^a	0.03–1.26	0.27
SCT Ratio	0.57	0.73	0.97	1.03–1.46 (0.73–1.13) ^a	N/A	N/A
PAC Ratio	0.14	0.23	0.52	0.36–0.59 (0.09–0.15) ^a	0.14–1.49	0.63

^a The cost-effectiveness results for the RFPs were adjusted to account for the impact of applying the HUP ex post savings, which were 25% of the ex ante saving on average. All RFP participants were also participants of the HUP, but the ex ante / ex post savings ratio may differ between the RFP participants and the HUP participants as a whole.

From the evaluation team's cost-effectiveness analysis, the REEL model does not appear to pass the cost-effectiveness test as a pilot or in any future models. The following takeaways should be considered from these results.

- **The mature incentive-based EE programs struggle to achieve cost-effectiveness**, apart from some IOU Residential HVAC programs. California has adopted very aggressive EE and RE goals; achieving these goals has become more difficult due to the state's stringent codes and standards that have increasingly raised the minimum EE performance baseline.³⁵ While California's market transformation efforts are having a positive transformative impact, resource programs are challenged to deliver energy savings cost-effectively.

³⁴ DNV GL. 2019. Impact Evaluation Report Home Upgrade Program – Residential Program Year 2017 California Public Utilities Commission CALMAC ID: CPU0191.01.

³⁵ The California Title 24 Building Energy Efficiency Standards ensure new and existing buildings achieve EE. The standards are updated regularly by the California Energy Commission.

- **Increasing REEL loan volumes may improve REEL program cost-effectiveness.** As participation increases from the REEL BAU to the REEL+ models, administration and LLR costs have less effect on cost-effectiveness results as they are largely fixed. Focusing efforts on increasing the loan volume of the REEL+ projections of more than 2,000 loans per year could play a key role in improving the program's cost-effectiveness.
- **REEL's ability to deliver low-cost loans causes non-energy savings (APR benefits primarily) to far outweigh energy savings benefits.** The APR reduction makes up the largest proportion of program benefits by far. While participating lenders currently offer competitive interest rates, with some as low as 4.50%, maintaining REEL in market and continuing to demonstrate that REEL loans are performing well, particularly in risky market segments, could provide lenders with confidence to pass on greater savings to borrowers. The Michigan (MI) Saves Home Energy Loan Program demonstrated strong LLR performance, resulting in lenders reducing interest rates, which led to increased loan volumes. Increasing these benefits could offer the best path forward toward a cost-effective REEL program.
- **The REEL model as it is currently structured carries notable administrative weight,** which affects the ability of the program to operate cost-effectively while delivering low or moderate loan volumes. Finding solutions to reduce the administrative costs associated with contractor management (such as a shared contractor management platform with other state-wide DSM initiatives), bank trustee fees, and the master servicer could collectively improve the program's cost-effectiveness.

Finding a REEL program model that can achieve a TRC threshold > 1.0 will likely require leveraging several of the factors outlined above. A cost-effective REEL model would need to reduce program costs (administration and LLR management fees) *and* increase program volume and benefits (energy savings, accounting for other NEBs, and further APR reductions). However, the estimated savings per REEL participant are based on the gross savings found in this evaluation; applying net savings would further reduce savings and REEL's ability to achieve cost-effectiveness. REEL offers a variety of social, economic, and environmental benefits that are not fully accounted for in the model: helping underserved Californians make improvements that improve their comfort, reducing energy poverty, improving people's health; boosting the value of housing stock; increasing economic opportunities for partners; and accounting for the social cost of carbon. Finding opportunities to reduce costs, applying a longer-term lens to measure market impacts, and reevaluating how ratepayer funds are used to support California's climate-related goals should be considered.

4.5 Pilot Design and Implementation Model

The REEL organizational structure is made up of multiple actors; each plays a unique role and function to support REEL in achieving its goals, including:

- **The CPUC** is responsible for governance and broad decision making.
- **CAEATFA** is responsible for developing and implementing CEEF functions and various pilots to increase the flow of private capital to EE projects; managing all program aspects, including enrolling lenders; establishing project design and requirements; -and managing the flow of funds and data
- **IOUs** support initial program design and develop OBR and on-bill financing (OBF) infrastructure and marketing coordination.

- **The master servicer** developed and manages the centralized platform to collect financing enrollments and utility bill data and will facilitate future OBR infrastructure and transactions if incorporated into REEL.
- **The bank trustee** holds utility funds and the LLR accounts.
- **Private lenders** originate, enroll, and service loans under the program, providing them to the master servicer.
- **The contractor manager** recruits and trains REEL contractors and performs quality assurance, site inspections, and contractor support. This functionality was initially conducted by CAEATFA until it brought on an industry expert to serve this role in October 2017.
- **REEL contractors** install eligible EE measures and submit required project information to lenders.
- **The marketing implementer** (the Center for Sustainable Energy) designs and implements marketing, education, and outreach strategies.

Objective 5

Gain feedback on the pilot design and implementation model from key stakeholders, including PAs, CAEATFA, participating contractors, and lenders.

Stakeholder feedback provides important perspective to assess the effectiveness of the REEL implementation model and the potential for a REEL program to be scaled up in the future and to further understand how the efficiency financing market has transformed since the CPUC approved funding for the pilots in 2012. To meet this objective, the evaluation team conducted semi-structured in-depth interviews with CAEATFA; all seven enrolled

lenders³⁶; and six efficiency PAs, including the four IOUs (Pacific Gas & Electric [PG&E], Southern California Gas Company [SCG], San Diego Gas & Electric [SDG&E], and Southern California Edison [SCE]) and two RENs (Bay Area Regional Energy Network [BayREN] and Southern California Regional Energy Network [SoCalREN]).

Overall, these interviews played a central role in evaluating REEL's processes and identifying opportunities to fine tune the program to attract greater participation and support deeper savings.

CAEATFA and Program Administrator Perspectives

Pilot Design

The sentiment overall is that the REEL multilender model, with CAEATFA as PA, is supported by CAEATFA and the PAs. While all parties interviewed agreed that a state-backed program adds credibility, trust, and security, there are opportunities to enhance the REEL model and better define the target market. The following key findings about pilot design were uncovered.

- **There are several challenges with the current program structure.** CAEATFA and the PAs reported several pilot design challenges related to the customer and contractor experience and complications to verify participant eligibility. Interviewees felt that investing in IT infrastructure may improve contractor and customer experience; extending REEL to publicly owned utility (POU) territories would streamline eligibility for participants who are not served by an IOU (for gas or electricity) and reduce

³⁶ Only four lenders were participating during the evaluation period, but all seven lenders currently participating were interviewed.

administrative burdens and, although several changes have helped streamline the process, administrative requirements like loan-by-loan eligibility checks take time and create complexity.

- **REEL's status as a pilot is hindering growth.** CAEATFA reported that it was challenging to recruit larger lenders to a pilot program because they do not want to invest the time and money to set up a new lending product that may exist over a short timeframe. This sentiment was echoed by other stakeholders, who indicated that they struggled to see the long-term benefits from joining a pilot.
- **There is a lack of evidence on loan volume and performance.** The pilot's short timeframe does not allow for a proven track record of loan volumes and loan performance.
- PAs felt that there **is demand for EE financing and, as PACE financing declines, there are opportunities for REEL to fill the market gap. However, REEL needs to expand the eligible measures list and reduce barriers to make inroads.** Although new state PACE regulations have resulted in declining PACE volumes, REEL is not growing at the same rate to fill the gap. PACE allowed for RE, EE, and other measures. Allowing REEL to become a more comprehensive solution may increase participation.
- **State policy goals for greenhouse gas (GHG) and electrification are changing, and there is a need to reevaluate what customers and the market really need, how REEL can best serve the market, and whether ratepayer funds can be used.** There is a great deal of interest in electrification and renewables, and many customers in California are looking to go "green" to help the environment and mitigate climate change. REEL should include other energy solutions to align with state policies, for example, solar. However, if these measures are not be eligible under a ratepayer-supported efficiency program, it could limit REEL's ability to adapt to consumer demand and state goals under its current model.
- **CAEATFA and PAs suggest that the multilender model offers borrower's choice and the ability to work directly with lenders.** They also viewed the model as creating healthy competition among lenders and avoiding participants being locked into one option or term. However, one PA suggested that using a single lending partner may encourage that lender to make greater investments in technology and marketing needed to scale up REEL. Another PA suggested that one lender adds simplicity for borrowers ("Borrowers don't have to evaluate multiple rates and terms"). CAEATFA believes REEL could get to scale with an IT investment and enrolling large FIs, RICs, or a single originator that could standardize application processing and sell to the secondary market.
- **Offering EE loans (even with low interest rates) was not viewed as a solution for truly low-income borrowers.** There is hesitancy to offer financing to low-income customers that could potentially add financial stress to this population, and many PAs favor other options available to low-income homeowners (for example, Direct Install, ESAP, CARE). REEL could be a better option for moderate-income borrowers, but the definition of *moderate-income* must be carefully considered. While REEL offers attractive interest rates and longer payback periods to lower monthly payments, moderate-income households may be vulnerable to falling into low-income status. CAEATFA felt REEL was more suitable for moderate income borrowers, while several PAs suggested that REEL may be most appropriate for upper-moderate- and high-income borrowers or that if lower-income homeowners are participating that the savings to investment ratio be greater than 1.0, so the monthly energy savings exceed the monthly loan payments for the EE upgrades.

Pilot Implementation

REEL experienced several hurdles that affected implementation, including the regulatory process and the complexity of financing and coordinating multiple players. Over time, program implementers recognized that CAEATFA needed freedom and flexibility to make decisions and implement REEL. The CPUC granted CAEATFA more latitude³⁷ and CAEATFA made modifications to the program that it believes will improve REEL's impact. Moreover, CAEATFA's experience implementing REEL is benefiting it as it launches additional initiatives like the new Small Business Financing and Affordable Multifamily pilots. There are opportunities to better integrate REEL with other efficiency programs and to educate and incent contractors.

- **The CPUC regulatory process is important to minimize risk to ratepayer funds but can slow the ability of the program to adapt.** Having to make regulatory requests for each change prevents REEL from being nimble and adjusting quickly to learnings as they emerge. Experience in other jurisdictions show that the most successful EE lenders are constantly adjusting and updating their programs as they generate new market intelligence and a deeper understanding of their customers' needs.
- **CAEATFA's experience with REEL is benefiting other pilots.** CAEATFA's familiarity with the CPUC and its experience with REEL has helped CAEATFA know where to go for information among the multiple parties involved, how IOUs are organized, and how to ask the right questions. The small business pilot is estimated to take three months to launch versus one year for REEL.
- **OBR should continue to be explored to increase participation.** The infrastructure for the Energy Financing Line-Item Charge (EFLIC) was built with PG&E but was challenged when the lender that had been interested in this model had a change of management and policy priorities and determined not to move forward. One PA noted that, on the commercial side, utility OBR/OBF has steadily become customers' first choice because it avoids the complexity of going through lenders, has different underwriting requirements, and allows repayment on a customer's utility bill.
- **Make it easy for contractors to participate.** PAs perceived that the process for enrolling in REEL was too long for contractors. PAs suggested improving the contractor experience with technology, minimizing paperwork, developing a support network, staggering payments for larger projects, and offering incentives to reduce administrative costs.

"Contractors do not shop for the best offer for customers; they promote the one that is easiest to work with."
— Program Administrator

³⁷ In the spring of 2017, bundling was removed (that is, single measure projects were allowed), modeling requirements were removed, and EEEMs became consistent across all IOU lists. In the fall of 2017, a single EEEM list was developed, the Customer Information Standardized Request (CISR) form was eliminated, lender certification for each loan was no longer required, IOU LLR accounts allocation per lender was combined, non-EEEM eligible for IOU rebate was allowed, loans could be refinanced (within three months), and mobile/manufactured homes became eligible. In the spring of 2018, the EEEMs list was incorporated into regulations and separated from IOU control, the credit-challenged program was initiated, and the LMI census tract method was introduced to measure underserved.

- Not all EUC/HVAC contractors are REEL contractors,³⁸ but once onboard, some view REEL financing as an alternative to rebates. Several PAs believe that contractors may be pushing one or the other: “Whatever helps them close the project quickly is going to win.” One PA noted that once a contractor signs up with REEL, the contractor no longer promotes the HUP. Another PA felt that if all contractors present financing, this could formally align the single-family home upgrade, REEL, and other programs.

“People are familiar with rebates; they are a natural lead-in. Someone needs to come up with the perfect pitch to combine the two.”

— Program Administrator

- **Balancing safety and a desire to reduce complexity is challenging.** Early on, CAEATFA chose to align REEL with IOU processes. For quality assurance, health, and safety for HUPs, a Combustion Appliance Safety (CAS) test was triggered for rebates whenever three building envelope measures were involved. CAEATFA believes contractors may not be suggesting larger projects because they do not want to trigger a CAS test.

Lender Perspectives

Key insights segmented into the two topics (pilot design and implementation) are presented below.

Pilot Design

Lenders reported that REEL is having a positive impact by offering customers better interest rates, helping those who would otherwise not have access to financing, and creating business opportunities for lenders. Lenders did identify several lost opportunities, notably, excluding publicly operated utilities, excluding solar, and gaining traction with other lenders.³⁹

- **Lenders would not be able to offer the same interest rates, terms, and loan amounts without the LLR.** Without the LLR, all lenders stated that they would have to adjust their offer. Unsecured personal loans are quicker, but no one (even high FICO score borrowers) would have access to the same rates offered by REEL. Borrowers also like the fact that REEL is unsecured compared to lender’s other home improvement/EE loan products that are secured. Several lenders reported gaining comfort with REEL over time. One lender’s recent assessment of the risk profile of all their existing borrowers revealed that all their REEL loans are performing well. No lenders raised any concern.
- **Lenders agreed that REEL was supporting those who would otherwise not have access.** Although most REEL borrowers are in the moderate-to-high FICO tiers, lenders pointed out that those with good credit may not have a lot of income and REEL is a better option. Moreover, the LLR has increased lenders’ comfort to offer better rates and be more lenient on DTI ratios. One lender reported that one contractor that it works with regularly prefers REEL because its current financing arm is turning down its customers.

“We started with minimum FICOs of 640 and decreased it to 580 to align with other lenders. We were losing two deals per month because of the FICO difference with other lenders.”

— Lender

³⁸ Only 26% were both during the two-year pilot evaluation period.

³⁹ The evaluation team notes that CAEATFA made the strategic resource decision to not enroll new lenders until after the evaluation so that it could target resources to the other pilots (Small Business Financing and Affordable Multifamily).

- **REEL is a business opportunity.** Several lenders reported that most REEL loans are with new members and REEL allows them to build relationships and sell more products. While other loan options are presented to members, REEL is often more favorable. Auto loans make up a large percentage of Credit Unions' loan portfolios and REEL offers an opportunity to diversify and spread risk.

"One borrower had such a good experience with REEL, they wanted to do more business with us."

— Lender
- **Excluding POU's may be hindering REEL's ability to scale.** To participate in REEL, homeowners must be receiving electric and/or gas from the IOUs.⁴⁰ One lender reported that its field of membership is in a dozen counties, but borrowers in regions served by POU's cannot participate.
- **Lenders did not look favorably at PACE, and this presents an opportunity for REEL.** All lenders reported negative experiences with PACE. Lenders were often not aware of PACE liens until borrowers refinanced their mortgages and details were unclear to consumers. But most lenders do not think REEL is an alternative to PACE unless it includes other measures like solar. One lender with a similar loan product (but secured) reported that 90% of potential REEL participants chose their secured loan over REEL because it included solar. Another lender reported that one of five applicants wanted solar.
- **Leverage participating credit unions to gain traction with other FI's.** Most participating lenders welcome more lenders into the fold. Multiple lenders provide options; promote better service, rates, and terms; and broaden the target market. Several lenders suggested promoting REEL through trade associations like the California Credit Union League. The Credit Union League hosts a statewide conference once a year that brings together 40–50 executives. This is an opportune time to promote REEL and have participating lenders share their experiences.

Pilot Implementation

Lenders are very satisfied with REEL and CAEATFA's support, but there are areas to improve pilot implementation, notably in marketing, supporting contractors and borrowers, relaxing lender guidelines and conducting quality assurance.

- **CAEATFA has built strong partnerships with lenders.** Lenders reported high satisfaction with REEL and CAEATFA. Lenders reported that CAEATFA is great to work with, very hands-on, and accessible. All lenders hoped REEL would continue and planned to participate.

"We're happy. The program took us a while to get rolling but has potential to move now. We're all in favor of the program continuing."

— Lender
- **REEL is labor intensive.** Lenders reported that the time to book REEL loans is much greater than other loan products and that a dedicated staff with knowledge of REEL guidelines and requirements is necessary. Additional time is also spent with borrowers and contractors. One lender reported that several emails are required for every single loan. Lenders suggested that an online interface would help. Some lenders recognized that this is the cost of participating in a pilot; the time to get up and running is all for the greater good.

⁴⁰ "Eligible Property" is defined as receiving service from one or more IOU. California Code of Regulations Title 4 Business Regulations, Division 13. CAEATFA. §10091.1.(u). Accessed at: <https://www.treasurer.ca.gov/caeatfa/cheef/reel/regulations/2018/reel-e-regs-9-17-18.pdf>.

- **There are opportunities to improve marketing.** Lenders noted that co-marketing with IOUs (for example, utility bill inserts) tend to drive most applications (the evaluation team notes that this activity occurred outside the pilot evaluation period). One lender mentioned that it received 10–15 applications within a week of utility bill inserts. Some lenders reported a notable increase in applications with co-marketing.
- **Relax guidelines and let lenders do what they do best.** Lenders expressed frustration with the state getting caught up in details, inspecting each loan eligibility, and manual reporting. Lenders suggested more automation and reducing monthly reporting to quarterly. One lender stated, “A permanent program should consider how to reduce manpower.”
- **Finding REEL-certified contractors is no longer an issue, but there is greater need to educate.** Lenders reported that getting contractors took a while and the ones that eventually came on board were not necessarily interested in supporting REEL nor comfortable with how REEL works. While streamlining of processes has helped, lenders are still hand-holding new contractors.
- **One lender suggested a need to conduct more quality assurance particularly for non-EEEM DIYers.** One lender flagged the potential for self-certification to be manipulated, that is, people self-certify that 30% non-EEEMs are DIY work, but may use funds for something else. There was concern that state-backed funding is open to misappropriation without proper checks and balances. The REEL contractor management team performs site inspections of approximately 20% of the projects.

REEL-Certified Contractor Feedback

The contractor web survey asked 57 REEL-certified contractors to provide their feedback on the REEL pilot overall, as well as on specific components. As mentioned earlier, fewer than half of REEL-certified contractors have completed REEL projects.

Contractor satisfaction with REEL pilot appears to be dependent on whether the contractor has completed a REEL project. Almost two-thirds (61%) of contractors (35 of 57) indicated that they were either somewhat or very satisfied with the REEL program overall. Notably, few contractors (6 of 57) reported that they were dissatisfied, and contractors who had not yet completed a REEL project had “neutral” opinions of the pilot (an average of 3 out of 5). As shown in Table 26, contractors who have completed a REEL project (“active” contractors) had a slightly higher average satisfaction score (statistically significant) than those REEL-certified contractors who had yet to complete a REEL project (“dormant” contractors).

Table 26. Contractor Satisfaction with REEL

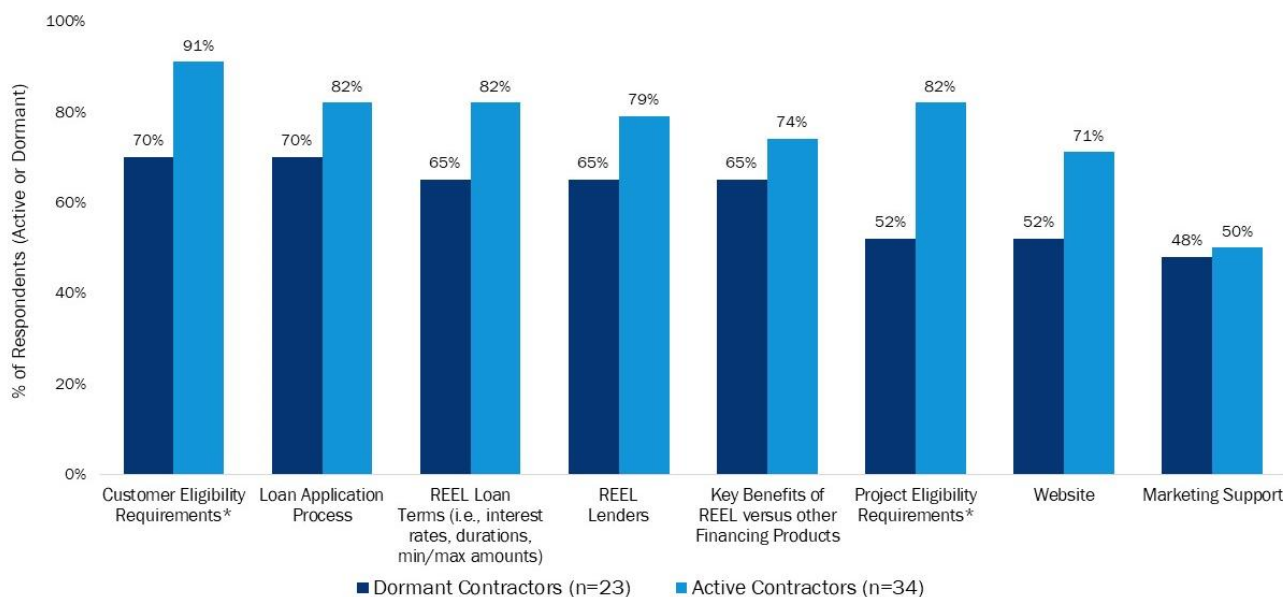
Response	Total (n=57)		Dormant Contractors (n=23)		Active Contractors (n=34)	
	Count	Percent	Count	Percent	Count	Percent
1 - Very dissatisfied	3	5%	2	9%	1	3%
2 - Somewhat dissatisfied	3	5%	1	4%	2	6%
3 - Neutral (neither satisfied nor dissatisfied)	16	28%	12	52%	4	12% ^a
4 - Somewhat satisfied	10	18%	3	13%	7	21%
5 - Very satisfied	25	44%	5	22%	20	59% ^a
Total	57	100%	23	100%	34	100%
Mean	3.9		3.4		4.3	
Standard Deviation	1.2		1.2		1.1	

^a Indicates statistical significance at the 95% confidence level.

As shown in Figure 9, respondent feedback on various pilot components was overall positive, with contractors describing the promptness of payment post-completion, increased loan duration, and maximum amount as key benefits. Most respondents indicated that the key program design elements (customer eligibility, REEL loan terms, application process) do not need improvement. Notably, Figure 9 reinforces the finding that dormant contractors had slightly lower, more neutral perceptions of the pilot than active contractors.

This is interesting, as PA interviews revealed that there is a perception that contractors find REEL complex and will not participate without better support, streamlined processes, progressive payments, and incentives. Lenders also noted that of those participating, additional training is needed to help them better understand REEL and how to participate. The lender and PA perceptions may speak to why the other half of enrolled contractors are currently not participating.

Figure 9. Contractor Feedback on REEL Components

% of Respondents Indicating a Component Did Not Need Improvement

Note: Original question was “Which components of the REEL program currently work as-is (and therefore do not need improvement) and which, in your opinion, need improvement?” Percentages refer to those who indicated a component did not need improvement.

* Indicates statistically significant difference between proportion of active and dormant respondents answering at the 95% confidence level.

4.6 Alternative Implementation Models

Objective 6

Compare and contrast the pilot implementation model with other models.

The REEL pilot model was compared to five similar financing programs in other jurisdictions to extract insights on best practices and suggest possible improvements that could be considered if REEL is to be scaled as a long-term program. The evaluation team explored three key topic areas:

1. LLR management and underwriting practices
2. Management of lenders
3. Marketing and integration with resource programs

The programs analyzed were:

- NYSERDA Smart Energy Loans and OBR
- MI Saves Home Energy Loan
- Enhabit, Oregon (OR)
- CT Green Bank Smart-E Loans
- Colorado (CO) Energy Office Residential Energy Upgrade (RENU) Loan

These were selected based on the following criteria: they offer financing to residential customers; they aim to support EE upgrades; they have statewide coverage; they incorporate credit enhancement features, such as LLRs; and they showcase different lender partnership models (single- or multilender models). The programs are summarized in Table 27.

Table 27. Other Statewide Financing Programs

Program and PA	Start Date	Number (and type) of Lenders	Loan Volume (total to date)	Average Loan Size (\$)	Loan Volume as % of Single-Family Homes in the State ^a	Amount Set Aside for LLR
Smart-E loans , CT Green Bank (CT)	2011	12 local lenders ^b (credit unions, community banks, community development financial institution [CDFI])	As of May 2018, 2,700 loans closed (\$48M)	\$17,778	0.28%	7.5% for Class A loan (≥ 680 FICO); 15% for Class B (< 680 FICO)
Enhabit (OR)	2009	4 local participating lenders (local banks)	As of June 2015, 1 lender issued more than 3,000 loans (exceeding \$40M)	\$13,333	0.25%	N/P
Smart Energy Loans and OBR , NYSEDA (NY)	2010 & 2012	1 lender (NYSEDA) + 1 loan originator + servicer	As of June 30, 2018, 14,000 Smart Energy Loans and 9,000 OBR loans issued (over \$263M combined)	\$11,435	0.59%	N/A
Home Energy Loan Program , Michigan Saves ^c (MI)	2009	5 local lenders (credit unions)	As of July 2016, 6,200 loans have been issued (over \$57M)	\$9,194	0.18%	5%
RENU , Colorado Energy Office (CO)	2018	1 local lender (credit unions)	As of 2018, 38 loans closed (\$0.5M) ^d	\$13,158	0.002%	N/P
REEL , CAEATFA (CA)	2017	7 lenders (credit unions), 1 master servicer	As of December 2018, 339 loans closed (\$5M)	\$17,165	0.004%	11% (regular), 20% (LMI borrowers)

N/A = Not applicable, N/P = Information not publicly available.

^a Data for number of occupied single-family homes (1-unit attached and detached homes) per state sourced from American FactFinder (https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml).

^b As of May 2018, <https://aceee.org/sites/default/files/pdf/conferences/eeff/2018/3A-Elliott-Hill-0%27Neill.pdf>.

^c As of July 2016. Based on Dunskey Energy Consulting. 2018. *Green Ontario Fund, Report 2: Single-Family Residential Financing*, pg. 29.

^d CO Energy Office. 2018. *Annual Report 2017–18*, pg. 7. Accessed at: <https://www.colorado.gov/pacific/energyoffice/reports>.

Based on the evaluation team's comparative analysis, the following insights emerged.

- **REEL incurs significantly higher costs for LLR and lender management than other programs, likely because of complex setup and reporting requirements.**
 - **Challenge:** REEL's lack of LLR funds that it can administer independently creates a complex and costly management process. Currently, REEL's LLR setup, which uses utility ratepayer funds from different IOUs, obligates REEL to use a master servicer to track loans individually to provide LLR funds from the correct utility, based on borrower territory. This adds complexity to LLR and lender management, as loans and LLR funds must be reconciled between utilities, PA, and the lenders.
 - **LLR Management:** In comparison, other programs such as those offered by Michigan Saves (MI) and the CT Green Bank, have access to LLR funds that they can administer internally. This has several benefits: funds are aggregated at the lender (not borrower) level, leading to simpler and less costly periodic reconciliation, and the program is able to reinvest and earn a return on LLR funds (instead of paying a master servicer to track the flow of ratepayer funds and a bank trustee to hold the funds, as REEL does).
 - **Lenders and Master Servicer:** The open-market approach and OBR functionality options have led CAEATFA to establish a master servicer, to create a centralized secure flow for data and funds between lenders and utilities and to facilitate loan enrollment to scale. In comparison, the CT Green Bank and MI Saves programs do not use a master servicer. NYSERDA uses a direct single-lender model and has a master servicer that originates and services loans and manages data and OBR. While the roles of the master servicer are different between NYSERDA and REEL, REEL incurs a significantly higher cost per loan (2.5x).
- REEL can seize opportunities to iterate and adapt LLR and underwriting practices to improve program accessibility and/or lower participant borrowing costs further.
 - Three of the five programs the evaluation team reviewed had LLRs as part of credit enhancement measures. Two programs, those offered by MI Saves and CT Green Bank, experienced better-than-expected LLR performance (low default and delinquency rates). When confronted with LLR coverage that exceeds the lender risk coverage needs, these lenders saw three ways to update their programs to get more value out of the LLR:
 - Reduce the capital held in the LLR, thereby freeing up capital for other needs (while maintaining the original LLR obligation to lenders)
 - Require lenders to expand underwriting criteria to take on more risk, lengthen terms, and/or lower interest rates
 - Jettison low-risk customers who do not need the LLR coverage, that is, cap the program's maximum FICO score.
 - The CT Green Bank and MI Saves programs both considered this range of options, applying and iterating to further improve the effectiveness of their LLR programs.
 - Another successful practice is tiered underwriting, to expand program access to borrowers who would not qualify for loans with traditional underwriting criteria. For example, NYSERDA's Tier 2 Loans expands access to the number of people who can qualify using alternative underwriting, considering mortgage payment history in place of FICO score. NYSERDA was able to adjust the

program such that it focused subsidized lending on low creditworthy applicants, while directing high-FICO-score applicants to conventional loans.

■ **Most programs find success with multiple local community lenders.**

- Three of the five programs analyzed leverage the value-alignment, customer familiarity, and approachability of mission-driven lenders, such as credit unions and local banks. With their strong links in the community, these private lenders are more likely to share and support the values that drive the financing program.
- Programs also found local lenders easier to approach, as larger lenders were not interested in joining a program or offering a product that had not demonstrated significant market demand. Similarly, REEL faced difficulties attracting large FIs, as the modest size of loans and the pilot status of the program failed to garner their interest. Thus, REEL has embraced partnerships with community lenders (all seven lenders are credit unions). If REEL decides to pursue larger conventional lenders in a program expansion, it could use the following arguments: its status as a conventional program (no longer a pilot, reassuring lenders that it is “here to stay”), its ability to leverage its track record (showcase statewide coverage, number of past customers, and strong loan performance), and its capability to point to market demand (for EE improvements and to fill the market gap left by the PACE financing decline).
- Although managing multiple lenders adds some complexity (for example, multiple terms and rates, different service territories) and credit unions specifically have other challenges (for example, field-of-membership expansion restrictions), local lenders can add value for rural customers. In the REEL pilot, most loans were issued by two statewide credit unions whose branch locations were limited to Southern California. Although the program could maintain statewide coverage with these two lenders, it may prefer to offer more convenience to rural customers by continuing to work with local lenders in parallel (more in tune with community needs, offering opportunities for face-to-face rather than internet interaction). The MI Saves program, for example, has overlapping lender coverage: One lender offers statewide coverage, while others focus exclusively on certain counties.
- The NYSERDA single-lender model, which issues loans from state funds, offers a plausible alternative to the multiple-lender model.

■ **Invest in training contractors, the driving force behind the marketing and quality of the program.**

- **Marketing:** Contractors remain the main marketing mechanism behind the programs analyzed. Other programs invest significant efforts to recruit and train contractors, through targeted outreach, regular training and events, and supplying support materials (for example, marketing or training tools). REEL also has a contractor enrollment and training process, which CAEATFA began internally and then hired a dedicated contractor manager to oversee. However, all lenders interviewed said that contractors still need further training, and surveys with contractors also showed a desire for better marketing support.
- **Quality:** Training contractors is also essential for quality purposes and supports process streamlining. The MI Saves program no longer requires project preapproval by the PA, after investing heavily in contractor training and relying on contractors to determine project eligibility. The program still conducts spot checking on the back end (taking remediation action with the

contractor, if necessary), but this is rare. REEL could consider this back-end approach as a way to streamline the application process.

■ Consider expanding to RE and Beneficial Electrification

- All other programs analyzed include both EE and RE measures, with RE typically including solar panel installation and/or battery storage systems. Beyond this being a common practice in other programs, RE was also mentioned as a key gap during lender interviews. Interviewees mentioned that expansion to renewables would position REEL as a “one-stop shop” to fill the market gap left by the decline of PACE in California, thus increasing its attractiveness. Interviewees also suggested that REEL consider including beneficial electrification⁴¹ and electric vehicle (EV) charging to align with state goals.

4.7 Evolving Regulatory and Industry Environment

Objective 7

Explore how the marketplace has changed since the 2012 decision to fund the pilots. Identify trends, if any, that will help the CPUC reorient strategic EE financing goals.

Since early 2012, several factors have emerged that could affect, either directly or indirectly, the demand for and supply of the type of financing that REEL provides, as well as its goals, design, and cost-effectiveness. This section discusses important trends within three key areas — regulatory policy, climate change, and the financial industry — and then concludes with a number of suggested strategies for responding to the impacts

these trends may have on REEL financing.

4.7.1 Regulatory Policy

The regulatory policies regarding EE, renewables, and carbon reduction have evolved rapidly and have become more aggressive since the decision to launch the financing pilots in 2012. This section describes these evolving policies and discusses how they have created both opportunities and challenges for REEL.

Two California Assembly Bills (ABs) paved the way for EE financing to emerge as a program design in California. In 2006, AB 32 established a comprehensive program to reduce GHG emissions from all sources throughout the state to 1990 levels by the year 2020, representing approximately a 30% reduction statewide. In 2008, AB 811 was signed into law and helped California municipalities accomplish the goals outlined by AB 32 by authorizing financing of renewable generation and EE improvements through low-interest loans that would be repaid as an item on the property owner's property tax bill. Since this time, PACE financing has become the leading form of EE financing in California, though other financing models have emerged through ratepayer funding, including the RFPs and REEL.

In 2015, California State Bill (SB) 350 increased California's renewable electricity procurement goal from 33% by 2020 to 50% by 2030. In addition, SB 350 requires the state to double statewide EE in electricity and natural gas end-uses by 2030. Then, in 2018, SB 100 set a planning target of 100% zero-carbon electricity resources by 2045 and increased the 2030 renewables target from 50% to 60%. On the same day

⁴¹ Beneficial electrification is allowed if the IOU provides electric service. CAEATFA is currently working with the Decarbonization Task Force to advance this.

that SB 100 was signed, Executive Order B-55-18 set a new statewide goal to achieve carbon neutrality (zero-net GHG emissions) by 2045 and to maintain net negative emissions thereafter.

This aggressive GHG emission reduction and renewable electricity procurement strategy will increase the use of Renewable Portfolio Standard (RPS)-eligible resources, including solar, wind, biomass, geothermal, and others. This strategy also places enormous pressure on the California PAs to seek innovative technologies and approaches to improve the design and cost-effectiveness of their EE, demand response, and RE portfolios. These aggressive goals were made more difficult over the years as the number of savings opportunities have been reduced. For example, increasing EE codes and standards have made certain measures, such as CFLs, no longer worth incenting. REEL and the other planned statewide financing pilots represent one such attempt at implementing an innovative approach to EE.

Finally, CPUC D. 18-01-004, in 2018, increased the required minimum percentage of third-party programs from 20% of total budgeted portfolio by 2020 to at least 25% by the end of 2018, 40% by the end of 2020, and 60% by the end of 2022. These solicitations may ultimately bring down overall costs of EE programs and portfolios. The rationale for third-party requirements is based on supporting innovation in program design, as well as the potential for cost savings through the competitive solicitation of programs. However, customers might be confused by the increased number of PAs. Third-party programs may offer financing as part of their proposed incentive structure. If REEL wants to continue to cross-promote financing alongside the PA and third-party rebate programs, the number of parties that REEL needs to coordinate with for marketing would multiply. As a result, the increase in third-party programs might make the marketing of the REEL program (should it become a full-fledged third-party program) more challenging.

Increasing Price of Carbon

The increased focus on reducing carbon set forth in SB 350 and SB 100 will increase the value of each ton of carbon avoided. This in turn will improve the cost-effectiveness of REEL, as well as all other EE, demand response, and renewable programs. The current price of carbon in the California Cap and Trade Program is approximately \$15 per metric ton of CO₂. However, in D. 16-02-007, the CPUC recommended a starting price of \$66.37 per metric ton of CO₂ emissions, because they considered the current price to undervalue the price due to the immaturity of the carbon market. Further, the CPUC recommended that this avoided-cost adder be used for demand-side cost-effectiveness analyses. Importantly, this decision also increased the price to \$150 per metric ton by 2030.

4.7.2 Changes in the California Energy Efficiency Landscape

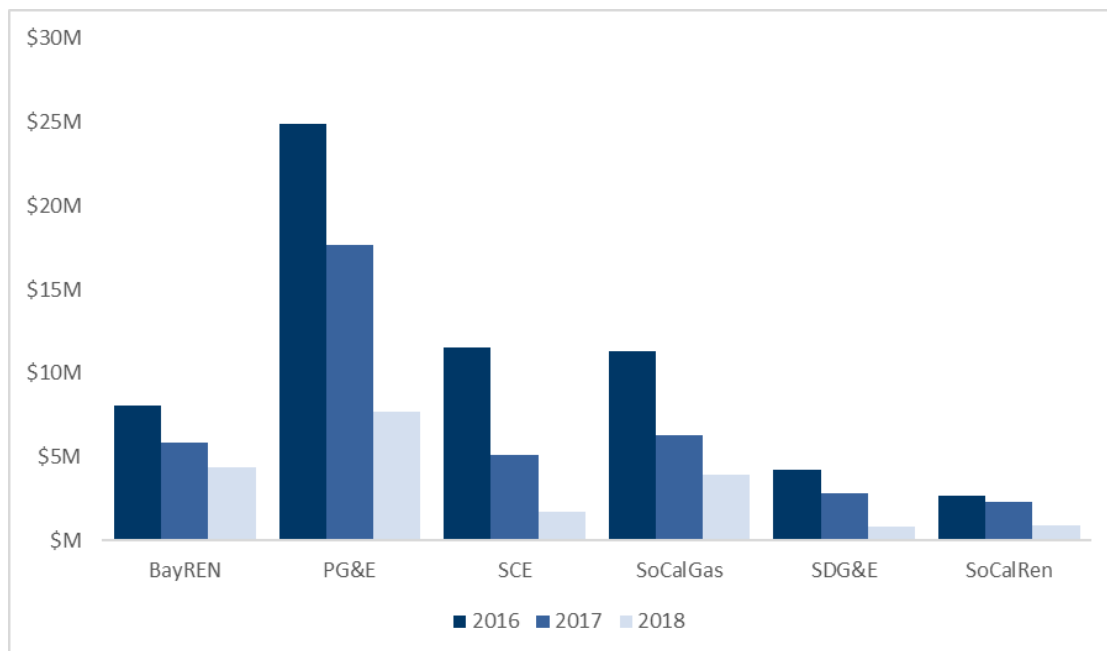
Energy Efficiency Program Expenditures Have Fallen Over Time

All demand-side resource programs in California must undergo cost-effectiveness analysis. During the last evaluation cycle (2013–2015), the EE portfolio was not shown as cost-effective,⁴² which in turn has caused changes to program funding levels. For example, HUP expenditures have declined for all IOUs in the past few years (see Figure 10). In addition, the IOUs' HUPs have experienced low realization rates (that is, the ratio of claimed savings to evaluated savings). In program year 2017, evaluated savings ranged from 13% to 63% of claimed savings for the program statewide.⁴³ This may also be leading to reductions in program expenditures.

⁴² CPUC. 2018. *Energy Efficiency Portfolio Report*, pg. 12.

⁴³ DNV GL. 2019. *Impact Evaluation Report: Home Upgrade Program – Residential Program Year 2017*. CPU0191.01.

Figure 10. Home Upgrade and Advanced Home Upgrade Programs Claimed Total Expenditures



Source: CEDARS.

A similar trend has been experienced across all residential Market Transformation programming in the state, with expenditures falling from \$80M in 2016 to \$62M in 2017 to \$30M in 2018. This points to potential opportunities for REEL to continue to support EE upgrades as rebate programs scale back.

Expanding Eligible Energy Efficiency and Renewable Energy Measures

The REEL program is focused on financing EE measures. However, there are opportunities to expand the list of measures to include solar, electrification, and battery storage.

Solar Photovoltaic

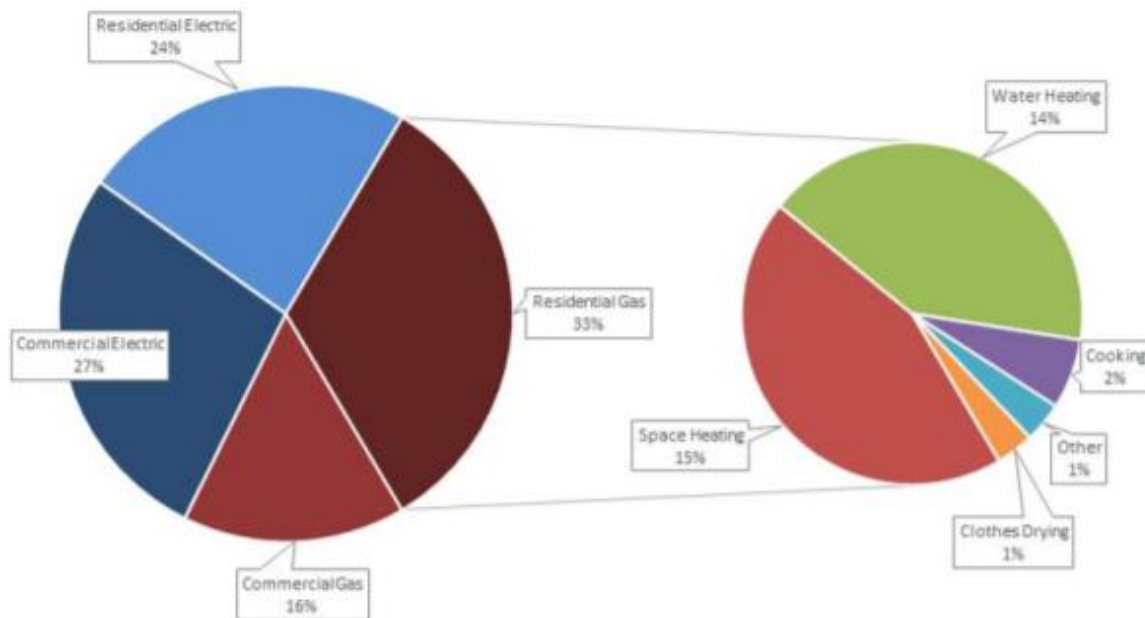
Since the design and launch of REEL, the cost for solar PV systems has fallen, while adoption of solar in the building industry has increased. With the Energy Commission adopting the 2019 Building Energy Efficiency Standards, which requires the installation of solar PV systems on the majority of new homes, starting January 1, 2020, the adoption of solar will continue to grow in California. This could spur additional demand in the retrofit market, which could benefit from financing.

Electrification

Electrification of space and water heating using highly efficient technologies is a key strategy to reduce or eliminate GHG emissions from buildings. The 2018 Integrated Energy Policy Report Update discussed shifting away from a reliance on natural gas at the end-use through electrification. Electrification allows for the integration of RE while also reducing carbon emissions.

The opportunity for reducing natural gas usage is greatest in the residential sector, with most usage in water and space heating (see Figure 11). Electrification efforts could also benefit from financing.

Figure 11. 2016 Energy Use in California Buildings (MMBtu)



Source: California Energy Commission. Accessed at: https://www.energy.ca.gov/sites/default/files/2019-05/energy_efficiency.pdf.

Battery Storage

California's rapidly evolving energy landscape and aggressive carbon reduction goals are increasing the need for energy storage technologies. With a growing amount of renewable generation needed to meet the state's GHG emission reduction goals, energy storage can help address the issue of intermittent electricity supply.

In compliance with AB 2514 (2010), the CPUC set targets for California's electric IOUs, requiring them to procure more than 1.3 GW of energy storage by 2020, with specific targets for transmission-connected, distribution-connected, and customer-side energy storage systems. Customer-side energy storage systems make up approximately 15% of the total target. While the focus has been on commercial scale storage, residential storage opportunities are becoming more prominent as battery costs fall.

4.7.3 Financing Market

Increasing debt among Californians combined with a slowing California economy could affect the ability or willingness of California households to take on additional debt to fund EE and RE projects. The LMI population, a specific target segment of REEL, has been left behind in particular. These trends represent a potential challenge for REEL's scalability.

A 2016 American Council for an Energy-Efficient Economy (ACEEE) study found that, while the financing market has grown overall, "significant gaps" remain for LMI customers. Further, the LMI population has not been helped as much as other groups by the strong recovery from the great recession of 2008 and will continue to need substantial help in adopting EE and RE measures. The recent June 2019 UCLA/Anderson

Forecast⁴⁴ reported that the California economy is slowing down, with an unemployment rate of 4.3% and inflation holding steady. However, new data from the U.S. Census Bureau's supplemental poverty measure⁴⁵ shows that roughly 7.5 million Californians — about 19% of the state's population — live in poverty. California is one of the three states tied for highest poverty rate, along with Florida and Louisiana. The national poverty rate is 14%. This underscores the continuing need for affordable financing (offered by REEL) and other low-income programs for the foreseeable future.

Finally, customer willingness and ability to participate in pilots like REEL is affected by their current debt load. According to a recent New York Federal Bank study,⁴⁶ among the 11 states reviewed, California had the highest average debt per household, at \$71,470. Yet while Californians are carrying the most debt, they do not seem to be having much trouble keeping up with their payments. Of those 11 states, California had the lowest level of seriously delinquent loans at 1.85%. The national average was 3.1%.

A 2016 ACEEE study suggested cementing stronger relationships to lenders that are already assisting LMI customers, such as community development financial institutions (CDFIs).⁴⁷ The REEL pilot is similar to this proposed model, as it is implemented by a state agency and it leverages the established reputations of seven locally based credit unions as partner lenders. However, the pilot (or future program) might consider adding CDFIs to the mix of lenders.

State Legislation Has Slowed the Growth of PACE Financing

Between July 2014 and June 2018, more than \$4 billion of EE and RE upgrades were financed through PACE in California.⁴⁸ For most of these funds, applications were approved within minutes through contractor-led point-of-sale financing. Approvals were largely based on home value, with income not an approval factor. In addition, the industry has been riddled with consumer protection issues, contractor fraud, and high costs. Stricter financing laws passed in 2017 and 2018, designed to enhance consumer protection and underwriting, have led to lower PACE financing uptake. Figure 12 shows that California's PACE financing experienced a one-third drop for the first six months of 2018 (relative to the prior year).

⁴⁴ UCLA/Anderson Forecast: June 2019 Economic Forecast (2018–2021).

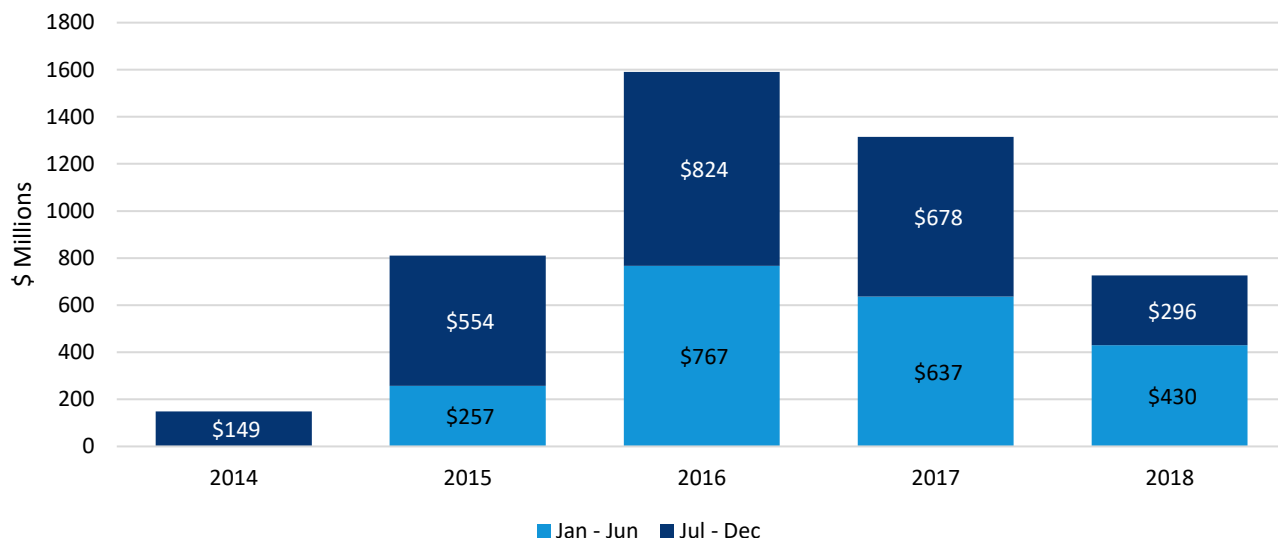
⁴⁵ See <https://www.census.gov/content/dam/Census/library/publications/2018/demo/p60-265.pdf>.

⁴⁶ See <https://www.americanbanker.com/list/household-debt-hit-another-all-time-high-is-it-poised-to-level-off>.

⁴⁷ CDFIs are institutions that seek to expand “economic opportunity in low-income communities by providing access to financial products and services.” For more information, see https://www.cdfifund.gov/Documents/CDFI_infographic_v08A.pdf.

⁴⁸ CAEATFA. 2018. *PACE Loss Reserve Program Enrollment Activity*. Accessed at: <https://www.treasurer.ca.gov/caeatfa/pace/activity.pdf>.

Figure 12. New PACE Financing Reported to CAEATFA (until December 31, 2018)



Source: CAEATFA. 2018. *PACE Loss Reserve Program Enrollment Activity*. Accessed at: <https://www.treasurer.ca.gov/caeatfa/pace/activity.pdf>.

While a lack of up-to-date PACE financing data has made it difficult to outline the extent of the impact of these changes, there does appear to have been a reduction in market size. PACE administrators have publicly claimed two key impacts from these laws.

1. The increased application burden has led contractors to be less likely to suggest PACE financing for their clients, unless the homeowner is unable to qualify for any other kind of financing (for example, home equity loan or unsecured loan). Approval time has increased from hours to days.
2. There has been a shift in homeowners submitting applications, with a decline of applications from those with FICOs ≥ 661 and a resulting increase in the share of those with FICOs ≤ 660 .⁴⁹

It is possible that these recent changes will allow for other financing tools, such as REEL, to gain a broader share of the market. By limiting PACE's advantages related to a simple application process and not requiring a credit check, the disadvantages of PACE (typically higher lender fees, a property lien, and higher interest rates) may lead to fewer contractors suggesting the product.

4.7.4 Climate Change

The latest reports on climate change have become increasingly dire for California in particular⁵⁰ and have driven CPUC policies over the last 15 years.⁵¹ The expected impacts of climate change — wildfires, strategic outages, and health effects — argue for increased efforts to measure a variety of NEBs and increased CPUC

⁴⁹ Asset Securitization Report. 2019. *Why PACE has become a 'second-look' product in California*. Accessed at: <https://asreport.americanbanker.com/news/why-pace-has-become-a-second-look-product-in-california>.

⁵⁰ California's Fourth Climate Change Assessment: California's Changing Climate 2018.

⁵¹ Executive Order S-3-05.

willingness to include these benefits in its assessment of cost-effectiveness of programs like REEL and other EE, demand response, and RE programs.

Wildfire Risk

The fourth Climate Change Assessment (CCA) notes that if GHG emissions continue to be reduced at current rates, California will experience average daily high temperatures that are significantly warmer than the historical average, and the number of extreme heat days will increase exponentially in many areas. These changes bring with them increased risk of wildfire, and California is ranked as the most wildfire-prone state.⁵² According to Verisk's 2017 Wildfire Risk Analysis,⁵³ losses from wildfires added up to \$5.1 billion over the past 10 years and 10 of the costliest wildland fires in the United States have been in California. The CCA⁵⁴ also reported that, if GHG emissions continue to rise and are not reduced, large wildfires (greater than 25,000 acres) could become 50% more frequent by the end of century.

These wildfires place not only homes and businesses at risk, but also the electric grid. Wildfires have already affected the financial health of two of the state's largest IOUs via bankruptcy and settlements, and some of these costs may eventually be passed down to the consumer through rate increases. To minimize wildfire risk, PG&E and SCE have decided that they will shut off power to wildfire-prone areas when the temperatures and wind speed become dangerously high. This will further affect ratepayers through outages.

Wildfire risk ultimately creates a greater need for EE and RE programs. Reducing energy obtained from the IOUs through the installation of EE technologies and solar panels will minimize the impact of the rate increases on customers. REEL financing is designed to assisting households in overcoming the up-front cost of such upgrades and may be especially helpful for LMI households. As a result, the increasing prices expected to be seen by consumers will increase REEL's cost-effectiveness using the PCT. Further, one implication for marketing REEL and other EE programs to customers in wildfire-prone areas is to be clear about the likely increase in service disruptions and the importance of minimizing their energy use and discomfort through the installation of EE measures and on-site renewable generation and storage.⁵⁵

One of the unintended consequences for customers shifting to solar is that, while shifting to solar will reduce the rate impacts for these customers, it will shift the recovery burden to customers for whom solar is not an option, many of whom are the LMI customers REEL is targeting. However, the lost revenue that results from more customers choosing solar is but one of many reasons why the IOUs are likely to increase their rates. Another key reason is the increasing occurrence of devastating wildfires, the response to which is triggering unprecedented levels of new investments and increased operating expenses. The staggering financial liabilities and future mitigation costs will weigh on both bundled and unbundled customers. Yet another potential reason for increasing rates is the proliferation of Community Choice Aggregators (CCAs) and "direct access" (DA), shrinking the amount of electric generation IOUs serve, and eroding a significant portion of their revenue as a result. Customers who continue to take "bundled" service – receiving both delivery and generation from the IOU – are bearing the cost of this lost revenue from customers opting to take "unbundled"

⁵² See https://www.verisk.com/insurance/visualize/key-findings-from-the-2017-verisk-wildfire-risk-analysis/?utm_source=Social&utm_medium=Twitter&utm_campaign=VeriskSM&utm_content=842017.

⁵³ Ibid.

⁵⁴ Governor's Office of Planning and Research, California Energy Commission, and the California Natural Resources Agency. 2018. Climate Change Assessment: California's Changing Climate 2018: A Summary of Key Findings from California's Climate Change Assessment. Accessed at: <http://www.climateassessment.ca.gov/>.

⁵⁵ Customers with solar panels with current generation battery storage, when fully charged, can serve their energy demands during such shutoffs.

service through one of these alternate channels. One possible option for beginning to address this imbalance that will likely fall disproportionately on LMI customers is to increase the charges for “unbundled” customers. As lost revenue continues to increase, other strategies to address this imbalance are expected to emerge.

Air Conditioning Saturation

The expected increase in temperatures is also expected to increase the saturation of air conditioning, which in turn will exacerbate carbon emissions. As discussed earlier in Section 4.2, REEL projects to date have primarily focused on air conditioning replacement (75% of projects). As such, REEL presents an opportunity to increase the adoption of energy-efficient air conditioning, especially when paired with Residential HVAC or Home Upgrade program rebates.

Health and Safety

Finally, the CCA also shows that all Californians will likely endure more illness and be at greater risk of early death because of climate change, with the vulnerable populations disproportionately affected. Heat waves are an example of the current and future risk climate change poses to people. Studies show that while air conditioning can reduce mortality and illness from heat, increased electrical demand for cooling due to hotter conditions could also drive up emissions. While the state is rapidly moving to cleaner electricity generation, increased support for energy-efficient air conditioners can make substantial contributions, and REEL has an opportunity to contribute by making them more affordable up front.

4.7.5 Summary

Table 28 presents some of the trends that were discussed above and possible strategies to consider in response.

Table 28. Summary of Trends and Possible Strategies

Trend	Possible REEL Strategies
IOU rate increases to cover the cost of wildfires	Alert customers to the possibility of rate increases and stress bill reductions in marketing REEL.
Increasing outages due to IOU power shutoffs to guard against wildfires	Alert customers to the increased probability of strategic outages due to wildfire prevention efforts and stress the need for solar panels and battery storage.
Increasing temperatures leading to increased air conditioner saturation	Stress the need for energy-efficient air conditioning.
Increasing health risks associated with increasing temperatures	Develop defensible methods for estimating the health benefits due to reductions in energy use and carbon.
Increasing importance and value of reducing carbon emissions	Stress the importance of reducing carbon emissions to mitigate climate change.
CPUC increases in carbon policies	Include carbon scenarios in C/B analyses.

4.8 Scalability Potential

Objective 8

Assess the scalability potential of this pilot and recommend if and how the pilot should continue.

This evaluation sought to determine the scalability potential of the REEL model to the extent possible after its two years of implementation. To assess this, the evaluation team focused on five key questions:

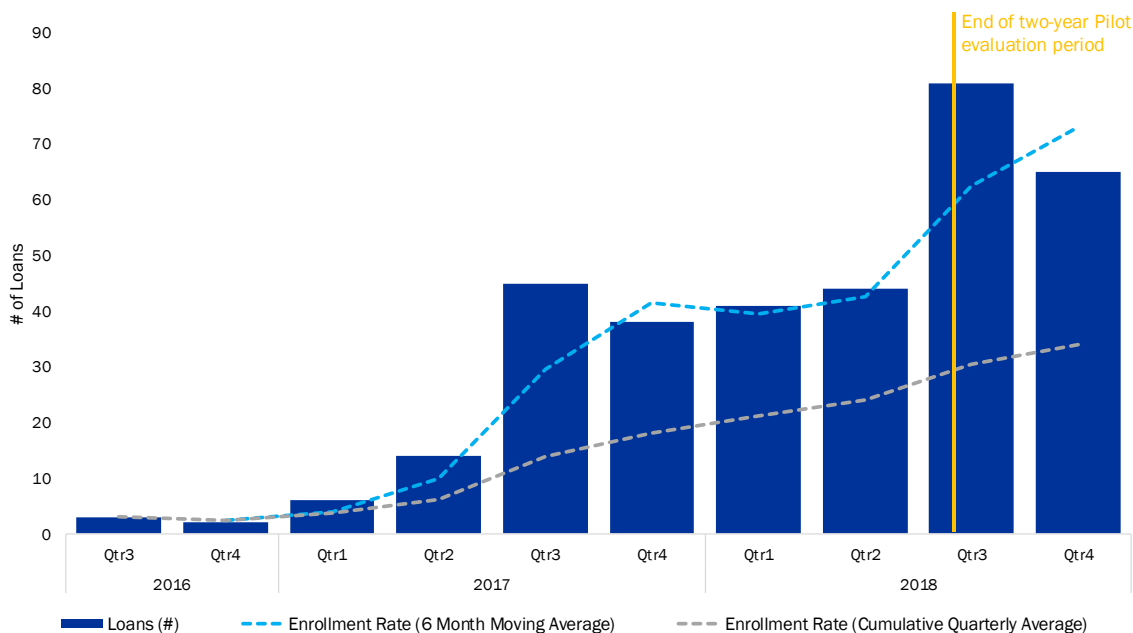
1. What infrastructure and momentum can REEL leverage to generate further volume?
2. Can REEL be a scaled up as cost-effective resource program?
3. Can REEL be self-supporting, thereby not requiring ratepayer money?
4. What is the appropriate administrative structure for a future REEL program?
5. What is the recommended path forward?

Building on the REEL Pilot Infrastructure and Momentum

Since issuing its first loans in Q3 2016, the REEL pilot has steadily increased its loan volume, as is to be expected for a new financing product that is being introduced to the market. This momentum in loan volume continued up to the end of the two-year evaluation period and continued to grow beyond the evaluation period suggesting that the REEL model's loan volume has more room to grow. Moreover, CAEATFA has built the infrastructure needed to support an expanded loan volume, including the networks of lenders and contractors needed to generate projects and originate loans. Overall, the evaluation results indicate that the REEL pilot successfully created the infrastructure to support a scaled-up REEL program.

The pilot is already showing steadily increasing participation since the first two years. Analysis of the growth in loan enrollment over the lifetime of the pilot shows that the number of loans closed per month has grown steadily over time and that the enrollment rate has increased dramatically since the first two-year pilot period. Figure 13 depicts both the cumulative loan growth and the six-month moving average, the latter of which provides a better picture of month-to-month increases. The spike in growth at the end of the two-year period demonstrates the recent momentum experienced by the pilot. Specifically, in the first two years, 212 participants participated in the pilot amounting to 9 loans per month across the two-year period; the monthly enrollment rate almost tripled in the five months after the pilot period to 25 loans per month. Lastly, comparing 2017 and 2018 (that is, the first two full calendar years' worth of operation), loan volume is significantly larger quarter-by-quarter in 2018 compared to 2017.

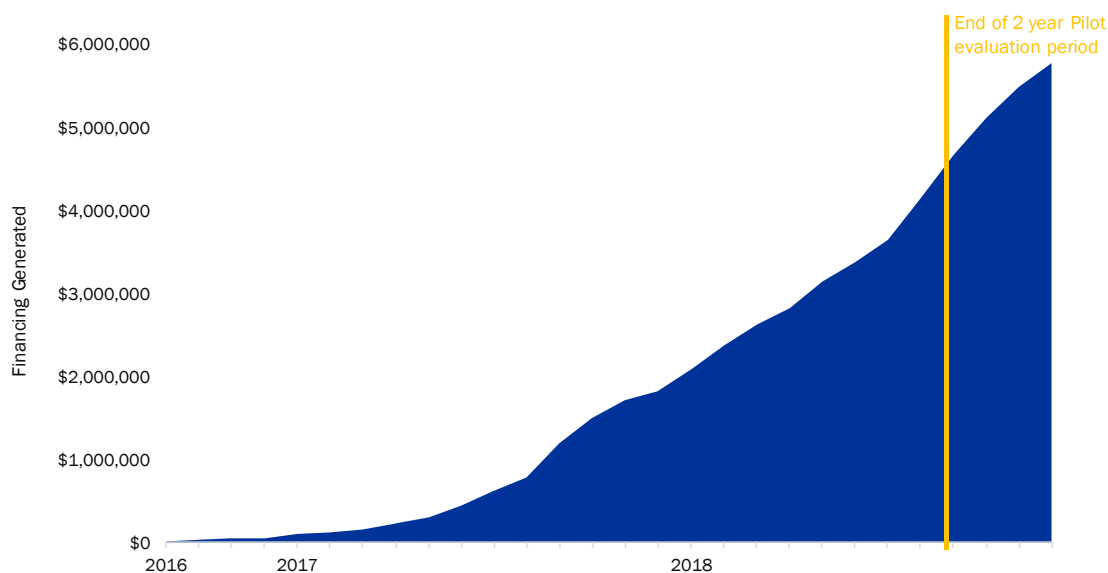
Figure 13. REEL Loan Growth



Note: Number of loans represent the count of loans enrolled on a quarterly basis.

The amount of financing generated by the pilot (\$5.78 million overall) follows the trend of growth in the number of loans, showing a strong cumulative growth over the life of the pilot with a spike in financing at the end of the two-year period and continuing five months later (see Figure 14). Approximately \$2.13 million of the \$5.78 million total financing generated by the pilot over the 30-month period happened in this 5-month period, which amounts to 37% of the pilot's total financing happening within only 16% of its lifetime.

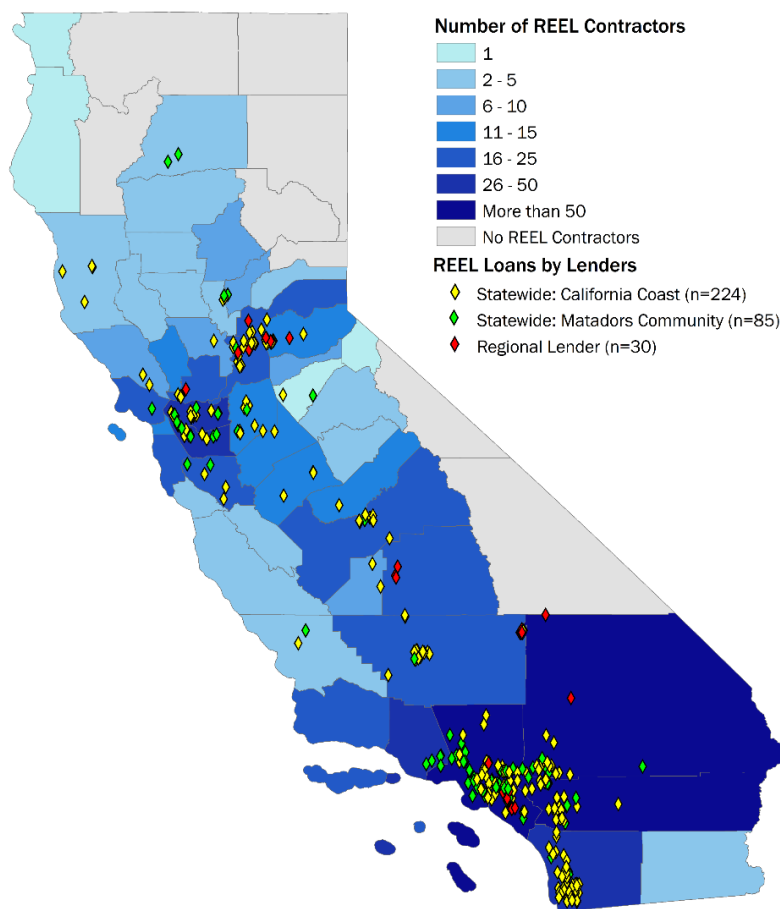
Figure 14. Cumulative REEL Financing



These financing tools can reach a significant and growing number of Californians as the current partner network of credit unions and contractors covers most of the state. However, to take this to further scale the pilot would need to enroll a larger volume lender with physical branches covering more of the state.

- At least one REEL-certified contractor and lender operates in every single county that falls within the IOUs' service territories, with the exception of no contractors serving Mono and Inyo in the eastern central part of the state. While participation to date is concentrated within the high population areas of the state (Southern California and the Bay Area), there has been a gradual expansion into the northeast and Central Valley, and, when population density is controlled for, the spread of loans per capita shows penetration of REEL loans in the lower-population Central Valley counties that is commensurate with that of the south and north.
- The statewide lenders have been notably successful in reaching parts of the state where they do not have physical branches, but there remain opportunities for more lenders to increase access to the pilot. Figure 15 shows the distribution of REEL loans throughout California, distinguishing between the two statewide lenders and the regional lenders. It is worth noting that there are several areas of the state that have REEL-certified contractors but no statewide or regional lender branches near their community. These potential participants may face barriers to loan approval and paperwork submission. For instance, interested residents in Madera county may need to travel up to an hour to reach the nearest lender branch (Valley Oak Credit Union in Tulare, Visalia, or Three Rivers) if it were necessary to submit paperwork or sign documents in person. However, such barriers could be eliminated if large lenders (with a national operating presence, fully equipped online services, and RIC capabilities) joined.

Figure 15. Map of REEL Participation, Lender Activity, and Contractor Territories (2.5 Years into the Pilot)



Note: Based on contractors and loan data July 2016–December 2018.

The current contractor network is scalable based on the number of contractors enrolled, the type of services that they offer, and their self-reported preference for REEL over competing financial products.

- Data provided in the PY2014 CA Finance Residential Market Baseline study,⁵⁶ conducted in anticipation of this pilot, estimated that approximately 56,000 contractors in California perform residential retrofit work that might qualify for REEL financing. While this provides a sense of the upper limit of contractor involvement, the REEL contractor pool was at 340 contractors as of June 2019 and is widely distributed across many parts of the state. This should not be viewed negatively as REEL's contractor pool is comparable to similar programs and has shown growth over the pilot period. For example, just over 500 contractors performed EUC-related upgrades in FY14–15 and two successful LLR programs (CT Green Bank's Smart-E loans and MI Saves Home Energy Loan Program) have just over 300 participating contractors. This suggests that the current contractor pool is sufficient to support a full-scale program. This is further supported by lender interviews, which revealed that more contractors are not needed, rather existing contractors need more training.

⁵⁶ See http://www.calmac.org/publications/PY2014_Residential_Finance_Market_Baseline_Volume_1_FINAL.pdf.

- Survey respondents indicated that most contractors specialized in services that align to the EEEM requirements of the program (for example, space heating and cooling equipment, water heating), but a significantly higher proportion of dormant contractors (65% versus 35% of active) offer services typical of a general contractor, such as renovations and building additions. Since the 70–30 funding rules make it less likely for a general contractor to have larger renovation projects that cover this scope, focusing efforts around training and equipping the contractors that offer services that complement REEL measure-specific activities is the best opportunity for scaling.
- The conversion from dormant to active contractors is also an important component of scalability potential as it would indicate a preference for REEL financing in a crowded and competitive EEFP market. Survey responses support contractors' preferences for REEL and indicate a high potential for conversion, with 91% of dormant contractors saying that they plan to complete a REEL project in the future. Additionally, although 81% (n=46) of survey respondents would offer some other type of financing if REEL was not available (most saying PACE [n=21]), 20% said that they would not offer any type of financing if REEL was not available. Compared to the alternative financing option, 40% (n=18) said that REEL was superior and only 11 of the total answering said that REEL was inferior.
- Most survey respondents (51%, n=29) identified the marketing support available to contractors as the program component needing the most improvement, citing a lack of homeowner awareness of REEL and the need for simple and customizable marketing materials to educate customers (for example, the need for term sheets that show monthly payments based on various project scenarios, cobranded materials, and user-friendly website content). Although updates to the website would be a substantial investment, offering term examples, cobranded marketing materials, and simplified application instructions and boosting REEL advertising are relatively simple fixes to overcome contractors' barriers to successfully selling REEL to homeowners.

Cost-Effectiveness

The C/B analysis results indicate that the REEL model struggles to meet the cost-effectiveness thresholds under the TRC, SCT, and PAC, even with a significant increase in loan volume. While the future program would likely be more cost-effective than the pilot, simply scaling the program volume does not appear to be sufficient for a REEL program to achieve cost-effectiveness. This is largely because many of the program costs increase linearly with the increased program volume, most notably the LLR lost opportunity cost and covered losses and, to some degree, the LLR-related costs.

To scale REEL as a cost-effective (or near cost-effective) resource program that is supported by ratepayer funds, further modifications to the program may be needed to expand the benefits and reduce the administrative costs. Table 29 highlights a range of modifications that could help expand the REEL benefits and reduce its operating costs.

Table 29. Opportunities to Increase REEL Benefits and Reduce REEL Costs

Opportunities to Increase Benefits	Opportunities to Reduce Costs
<p>↑ Expand the EEEMs list to include solar, electrification, battery storage, and EVs.</p> <p>↑ Require higher standards on the equipment available for installation, and include analysis of key measures that can generate grid benefits aligned with the current peak grid demand.</p> <p>↑ Account for the contribution REEL is making toward California's climate-related goals and include the social cost of carbon.</p> <p>↑ Continue efforts to develop a public database on REEL loan performance to demonstrate loan performance strength to attract more lenders, potentially larger lenders, and to inspire those participating to further reduce their APR.</p> <p>↑ Enhance marketing to increase awareness of REEL and drive participation.</p> <p>↑ Continue to invest in contractor support, training, and streamlining of processes to improve contractor experience and increase participation.</p> <p>↑ Require lenders to reduce APR on loans, in response to very low default rates, to increase customer benefits, and to attract more volume.</p>	<p>↓ Reduce LLR ratios if the loan pool performance warrants lower coverage.</p> <p>↓ Administer the LLR internally rather than contract it out to a master servicer and bank trustee. (This would require reducing the constraints on the REEL program and/or transferring to a nongovernmental delivery agent.)</p> <p>↓ Address high loan enrollment costs to reduce complexity in determining REEL eligibility (that is, IOU territory or not).</p> <p>↓ Explore efficiencies in administration and contractor management operations; this is currently under way.</p>

Based on the options open to modify REEL, the following strategies emerge as offering the highest potential to improve its cost-effectiveness.

- **Expand eligibility and applicable measures and lower the required interest rates to drive further loan volume:** Expanding eligibility to POU territories and expanding lender underwriting as the loan pool performs well can help increase volume. The evaluation team recognizes, however, that POUs are not under CPUC jurisdiction and may require a different approach. Expanding the eligible measures to include solar PV, the CPUC can support REEL evolving into a cost-effective, ratepayer-supported program. Finally, if the LLR performance continues to show extremely low default rates, work with lenders to bring down the program interest rates and lower the minimum FICO scores, thereby driving more participation and increasing the APR reduction benefits.
- **Track loan pool performance and build new program efficiencies:** The REEL pilot established a pool of EE loans that can better describe the risk profile of REEL customers and projects. This provides an opportunity to retune the LLR ratios and the loan terms to further improve the program cost-effectiveness. Reducing the LLR ratio would likely have significant impact on program cost-effectiveness by reducing the LLR lost opportunity costs of capital costs and, to some degree, the LLR management costs. Finally, building and maintaining a public database of REEL loans and their performance may attract more lenders into the EE space (either by joining REEL or independent of

REEL), which could further increase REEL volume and/or demonstrate market transformation benefits.

- **Account for the full range of REEL benefits:** Finally, it has been recognized throughout the cost-effectiveness analysis that many REEL benefits are not fully accounted for or are unknown. By determining the correct values for NEBs from the EEEMs investments and, perhaps more importantly, the non-EEEMs investments through REEL loans may support using the higher range values for these benefits. Moreover, capturing the societal cost of carbon in the analysis would further improve the REEL program cost-effectiveness, particularly if it is coupled with adding fuel switching measures to the program.

Overall, the evaluation team’s analysis suggests that REEL would need to evolve in several notable ways if it were to establish itself as a cost-effective, ratepayer-supported program. The current LLR management and capital costs pose a barrier to program cost-effectiveness that may require significant modifications to overcome.

Self-Supporting Program Over Time

As an alternative, the evaluation team assessed the potential for REEL to become a self-supporting program without the need for regular injections of ratepayer funds. The first step was to determine REEL’s private/public capital leverage ratio, which gives an indication of the amount of funds that would need to be raised to support the REEL program, relative to the overall program loan volume.

The evaluation team then determined what interest rate rider would be needed to cover the program costs. The interest rate rider would be applied to each loan over its entire repayment term, collected from the lender and remitted to the REEL PA to support the program costs. A high-level estimate was performed for each REEL model assuming that the rate rider would cover all program administration costs and LLR covered losses. The calculation assumed that all loans are paid out over their full term and did not account for early repayments.

The results of this analysis and the leverage ratios are presented in Table 30. For this analysis, the evaluation team added an additional scenario considering the REEL+ program and estimated volume, but without the master servicer costs. This represents a self-supported REEL model that would not be required to track loans and funds for each IOU and would have an LLR that is managed by CAEATFA itself.

Table 30. Interest Rate Rider Needed to Allow REEL to Be Self-Supporting

	REEL Pilot	REEL BAU	REEL+	REEL+ (no master servicer)
Total Portfolio Value (\$M)	\$3.75	\$21.25	\$78.18	\$78.18
Leverage Ratio	1.86	3.08	7.19	8.40
Interest Rate Rider Required	6.20%	3.75%	1.44%	1.14%

From the results in Table 30, a few conclusions about REEL’s potential as a self-supported program emerge.

- **As program volume increases the potential for a self-supported becomes more evident:** The leverage ratios rise, and the required interest rate rider drops significantly under the REEL+ models, suggesting that if REEL could generate significant volume, it would have a higher potential to be self-supporting.

- **The REEL+ and REEL BAU interest rate rider is significantly lower than the current average APR reduction of 4.6%:** Under the REEL+ model (with or without the master servicer), the interest rate rider would be less than half the current average APR benefit, suggesting that even with the rate rider, the program would still pass along significant APR benefits to the customers. However, it should be noted that 22% of REEL pilot participants had APR benefits of 3% or less, so the rate rider may erode the interest rate benefit for some customers to the point that the program becomes less attractive to them.
- **While there is the potential to cover REEL's costs via a rate rider, the LLR itself would require further support:** The interest rate riders do cover LLR losses but were not set sufficiently high to provide the funds needed to establish the initial LLR pool itself, largely because this is a significant up-front cost that cannot effectively be collected via a rate rider. Under the REEL+ model with steady annual volumes, the evaluation team estimates that the LLR would ramp up to nearly \$15M within 10 years as the loan pool expands year by year. After 10 years (the average loan term), the required LLR would grow slowly, mostly due to annual inflation in prices and loan values. This initial pool of LLR funds would need to be supplied to CAEATFA in the initial years, like the PACE LLR that it currently operates.

A self-supported program would have fewer restrictions than the current program as it would not be subject to the rules that govern the use of ratepayer money. This could facilitate the following changes to the program.

- **Expanded and consistent EEEMs list:** Without the ratepayer efficiency funds restrictions, REEL could expand to include solar PV. Under this model, REEL would offer many of the same options as PACE currently does and may generate increased volume as a result, which would further help maintain the self-supported model.
- **Reduction of LLR complexity:** With the removal of ratepayer money, it may be possible to significantly reduce the LLR management complexity. Under this model, there would be no need to track the LLR contributions to IOUs or to maintain the bank trustee. Examination of programs in other jurisdictions that operate simple LLRs (tracking only the aggregate loan amount per lender) indeed showed much lower LLR management costs, especially when the LLR can be managed internally by the PA.
- **Enhanced flexibility:** CAEATFA noted that making the needed adaptations to the REEL pilot model was often slow due to the navigation through both standard state procedures and CPUC administrative and governance processes. With the removal of ratepayer money, it is assumed that the CPUC would no longer have responsibility for the program. This would remove the requirement for the program to pass cost-effectiveness tests and may also give CAEATFA (or an alternative administrator) the flexibility to adapt the program to market conditions and intelligence as it arises. The interviews with programs in other jurisdictions underlined the importance of flexibility and adaptation to delivering successful financing programs.

While removing ratepayer funds may offer options to expand the program and make it more flexible and comprehensive, it would also pose some challenges.

- **Reduced attractiveness for lenders:** A self-supported program may be less attractive to lenders for several reasons beyond simply the requirement that they would have to charge an interest rate rider on behalf of CAEATFA (or an alternative PA). The self-supporting program would likely not be as closely tied to the IOUs via the ratepayer funds, which could reduce marketing and leveraging options

through utility bill inserts and utility program contractors. Maintaining these linkages would likely be important even for a self-supporting program. Also, having CAEATFA deliver the program would maintain government support for the program, which attracted some of the enrolled lenders. Finally, the rate rider itself may turn away lenders either because they feel that the attractiveness of the program for their customers is reduced or because they see the rider as a diversion of their own potential returns from the loans.

- **Reduced attractiveness for participants:** Under a self-supported program, the interest rider would raise costs for participants and reduce the APR benefits that they receive. The cost-effectiveness analysis revealed that the current PCT is just slightly higher than 1.0, and this would likely drop further with the rate rider. This could be offset by expanding the program to more measures that are either more economically advantageous to participants or carry high NEBs.
- **Capital sourcing challenges:** The most daunting challenge for a self-supporting program would be raising the initial LLR funds and managing program cash flow. As outlined earlier, the interest rate rider assessed here does not cover the initial LLR establishment, it just covers the LLR losses. Covering the LLR itself through lenders would require them to transfer a further 10%-20% of the loan value to CAEATFA for each loan in the initial years, and less as the LLR pool grows. The evaluation team does not believe that this is a viable model, and instead proposes that even a self-supported program would require an initial injection of money, likely from the government. For example, CT Green Bank used remaining ARRA funds to establish its Smart-E loan LLR.
- **Cash flow management challenges:** Finally, while the rate rider does provide enough returns to cover REEL program costs, it does so over 10–15 years, while most of the costs are incurred in the year that the loan is issued. This challenge would be most pronounced in the initial years as CAEATFA builds its pool of covered loans and ramps up its revenues from the rate rider. CAEATFA would likely require an injection of cash or bridge funding to cover its administrative costs in the initial years, which could be paid back later once the rate rider revenues are sufficient.

Overall, this analysis suggests that, with some significant setup assistance, a self-supporting model may be possible. Even then, it would likely take years to fully stand on its own. While it may be a challenge to pursue this model, it does offer several benefits, such as increased flexibility, that could reduce the REEL administrative burden and allow the program to continuously adapt to the market demands and drive higher volume.

Another avenue that has been suggested is that, after the pilot has jump-started EE lending, the private market would offer REEL financing without ratepayer-funded support. This evaluation indicates that it is too early to expect this to occur, as REEL accounts for a small portion of these lenders' total loan portfolio, and the lenders will need more time to assess the risk. Given that most loans average about 10 years, it is too early to assess how these loans will perform based on the first one to two years of this lending. Notably, however, all lenders interviewed said that they would not offer the same rates and terms without the LLR, but that they recognize that REEL is important in helping the community and serving those who would otherwise not have access.

Administrative Structure

Those interviewed suggested that a state-backed program adds credibility, trust, and security. Stakeholders also commended CAEATFA for its ability to launch REEL, identify and address constraints, and establish the infrastructure and team to deliver and build strong relationships with partners. CAEATFA has gained valuable

experience that will benefit REEL if it continues, as well as other initiatives like the Small Business and Affordable Multifamily pilots.

5. Detailed Gross Impact Results

This chapter provides detail on the data sources, methods, and results for the LFER analysis to estimate overall gross savings for the pilot. Notably, this LFER approach did not include a comparison group (that is, the analysis included only participants). As such, the results estimate gross impacts only and do not reflect the savings specifically attributable to the pilot (net savings). The evaluation team added a comparison group to estimate net savings and those results are available in Chapter 6.

5.1 Data Sources and Data Cleaning

Four California IOUs (PG&E, SCE, SCG, and SDG&E) provided the evaluation team with hourly electric and daily gas interval data for all participants who had enrolled in the pilot from inception through January 2018.

The evaluation team performed several data cleaning and quality control checks on the data. First, because this evaluation focused on participants who enrolled within the first two years of the pilot, the data cleaning process removed participants who had their loan approved after July 31, 2018. The evaluation team also dropped participants who had insufficient pre-participation period data (that is, insufficient data to calculate monthly energy usage for all the pre-participation period months). Table 31 shows that these data-cleaning steps removed between 36% and 62% of REEL participants from the analysis, depending on IOU and fuel type, primarily because many participants received loans after the evaluation period.

Table 31. Data-Cleaning Results

Fuel Type	IOU	Number of Participants	Enrolled after July 31, 2018	Incomplete Pre-Participation Period AMI Data	Included in Model	% Remaining
Electric	PG&E	121	-56	-18	47	39%
	SCE	128	-36	-10	82	64%
	SDG&E	45	-10	-7	28	62%
Gas	PG&E	125	-53	-25	47	38%
	SCG	137	-51	-9	77	56%
	SDG&E	43	-10	-7	26	60%

Note: The number of participants pre-cleaning (third column) does not sum to 339. Reasons include not having interval data available, being customers of more than one utility, and receiving electric or gas service from a municipal utility.

In addition, the evaluation team:

- Averaged electric values with the same date and hour for a given customer
- Adjusted for electricity sent back to the grid through Net Energy Metering (NEM)
- Summed hourly electric usage to the daily level for kWh impacts
- Averaged hourly electric usage during the Commission Peak Period (4 pm–9 pm)⁵⁷ for kW impacts

⁵⁷ <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442459140>.

5.2 Model Specification

The evaluation team split the models by fuel type. The kWh impacts model included all hours of the day, while the kW impacts model included only the Commission Peak Period hours (4 pm–9 pm). The evaluation team tested a variety of model specifications for each fuel type and ultimately selected specifications that yielded the best fit on standard econometric metrics. Notably, the various model specifications estimated consistent results. Equation 1 and Equation 2 show the selected model specifications for each fuel type. Again, it is important to note that the kWh and kW impacts used the same model specification, and differed only in the electric usage hours included in the models (that is, the electric models included all 24 hours of the day, while the demand models included only the Commission Peak Period hours).

Equation 1. Model Specification for Electric and Demand Fixed Effects Model without Comparison Group

$$\begin{aligned}
 kWh_{it} = & \alpha + \delta_i + \beta_{post} post_{it} + \beta_{HDD} HDD_{it} + \beta_{CDD} CDD_{it} + \sum_{m=1}^{12} \beta_{month} month_{mt} + \beta_{post\ HDD} post_{it} \\
 & * HDD_{it} + \beta_{post\ CDD} post_{it} * CDD_{it} + \sum_{m=1}^{12} \beta_{post\ month} post_{it} * month_{mt} + \beta_{NEM\ CDD} NEM_i \\
 & * CDD_{it} + \beta_{NEM\ HDD} NEM_i * HDD_{it} + \sum_{m=1}^{12} \beta_{NEM\ month} NEM_i * month_{mt} + \varepsilon_{it}
 \end{aligned}$$

Where:

kWh_{it} = Consumption (kWh) for household i at time t (all 24 hours for electric model and 4 pm–9 pm for demand model)

α = Overall intercept

δ_i = Household-specific intercept (absorbed)

$post_{it}$ = Indicator variable for post-participation period (where a proxy-period is assigned to comparison group customers based on the project completion data of their respective matched participants)

CDD_{it} = Cooling degree days for household i at time t

HDD_{it} = Heating degree days for household i at time t

$month_{mt}$ = Set of 12 indicator variables for month of the year

NEM_i = Indicator variable for NEM rate status

β_x = Model coefficients

ε_{it} = Error term

Equation 2. Model Specification for Gas Fixed Effects Model without Comparison Group

$$\begin{aligned}
 therms_{it} = & \alpha + \delta_i + \beta_{post} post_{it} + \beta_{CDD} CDD_{it} + \beta_{HDD} HDD_{it} + \beta_{post\ CDD} post_{it} * CDD_{it} + \beta_{post\ HDD} post_{it} \\
 & * HDD_{it} + \varepsilon_{it}
 \end{aligned}$$

Where:

$therms_{it}$ = Consumption (therms) for household i at time t

α = Overall intercept

δ_i = Household-specific intercept (absorbed)

$post_{it}$ = Indicator variable for post-participation period (where a proxy-period is assigned to comparison group customers based on the project completion data of their respective matched participants)

CDD_{it} = Cooling degree days for household i at time t

HDD_{it} = Heating degree days for household i at time t

β_x = Model coefficients

ε_{it} = Error term

5.3 Results

Table 32 provides the average daily and annual gross impacts among the pilot participants in the model, based on the LFER models without the comparison group. These estimates show that the pilot participants saved, on average, 12.8% of their annual electricity consumption and 2.6% of their annual gas consumption. Participants in the model also, on average, reduced their peak period electricity usage by about 7%.

Table 32. Average Daily and Annual Gross Impacts Per Participant

Fuel Type	Participants in Model	Per-Participant Impacts				% Impacts
		Daily Baseline Usage	Daily Impacts	Standard Error	Annual Impacts	
kWh	157	15.84	2.03	0.313	741	12.8%
kW	157	1.16	0.08	0.020	NA	6.9%
Therms	150	1.12	0.03	0.010	11	2.6%

Table values do not calculate appropriately due to rounding.

Applying the average savings above to the 212 REEL participants in the evaluation period yields total gross electric and gas impacts for the pilot. As shown in Table 33, in its first two years, the pilot achieved approximately 157 MWh in energy savings, 17 kW in peak demand savings, and 2,321 therms in gas savings.

Table 33. REEL Pilot Total Gross Impacts

Units	Total Participants	Per-Participant Daily Impacts	Total Pilot Impacts
kWh	212	2.03	157,081
kW		0.08	17
Therms		0.03	2,321

Note: Total kWh and therm impacts are calculated as *daily per-participant impact* * 365 * 212. Total kW impacts are calculated as *daily per-participant impact* * 212. Table values do not calculate appropriately due to rounding.

6. Detailed Net Impact Results and Pilot Influence

The evaluation team explored two approaches to understanding net impacts attributable to the pilot. The first, presented in Section 6.1, shows the results of the LFER model using a matched comparison group. The second, presented in Section 6.2, uses self-reported responses from the participant survey to further understand pilot influence qualitatively.

6.1 Net Impacts

The evaluation team used an LFER model with matched comparison group approach to estimate net pilot impacts. The comparison group is composed of nonparticipating residential customers who had similar energy usage to REEL participants in the period before participants completed a REEL project. The use of comparison groups is a standard approach for estimating net impacts for many types of residential ratepayer programs in California, as it allows the model to account for a wide variety of exogenous factors (that is, not related to the pilot) that might affect changes in energy use post-participation.

The next subsections detail the data sources and cleaning methods, model specifications, and results of the LFER model with the matched comparison group.

6.1.1 Data Sources and Data Cleaning

The evaluation team used the same hourly electric and daily gas interval data provided by the IOUs for the gross impact model described in Chapter 5. In addition, for use in the net impact model, the team requested that the utilities provide interval data for a random sample of nonparticipants for a comparison pool. The team requested that the comparison pool be 20 times the size of the participant sample to obtain a sufficient range of potential comparison group customers and allow for proper matching. Table 34 provides the total number of electric and gas comparison pool customers from each IOU.

Table 34. Size of Initial Comparison Pool

IOU	Number of Electric Customers	Number of Gas Customers
PG&E	2,420	2,500
SCE	2,560	N/A
SCG	N/A	2,760
SDG&E	920	880

The evaluation team leveraged the cleaned participant dataset described in Section 5.1 and applied the same steps to the matched comparison group pool prior to matching.

6.1.2 Comparison Group Matching

The evaluation team built the matched comparison groups based on energy consumption prior to the completion of the project (that is, pre-participation period), specifically average daily use during each pre-participation period month. The matching process included replacement, that is, one participant matched to one or multiple comparison group customers. Each energy fuel type (electric and gas) had a separate matched comparison group.

The team explored the use of several matching methods and ultimately selected the Mahalanobis distance method for comparison group matching. The Mahalanobis method is a standard industry approach that matches participants and comparison customers by choosing pairs with the smallest overall distance between customers' pre-participation period average monthly usage by normalizing the distances based on the standard errors of each pre-participation period month and accounting for the covariance among all pre-participation period months.

The evaluation team verified the equivalency of the participant and matched comparison groups by conducting equivalency checks based on their pre-participation period energy usage. The sections below provide greater details for these equivalency checks

Electric Usage Comparison Group Matching Results

For electric usage, participants matched to comparison group customers based on their pre-participation period average monthly electric usage and NEM status. A customer with a NEM status of 1 indicates that the customer was on, or switched to, a NEM rate at during the analysis period. The evaluation team matched NEM participants to NEM comparison group customers and non-NEM participants to non-NEM comparison group customers. In addition, the evaluation team verified matching based on the hourly and monthly usage. Both NEM and non-NEM participants have similar pre-participation period electric usage compared to the matched comparison group, as shown in Figure 16 and Table 35. Figure 16 compares the average hourly pre-participation period energy usage graphically, while Table 35 quantifies the differences. The differences between treatment and comparison groups, in both NEM and non-NEM cases, were close to 0 for all hours during a typical pre-participation period day.

Figure 16. Average Hourly Mahalanobis Distance Matching by NEM Status, Electric

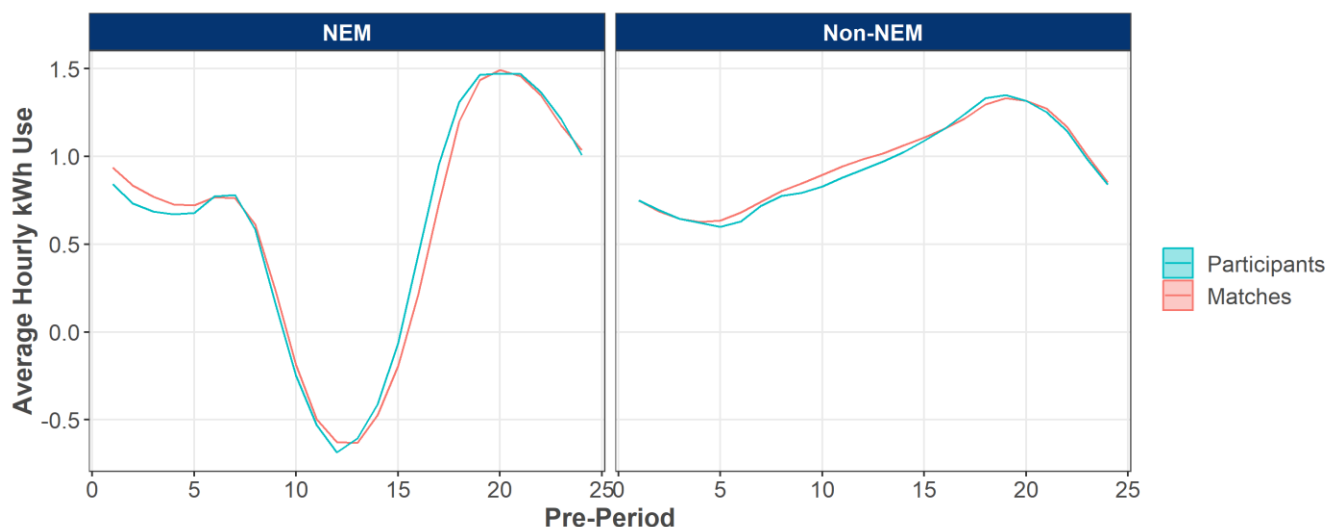


Table 35. Average Hourly Mahalanobis Distance, Covariate Balance for Matched Pre-Participation Period Months by NEM Status, Electric

Customer Type	Hour	Participant Count	Comparison Count	Average Hourly Electric Consumption		
				Participants	Comparison Group	Difference
Non-NEM	1	118	549	0.75	0.75	0.00
	2			0.69	0.68	0.01
	3			0.64	0.64	0.00
	4			0.62	0.63	0.00
	5			0.60	0.63	-0.04
	6			0.63	0.68	-0.05
	7			0.72	0.74	-0.02
	8			0.77	0.80	-0.03
	9			0.79	0.85	-0.05
	10			0.83	0.89	-0.07
	11			0.88	0.94	-0.06
	12			0.93	0.98	-0.06
	13			0.97	1.02	-0.05
	14			1.02	1.06	-0.04
	15			1.09	1.11	-0.02
	16			1.16	1.16	0.00
	17			1.24	1.22	0.03
	18			1.33	1.30	0.04
	19			1.35	1.33	0.02
	20			1.32	1.32	0.00
	21			1.25	1.27	-0.02
	22			1.14	1.17	-0.02
	23			0.98	1.00	-0.02
	24			0.84	0.85	-0.01

Customer Type	Hour	Participant Count	Comparison Count	Average Hourly Electric Consumption		
				Participants	Comparison Group	Difference
NEM	1	43	196	0.84	0.93	-0.09
	2			0.73	0.83	-0.10
	3			0.69	0.77	-0.08
	4			0.67	0.73	-0.06
	5			0.68	0.72	-0.04
	6			0.77	0.77	0.01
	7			0.78	0.76	0.02
	8			0.58	0.61	-0.03
	9			0.15	0.23	-0.07
	10			-0.25	-0.19	-0.06
	11			-0.53	-0.50	-0.03
	12			-0.69	-0.63	-0.06
	13			-0.61	-0.63	0.02
	14			-0.41	-0.47	0.06
	15			-0.06	-0.19	0.13
	16			0.44	0.22	0.23
	17			0.96	0.73	0.23
	18			1.31	1.20	0.11
	19			1.47	1.43	0.03
	20			1.47	1.49	-0.02
	21			1.47	1.46	0.01
	22			1.37	1.35	0.02
	23			1.21	1.18	0.03
	24			1.01	1.03	-0.03

In addition, the evaluation team checked the balance after matching on the average monthly level. The non-NEM participants have similar energy usage after Mahalanobis distance matching compared to the matched comparison group. NEM participants, on the other hand, have higher average pre-participation period monthly usage during the summer months compared to the matched comparison group. This was accounted for within the regression model by adding monthly terms and interacting them with other coefficients within the model.

Gas Usage Comparison Group Matching Results

For gas usage, participants matched to comparison group customers based on their pre-participation period average monthly gas usage and NEM status. Participants had very similar pre-participation period gas usage compared to the matched comparison group after matching, as shown in Figure 17 and Table 36. Figure 17 compares the average monthly pre-participation period gas usage graphically, while Table 36 quantifies the differences and shows them to be close to 0 for all pre-participation period months.

Figure 17. Average Monthly Mahalanobis Distance Matching, Gas

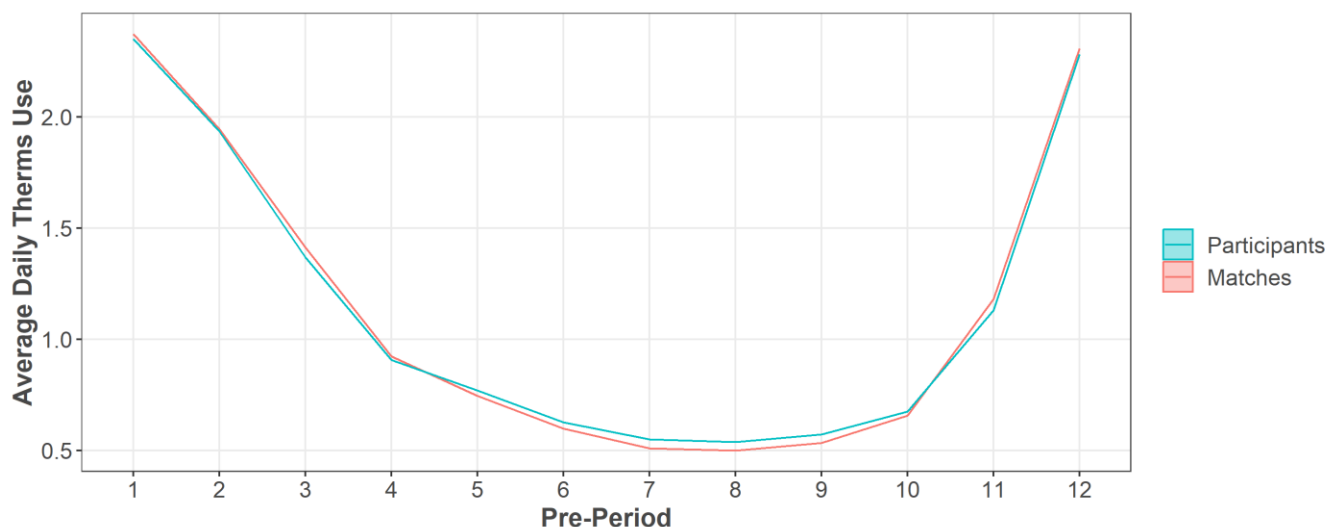


Table 36. Average Monthly Gas Consumption Data: Covariate Balance for Pre-Participation Period Months

Pre-Participation Period Month	Participant Count	Comparison Count	Participant Average Monthly Gas Consumption	Comparison Group Average Monthly Gas Consumption	Difference
1	157	451	2.35	2.26	0.09
2			1.94	1.85	0.09
3			1.37	1.33	0.04
4			0.91	0.88	0.02
5			0.77	0.72	0.05
6			0.63	0.59	0.03
7			0.55	0.51	0.04
8			0.54	0.51	0.03
9			0.57	0.56	0.01
10			0.67	0.66	0.01
11			1.13	1.14	-0.01
12			2.28	2.20	0.08

6.1.3 Model Specifications

The evaluation team split the models by impact type (that is, kWh, kW, and therms). The kWh impacts model included all hours of the day, while the kW impacts model included only the Commission Peak Period hours (4 pm–9 pm). The evaluation team tested a variety of model specifications for each fuel type and ultimately selected specifications that yielded the best fit on standard econometric metrics. Notably, the various model specifications and matched comparison groups estimated consistent results. Equation 3 and Equation 4 show the selected model specifications of the LFER models with the comparison group for each fuel type. It is important to note that the kWh and kW impacts used the same model specification and differed only in

the electric usage hours included in the models (that is, the electric models included all 24 hours of the day, while the demand models included only the Commission Peak Period).

Equation 3. Model Specification for Electric and Demand Fixed-Effects Model with Comparison Group

$$\begin{aligned}
 kWh_{it} = & \alpha + \delta_i + \beta_{post}post_{it} + \beta_{HDD}HDD_{it} + \beta_{CDD}CDD_{it} + \sum_{m=1}^{12} \beta_{month}month_{mt} + \beta_{post\ HDD}post_{it} * HDD_{it} + \beta_{post\ CDD}post_{it} \\
 & * CDD_{it} + \sum_{m=1}^{12} \beta_{post\ month}post_{it} * month_{mt} + \beta_{NEM\ CDD}NEM_i * CDD_{it} + \beta_{NEM\ HDD}NEM_i * HDD_{it} \\
 & + \sum_{m=1}^{12} \beta_{NEM\ month}NEM_i * month_{mt} + \beta_{post\ participant}post_{it} * participant_i + \beta_{participant\ CDD}participant_i \\
 & * CDD_{it} + \beta_{HDD}participant_i * HDD_{it} + \sum_{m=1}^{12} \beta_{participant\ month}participant_i * month_{mt} \\
 & + \sum_{m=1}^{12} \beta_{post\ participant\ month}post_{it} * participant_i * month_{mt} + \varepsilon_{it}
 \end{aligned}$$

Where:

kWh_{it} = Consumption (kWh) for household i at time t (all 24 hours for electric model and 3 – 7 pm for demand model)

α = Overall intercept

δ_i = Household-specific intercept (absorbed)

$participant_i$ = Indicator variable for inclusion in participant group

$post_{it}$ = Indicator variable for post-participation period (where a proxy-period is assigned to comparison group customers based on the project completion data of their respective matched participants)

HDD_{it} = Heating degree days for household i at time t

CDD_{it} = Cooling degree days for household i at time t

$month_{mt}$ = Set of 12 indicator variables for month of the year

NEM_i = Indicator variable for NEM rate status

β_x = Model coefficients

ε_{it} = Error term

Equation 4. Model Specification for Gas Fixed-Effects Model with Comparison Group

$$\begin{aligned}
 therms_{it} = & \alpha + \delta_i + post_{it} + post_{it} * participant_i + post_{it} * participant_i * CDD_{it} + post_{it} \\
 & * participant_i * HDD_{it} + \varepsilon_{it}
 \end{aligned}$$

Where:

$therms_{it}$ = Consumption (therms) for household i at time t

α = Overall intercept

δ_i = Household-specific intercept (absorbed)

$post_{it}$ = Indicator variable for post-participation period (where a proxy-period is assigned to comparison group customers based on the project completion data of their respective matched participants)

$participant_i$ = Indicator variable for inclusion in participant group

CDD_{it} = Cooling degree days for household i at time t

HDD_{it} = Heating degree days for household i at time t

β_x = Model coefficients

ε_{it} = Error term

6.1.4 Results

Table 37 provides the average daily and annual net impacts among REEL participants in the model, based on the LFER models with the comparison group. These estimates show that REEL participants, on average, achieved net impacts of 5% of their annual electricity consumption and 1.5% of their annual gas consumption. Participants in the model also, on average, reduced their peak period electricity usage by about 3%.

Table 37. Average Daily and Annual Net Impacts Per Participant

Fuel Type	Per-Participant Impacts					% Impacts
	Participants in Model	Daily Baseline Usage	Daily Impacts	Standard Error	Annual Impacts	
kWh	157	15.39	0.82	0.291	301	5.4%
kW	157	1.17	0.03	0.020	NA	2.9%
Therms	150	1.11	0.02	0.009	6	1.5%

Table values do not calculate appropriately due to rounding.

Applying the average savings above to the 212 REEL participants in the evaluation period yields total net electric and gas impacts for the pilot. As shown in Table 38, in its first two years, the pilot achieved approximately 64 MWh in energy savings, 7 kW in peak demand savings, and 1,262 therms in gas savings.

Table 38. REEL Pilot Net Impacts

Units	Total Participants	Per-Participant Daily Impacts	Total Pilot Impacts
kWh	212	0.82	63,749
kW		0.03	7
Therms		0.02	1,262

Note: Total kWh and therm impacts are calculated as *daily per-participant impact * 365 * 212*. Total kW impacts are calculated as *daily per-participant impact * 212*. Table values do not calculate appropriately due to rounding.

6.2 Pilot Influence Analysis

This section explores the kinds and levels of influence the REEL pilot had on participants' projects. The data source for this analysis is the participant survey results (n=49), in which the evaluation team asked several batteries of questions aimed at understanding the influence of financing *in general* and the *specific influence of REEL* compared to other potential financing alternatives.

6.2.1 Motivations for Doing a Home Upgrade Project

While financing is a tool for making home upgrade projects more affordable, it is not usually the impetus for deciding that there is a need to do a home upgrade. As shown in Table 39, the most common motivators among respondents were the desire to reduce energy bills and increase comfort reasons (more than half of respondents cited one of these). The next most common motivations (combined 28%) were to fix problems with the equipment or structure of the home.

Table 39. Motivations for Home Upgrade

Motivation	Frequency	Percent
Reduce energy bills	14	29%
Comfort (home too hot or cold)	12	25%
Equipment repairs	10	20%
Improved environmental friendliness	6	12%
Home structure repairs	4	8%
Prepare for sale	2	4%
None of the above	1	2%
Total	49	100%

6.2.2 The Influence of Financing in General

Participant survey responses make it clear that the kind of projects respondents completed typically required financing. Before asking specific questions about the effect of financing on various aspects of the project (cost, timing, and efficiency), the survey asked a general question about reasons for seeking financing. Almost half (49%) said that they used financing because they did not have enough cash on hand to do the project right away, and another 6% did not want to deplete the cash they had. More than 16% cited the good terms offered as a reason. This last response may indicate that some respondents were thinking of the REEL pilot specifically in answering this question, but the responses are another reflection of how important financing is to customers undertaking a home upgrade project.

A large majority of respondents (32, or 65%) indicated that the loan was necessary to do the exact same project that they did or at the time that they did it.⁵⁸ Looking at some of the influence factors individually, as shown in Table 40, almost half (49%) said that they would have been somewhat or very unlikely to have undertaken the project at all without financing, and 49% said that the size of their project (in terms of cost) would have been somewhat or very unlikely to have been the same without the availability of financing.

Table 40. Likelihood to Do Projects without Financing

Likelihood of Doing the Project without Financing	At All		At the Same Cost	
	Count	Percent	Count	Percent
Very Likely	17	35%	18	37%
Somewhat Likely	8	16%	7	14%
Somewhat Unlikely	8	16%	9	18%
Very Unlikely	16	33%	15	31%
Total	49	100%	49	100%

⁵⁸ Source: Combination of survey questions asking about the likelihood to do the project at all (F2), at the same time (F3), at the same efficiency level (F4), and at the same cost (F5). See Section 8.3.4.

For others, financing affected the level of efficiency that they incorporated into their project. As shown in Table 41, about 30% said that, to some extent, not having financing would have reduced the level of EE they chose. Specifically, they said that the efficiency would have been at the code minimum or a little higher, but not as high as the completed project.

Table 41. Likelihood to Do Project of the Same EE Level without Financing

Response	Count	Percent
The same or higher efficiency as what you installed	29	59%
Above the minimum but lower efficiency than what you installed	6	12%
The minimum efficiency standards or building code	9	18%
Don't know	3	6%
Refused	2	4%
Total	49	100%

Financing also significantly accelerated the timing of the project for many participants. As shown in Table 42, 39% said that they would have done the project one and a half or more years in the future and another 8% said that they never would have done it without financing.

Table 42. Timing of Project without Financing

Without Financing, Respondent Would Have Done Project:	Count	Percent
At the same time or sooner	10	20%
Within six months	12	25%
Within a year	4	8%
Within a year and a half	5	10%
Within two years	1	2%
Two years or longer	13	27%
Never	4	8%
Total	49	100%

Financing Versus Rebates

Only six respondents (or 12%, n=49) received rebates in addition to the REEL loan. Among them, four said that the loan was significantly more important than the rebate and two said that the loan was somewhat or significantly less important than the rebate. There was a notable connection between the size of the respondents' rebate and their response on relative importance, as shown below.

Table 43. Relative Influence of Loans and Rebates (n=6)

Rebate Amount	Loan Amount	Rebate as % of Loan	Relative Importance	Relative Need
\$5,000	\$6,500	77%	The loan was SIGNIFICANTLY LESS important than the rebate.	I needed BOTH the rebate and the loan in order to do the project.
\$3,000	\$19,974	15%	The loan was SOMEWHAT LESS important than the rebate.	I would have done the project without either the rebate or the loan.
\$1,500	\$26,439	6%	The loan was SIGNIFICANTLY MORE important than the rebate.	I needed the loan to complete the project but did not need the rebate.
\$600	\$9,480	6%	The loan was SIGNIFICANTLY MORE important than the rebate.	I needed the loan to complete the project but did not need the rebate.
\$175	\$3,366	5%	The loan was SIGNIFICANTLY MORE important than the rebate.	I needed the loan to complete the project but did not need the rebate.
\$50	\$18,842	<1%	The loan was SIGNIFICANTLY MORE important than the rebate.	I needed the loan to complete the project but did not need the rebate.

Notably, while only 12% of survey respondents reported receiving rebates in addition to financing, this does not reflect the population of the first two years of participants. The evaluation team verified through cross-referencing REEL and statewide rebate program data that 27% (57 of 212) of participants in the first two years also received rebates.

6.2.3 Financing Alternatives

The REEL pilot is one of many possible options for financing a home upgrade project. Participants may well have alternatives, although some who have poor credit ratings or substantial DTI ratios may not have alternatives, or they may have them but at less attractive loan terms. The participant survey asked respondents whether they had sought out other options, or would have without REEL, and whether they thought that they could find financing that they could qualify for or would accept (that is, acceptable loan terms and affordable monthly payments).

Convenience was clearly a factor in the decision of some to go with REEL financing. Most respondents were not inclined to shop for alternatives before choosing a REEL loan. A little over 40% remembered that their contractor offered them alternative loan options, but only about a third (32%) reported that they shopped for other financing options. As shown in Table 44, of those who looked for other options (n=16), five said that they found at least one that they would have qualified for, one found a lower interest rate (but did not take it due to a longer loan approval wait), and four found alternatives with longer loan terms.

Table 44. Actual Alternatives Sought before Choosing REEL

Question about Alternative Financing	Yes (Count)
Did you seek out or research other financing options?	16
Would/did you qualify?	5
Did they have lower interest?	1
Did they have a longer term?	4

However, respondents likely would have sought alternative financing had REEL not been available. The survey asked respondents who did not seek financing alternatives what they hypothetically would have done absent REEL. As shown in Table 45, combining the respondents who said that they *did* look at alternatives with those who *would have* looked for something else absent REEL shows that 86% would have shopped for other financing if REEL had not been available. In other words, only 14% would not have looked for financing absent REEL. This reinforces the earlier finding (in Section 6.2.2) that respondents typically required financing to do their project.

Table 45. Shopping Behavior (Hypothetical and Actual)

If There Were No REEL ^a	Count	Percent (n=49)
Would have sought alternatives	26	53%
Did seek alternatives	16	33%
Total	42	86%

^a Categories based on responses to survey questions R1, R3, and R5a. See Section 8.3.5.

6.2.4 Specific Influence of REEL Affordability

Respondents generally believed that the REEL loan offered a more attractive option than they otherwise would have found, in terms of an affordable monthly payment. A large majority (78%, or 38 respondents) thought it very likely that they would have qualified for another loan and six (12%) thought that it was somewhat likely. However, only eight thought that they would be able to find a loan that was just as or more affordable than REEL.

Given the inferior affordability of alternatives anticipated by most, about 38% said that they would have done a somewhat or much smaller project if the REEL loan had not been available at the terms offered (Table 46). An additional 18% said that they would not have used financing at all, which, as discussed in Section 6.2.2, likely would have affected the size, efficiency, and/or timing of the projects. On the other hand, about 22% said that they would have done exactly the same project, which indicates that they would have paid in cash or used an alternative financing option even if it was less affordable.

Table 46. Self-Reported Influence of REEL on Project Size If Qualified and If Loan Cost Was Higher

Without REEL, Respondent Would Have:	Count	Percent
Done a much smaller project	10	20%
Done a somewhat smaller project	9	18%
Done the exact same project	11	22%
Not used financing at all	9 ^a	18%
Don't know	2	4%
Could have found a similarly or more affordable loan ^b	8	16%
Total	49	100%

^a Original frequency was 8. Includes one extra person who said that he was “very unlikely” to qualify for other financing and, thus, was not originally asked this question.

^b Survey question excluded these eight respondents.

Notably, there were reasons beyond affordability that convinced customers to choose a REEL loan. As shown in Table 47, contractor recommendations, avoiding a property lien (a direct comparison to PACE financing), and an easy qualification process were also important factors for several respondents.

Table 47. Reasons for Choosing REEL (Multiple Response)

Response	Count	Percent (n=49)
Loan Terms		
Low interest rate	26	53%
No lien on house	5	10%
Monthly payment	3	6%
Loan duration	3	6%
No prepayment penalty	1	2%
Loan amount	1	2%
No down payment	1	2%
Other attractive loan terms (not specific)	6	12%
Connection to Contractor or Other Organization		
Contractor recommendation	8	16%
Connected to credit union	2	4%
Connected to the CPUC	1	2%
Qualification and Application Process		
Easy qualification	4	8%
Ability to Qualify		
Only financing offered to them	1	2%
Could not qualify for other financing	1	2%
Able to qualify	1	2%
Other – Not REEL-Related		
Rebates available	2	4%
Not enough cash on hand	1	2%
Wanted to save money	1	2%
Interest in EE	1	2%

6.3 Future Considerations for Net-to-Gross Ratio Analysis

The evaluation team spent a substantial amount of time thinking about how to measure and calculate finance program influence or attribution, including net-to-gross ratios (NTGRs). In a prior study evaluating some regional financing efforts throughout the state,⁵⁹ the evaluation team used a latent class discrete choice approach to estimate the impact of a finance program on residential customers' decisions about their home upgrades. This method can produce a NTGR along with other information. The approach was valuable in that it allowed for the measurement of the impact of each loan and project attribute net of all others, and what their joint effects were. However, that effort likely set the lower limit of what the real program NTGR was because it considers only the stripped-down objective program components. It does not take into account the human influence of contractors and their ability to sell the project and the financing, for example. Part of the contractor influence could also be convenience and speed of processing. The evaluation team on that study made an effort to include the convenience factor in the choice exercise, but may not have successfully captured its entire effect, and the method may not allow for measuring contractor salesmanship at all.

The evaluation team on the current study also completed a consumption analysis as part of this project and that analysis has produced gross and net, or close to net, impacts of the pilot. As always, with a quasi-experimental design, the net impact estimate probably does not estimate the pure net impact on consumption, but something between net and gross. In this case, it is almost certainly closer to net than gross because of the source of the comparison group. Still, it affords another estimate of a NTGR.

The team also included a NTGR battery of questions on the REEL participant survey. While it is a bit early in the pilot's implementation to calculate a NTGR, as early adopters in pilots do not often reflect what might be experienced in a fully operational program, the team considered this project an opportunity to explore methods of generating one by using a pretesting self-reported approach. The issues surrounding measuring a self-report-based NTGR are much more complex than they are for assessing rebate or incentive programs. For the latter, one needs to think and ask about only the impact of the rebate on the customer's decision to install. Even for behavior programs, one needs to think about and measure only the influence of the intervention on changing customer behaviors. For finance programs, much more must be considered.

Calculating a NTGR for a finance program involves more than asking what participants would have done absent the program, because a finance program is just one part of a very large finance market. There are alternatives for many home upgraders, and these alternatives should be taken into account when thinking about free-ridership (FR) on the pilot (or any other program). The evaluation team's approach, starting with the questionnaire, takes into account:

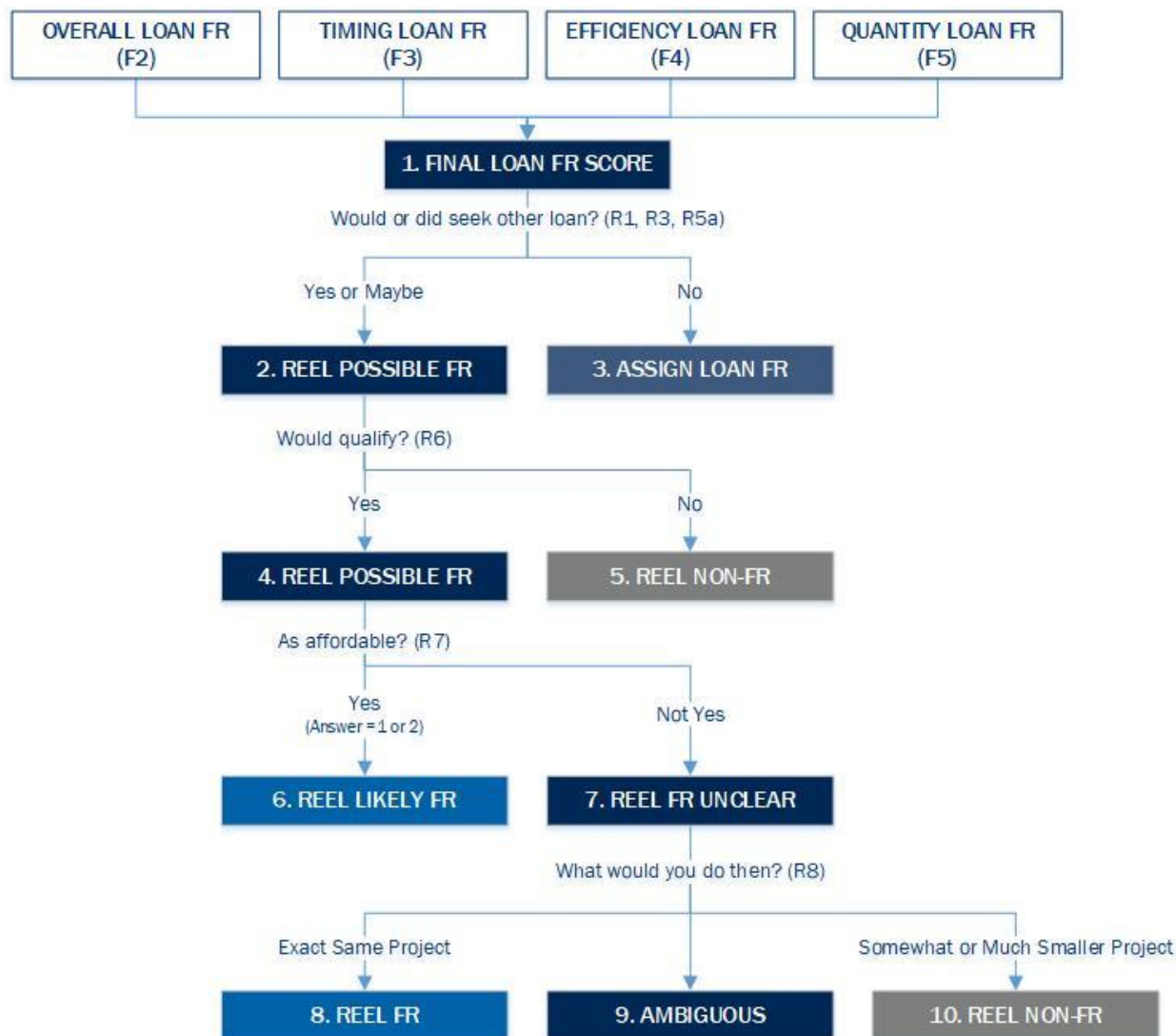
- Whether participants needed a loan to do their projects
- Whether they sought loan alternatives
- Whether they did or would qualify for the alternatives
- Whether the alternatives were more or less affordable than REEL
- What they would have done if facing a finance market that gave them less-affordable options than REEL offered

⁵⁹ http://www.calmac.org/publications/Regional_Finance_Program_Study_Final_Report_12.22.2017.pdf.

Addressing all issues is essential to generating a method that is realistic.

Given the complexity of the task, the team used a branching tree as a visual aid to think about and explain the method (Figure 18).

Figure 18. Proposed Framework for Self-Report-Based Finance Program NTGR



The tree nodes include question numbers that readers can use to find the actual questions in Chapter 8.

Each branch in the tree represents possible responses to questions on the evaluation team's participant survey questionnaire. The recommended approach begins by asking a set of questions oriented to the necessity (or lack) of getting some kind of loan for doing a home upgrade project. Participants who did not need a loan at all would very probably be free-riders on the pilot. Questions pertaining to that are represented by the first four nodes in the tree. These questions follow the current industry guidelines for the self-report approach to NTGRs. Specifically, the team asked questions to measure the effect (in probability terms) of the availability of loans on the project overall, its timing, its EE, and its size (quantity in the lingo of self-report methods). The guidelines call for taking a mean of these four probabilities. This mean represents what would

be the average level of FR. The evaluation team recognizes that FR does not make sense when considering the impact of the wider finance market on customer projects. There is no program on which customers could ride free. However, the team retains that terminology because this probability is carried throughout the tree, though it is modified along the way to take account of the influence of REEL per se. The overarching logic of the approach and the tree that represents it is that the beginning of the REEL FR probability is the Loan FR probability. The Loan FR is then either reduced or not depending on the participants' answers to questions relevant to the specific REEL program and its alternatives in the market.

It is important to repeat here that the tree approach to showing the logic is only a heuristic tool to help visualize the logic. In reality, the team does not recommend assigning participants to categories of responses as may be implied by the branches of the tree and the resulting nodes. In practice, probabilities associated with the answers to each question rather than nodes or categories would be used. In fact, part of the overall approach is to be able to multiply the probabilities at each level of the tree to produce the final REEL FR probability.

Starting with the Loan FR probability, represented as Node 1, go to the first branch, ending in Nodes 2 and 3. This branch represents whether respondents searched for loans (either before or after learning about the REEL program). If participants did not do any searching for other loans, then their REEL FR probability would be equal to the Loan FR probability and none of the subsequent questions pertain to them.

For those who searched for other loans, a critical question is whether they probably would have qualified for the loans that they found in their searches. If they would not have qualified for alternatives, then they should be assigned the Loan FR probability, modified (multiplied) by their probability of qualifying. The probabilities associated with those calculations are represented in Nodes 4 and 5.

Nodes 6 and 7 reflect the values associated with the likely affordability of alternative loans that they qualified for per their self-reports. If the loans that loan seekers were qualified for were equally or more affordable than REEL's, then that fact (or a probability associated with it) should reflect a high likelihood that those participants would be free-riders on REEL.

However, if the alternative sources of financing were *less* affordable than REEL, the final question is what those participants would have done under those conditions. The tree shows three nodes (8, 9, and 10) that reflect the answers to that question. Those participants who say the alternatives that they qualified for were less affordable than REEL would get different calculations for their final REEL FR probability, depending on their answers.

- If they say that they would have completed the exact same project without the REEL loan terms and the alternatives were more expensive,⁶⁰ the final REEL FR probability should be set to 1, regardless of prior answers because if they could have obtained a loan with equal or better terms, they did not need REEL.
- If they say that they would have done smaller projects, then the probabilities associated with that would be multiplied by the probability from Node 7 to produce a final REEL FR probability.

⁶⁰ The evaluation team focused questions on affordability, but there are other loan terms that can also have an impact on customer decisions (the length of the loan and whether or not it places a lien on the home are also important factors that were not incorporated into this approach).

- If they give ambiguous answers, such as saying that they do not know what they would have done or that they would not use financing at all, the prior probability represented in Nodes 6 and 7 would be carried forward as their final REEL FR probability.

The team assigned probabilities to all of the FR questions so as to test the viability of the approach. Based on that test, the team recommends it for estimating NTGRs for finance programs, but slight revisions to some of the questions are needed, and, in many cases, the team assigned probabilities to response categories, while the team would recommend asking the *respondent* to assign probabilities with the usual 0–10 scoring method.

Should REEL become a full resource acquisition program, several decisions would need to be made in terms of the accepted evaluation method for calculating net savings claims and how to avoid double-counting in gross and net savings between REEL and other ratepayer resource programs that overlap with REEL including residential rebate programs and the codes and standards advocacy programs.⁶¹ Avoiding double-counting needs to consider the best method to operationalize the evaluation results given that different evaluation contractors are evaluating these various programs independently of each other. These concepts were not fully explored in this evaluation, given that the pilot is not claiming savings and other research questions were more pertinent to helping the CPUC assess the pilot's potential to continue and scale. Should REEL become a full program, the team recommends workshopping the methods and administration to address these important factors among key stakeholders in California. The workshops would be designed to produce a recommendation to the CPUC on the most optimal methods to calculate net savings and mitigate double-counting across programs.

⁶¹ Given that most REEL projects have not received IOU rebates as well, there is the potential for these projects to show up in the population that is examined as part of the Codes and Standards Advocacy Program, as these are residential retrofit projects that meet or exceed code but did not receive utility rebates. There is no current potential for double-counting energy savings between the REEL pilot and the Codes and Standard Advocacy Program as the 2016–2018 C&S Impact Evaluation removed all REEL projects from its potential population pool.

7. Detailed Cost-Effectiveness Results

The evaluation team performed a cost-effectiveness analysis on the REEL pilot, as well as on projected REEL program models. As part of this effort, the evaluation team:

- Explored how pilot funding was spent (marketing, LLR, administration, start-up costs, etc.),
- Assessed the pilot costs and benefits achieved (including energy savings supported, contractors trained, and lenders enrolled)
- Compared the results to other DSM investments (for example, the Residential HVAC program and EUC)

The evaluation team conducted a C/B analysis of the pilot, assessing a range of relevant quantitative and qualitative metrics. The team then performed a comparative analysis on the REEL pilot and two projected future REEL program rollout scenarios. This analysis, combined with an assessment of the Resolution E-4900 metrics, is valuable in determining the potential scalability and likely cost-effectiveness of a future REEL program.

Central to the analysis is the application of two cost-effectiveness tests from the California SPM: the TRC and the PAC.⁶² While cost-effectiveness was not identified as a Resolution E-4900 metric to measure pilot success, cost-effectiveness testing provides a valuable comparative tool to address the CPUC's request for "exploring the costs and benefits" of the pilot and, more importantly, to determine if the REEL model could be operated as a cost-effective resource program in the future.⁶³ In other words, conducting the cost-effectiveness analysis will provide an apples-to-apples C/B comparison to other residential DSM investments in California.

The objectives of the cost-effectiveness analysis, in the context of this study, include:

- Assessing the cost-effectiveness of the REEL pilot, as well as two future program scenarios using an interpretation of California's SPM tests that specifically addresses the unique cost and benefits associated with financing programs⁶⁴
- Comparing the costs and benefits of the REEL pilot and future REEL program models to other DSM investments in California
- Assessing whether the REEL model can be delivered in the future as a resource program that achieves a TRC ratio greater than 1.0
- Providing recommendations on future statewide EE financing programs

⁶² CPUC. 2001.

⁶³ Mandated by the legislature (Public Utility Code Section 454.5), the CPUC must ensure all available EE and demand reduction resources be cost-effective.

⁶⁴ The financing program model (FPM) interpretation applies an adapted version of the SPM tests to capture the full range of financing-related costs and benefits, and thereby provide a fulsome assessment of the program's cost-effectiveness.

7.1 Cost-Benefit Ratio

In its simplest form, a C/B ratio is used to determine the value of a program intervention versus the cost of that intervention, considered from a variety of perspectives. This ratio provides a value of benefits and costs that are represented by actual dollars spent and gained. The basic algorithm is shown below.

$$BCR = Benefits \div Costs$$

The C/B ratio is derived by converting the entire stream of current and future costs and benefits into present values. Detailed descriptions of the financing program model (FPM), inputs, assumptions, and algorithms for each cost-effectiveness test and model is provided in Appendix B. Below is an overview of the cost-effectiveness methodology, key inputs and assumptions, and sensitivity analysis performed by Dunskey.

7.2 Cost-Effectiveness Test Results

The pilot and two future REEL program scenarios assessed for cost-effectiveness are described below.

1. **REEL Pilot:** Based on actual pilot operating expenditures (excluding start-up costs), participation, and estimated average savings per participant for the two-year evaluation period (FY16–17 and FY17–18).
2. **REEL BAU:** A future REEL program based on modest operating expenditure reductions and modest increases in participation (240 participants per year) over a five-year period, excluding start-up costs realized during the pilot phase.
3. **REEL+:** A future REEL program that assumes increased expenditures (additional staff and investments in IT and EFLIC) and a significant increase in participation rates (883 participants per year), excluding start-up costs realized during the pilot phase.

To assess the REEL pilot and future REEL programs, the evaluation team made appropriate adjustments to account for how the program could scale up and account for the reduced investment needed for setup and operating costs. This approach seeks to answer whether the pilot points to a successful model to help achieve California’s overarching DSM financing objectives.⁶⁵

Some of the input assumptions cannot be measured directly and carry a significant degree of uncertainty. To account for this, the evaluation team presents cost-effectiveness results as “Low,” “Mid,” and “High” values, representing the range of possible results, with the “Mid” being judged as the most realistic outcome. The cost-effectiveness results are shown in Table 48.

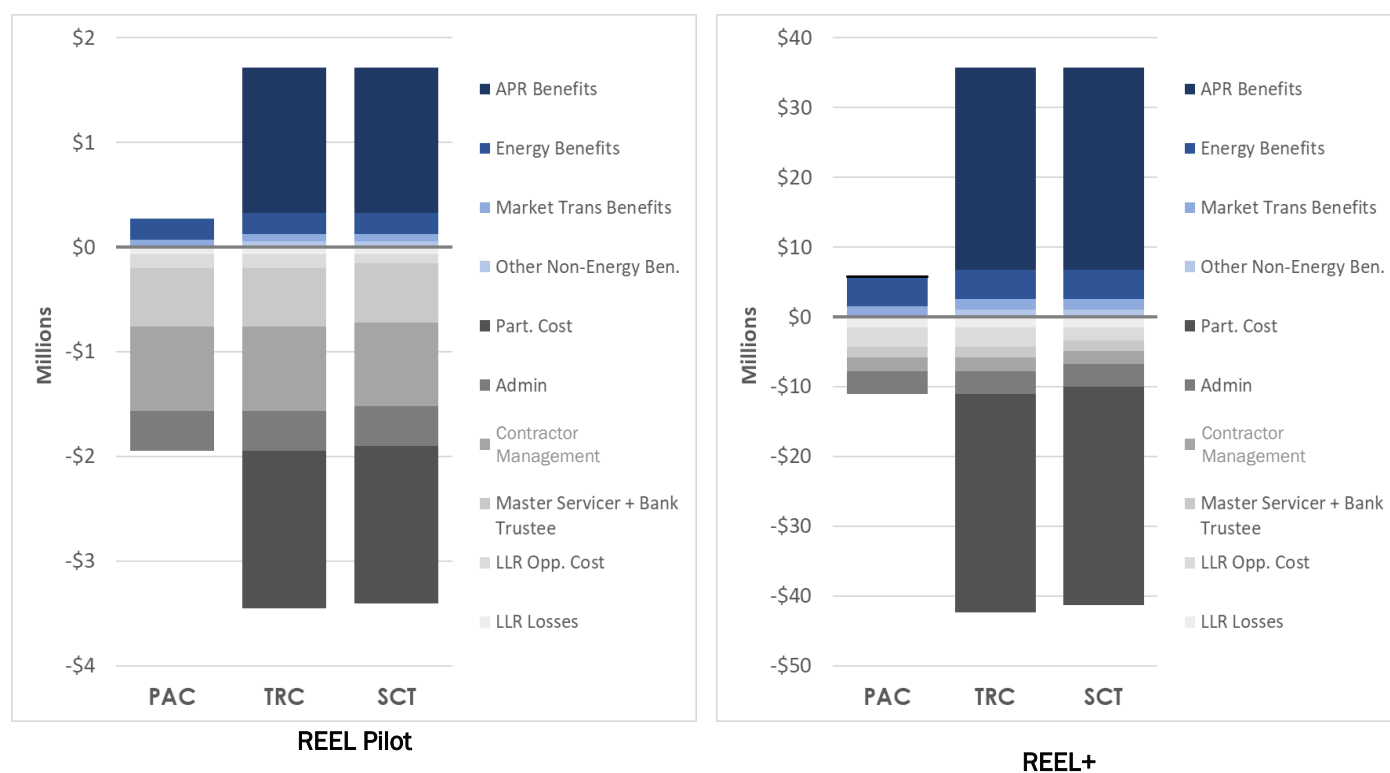
⁶⁵ Ds. 12-05-015, 12-11-015, 13-09-044, and 17-03-026 directed support for EEFPs to test “scalable” products, “leverage” ratepayer funds, and “stimulate deeper EE projects than previously achieved through traditional program approaches (e.g., audits, rebates, and information).”

Table 48. Cost-Effectiveness Results for the REEL Pilot and Two Future Programs (REEL BAU and REEL+)

REEL Scenario	Cost-Effectiveness Results (Financing Program Model)*			
	PCT	PAC	TRC	SCT
REEL Pilot excluding start-up costs	1.09 (0.93, 1.29)	0.14 (0.10, 0.18)	0.50 (0.40, 0.59)	0.57 (0.51, 0.66)
REEL BAU excluding start-up costs		0.23 (0.16, 0.31)	0.63 (0.52, 0.78)	0.73 (0.65, 0.88)
REEL+ excluding start-up costs		0.52 (0.33, 0.80)	0.84 (0.68, 1.06)	0.97 (0.86, 1.20)

* The “Mid” scenario results are in bold. The “Low” and “High” scenario results are in parentheses below.

Figure 19. Comparison of Costs and Benefits of the REEL Pilot and REEL+ Program



Program administration and loan loss reserve management costs make up a significant portion of REEL pilot costs. However, because the administration and loan servicing are mostly fixed costs, under an increased loan volume as modeled in the REEL+ program, they would drop to a much smaller portion of the overall costs. Participant costs are a significant portion of costs in both the TRC and SCT in all scenarios, as they scale with program participant size. Similarly, NEBs in the form of APR reductions represent the majority of benefits in the SCT and TRC under all scenarios, as they also scale with program participation.

Based on these results the following conclusions are drawn:

- The current implementation model for REEL carries significant administration and loan servicing costs. Specifically, the administration costs (including the master servicer) and LLR management

(including the bank trustee costs that extend for the life of the LLR) account for more than half of the REEL pilot TRC and SCT costs. This becomes less of a concern under the REEL+ program, which scales to incorporate more participants and in which the fixed administration costs remain relatively stable.

- While the contractor management costs (embedded in the administration and loan servicing costs) are also significant, interviews with CAEATFA, PAs, lenders, and other jurisdictions revealed that contractor support is critical to program success.
 - Overall, the REEL pilot and REEL program projections do not pass the cost-effectiveness tests (> 1.0) under the “Mid” inputs scenario. The one exception is that the REEL+ Program passes the SCT marginally ($SCT = 1.02$). The “Mid” inputs scenario represents the midpoint in the projected program costs, estimated benefits, and program uptake ranges, and is considered to be the most probable assessment of the three program models C/B results.
- Under the “High” inputs scenario, the REEL+ program passes the TRC and SCT, and the REEL BAU program passes the SCT. However, it should be noted that the “High” inputs scenario represents the most optimistic interpretation of each program’s cost and benefit stream, and it would be unlikely that the program could deliver on all of them simultaneously. They include a decline in covered losses, high-end APR reductions, increased market effects, deeper and more persistent energy savings, a lower discount rate, and the high-end value placed on NEBs. The “High” scenario assumptions were intended only to provide an upper limit to the cost-effectiveness results rather than an expected outcome of a future program, while **the “Mid” scenario represents the most realistic expected results.**
- The programs are cost-effective from the participant perspective under the “Mid” scenario. The PCT benefits do not change among programs because all costs and benefits from the participant perspective scale directly with the number of participants.
- The PAC results are particularly low compared to the TRC and SCT results. This runs counter to conventional cost-effectiveness expectations where PAC ratios are typically higher than the TRC and SCT. PAC results are lower in this case as energy savings make up only a small portion of the overall benefits and the PAC does not account for the APR reduction, which is a benefit to the participant only.

7.2.1 How Does REEL Compare to Other DSM Initiatives?

To better understand the results, the evaluation team benchmarked the REEL pilot and two future program projections with other residential DSM investments, including:

- **EUC:** EUC is a rebate program that allows homeowners to choose one of two tracks. The AHUP is most comparable to the types of projects in the REEL pilot.
 - **HUP** is a customer entry point into whole-house efficiency upgrades. Customers must install at least three measures, including one base measure, such as duct sealing, air sealing, or attic insulation. Incentives are based on the measures installed, capped at 50% of the total project cost or \$1,300–\$3,000, depending on the PA.
 - **The AHUP** helps customers accomplish more-complex efficiency upgrades than HUP and involves a comprehensive energy assessment. Incentives are based on the modeled percent energy

savings rather than on the measures installed, up to \$5,500, with higher incentives awarded through “bonus kickers” based on total modeled savings. The IOUs offer the AHUP to customers in their territories.

- **Residential HVAC program:** The Residential HVAC program offers prescriptive rebates for high-efficiency HVAC equipment.
- **RFPs:** The Golden State Finance Authority (GSFA) Residential Energy Retrofit Program and the SoCalREN Home Energy Loans Program provided loans to support EUC Home Upgrade and Advanced Home Upgrade projects from 2013 to 2015.

For each program, the evaluation team compared how funding was allocated, the multiple benefits and outcomes achieved, and the C/B ratios to better understand whether REEL points to a successful model to achieve California’s goals.

Costs

Table 49. Comparison of Annual Program Costs

Component	Costs (\$M) Annual					
	REEL (Pilot) FY17–FY18 ^a	REEL BAU (Program Projection) Annualized ^b	REEL+ (Program Projection) Annualized ^c	Regional Finance Pilots 2013–2015 Annualized ^d	Residential HVAC Program Year 2017 ^e	EUC (HUP and AHUP) Program Year 2017 ^f
Administration	0.4	0.5	0.4	0.1	0.1	2.4
Investments/Incentives	N/A	N/A	N/A	0.3	4.7	36.4
LLR Losses	0.005	0.03	0.1	.02	N/A	N/A
Bank Trustee and Master Servicer	0.2	0.2	0.4	N/A	N/A	N/A
Contractor Management (training and outreach)	0.4	0.4	0.4	N/A	0.2	1.3
TOTAL Cost (M)	\$1.0	\$1.1	\$1.3	\$0.4	\$4.9	\$40.0
Administrative Costs (\$,000 spent per loan)	2.2	2.1	0.5	1.1	N/A	N/A
Administrative Costs (\$ per \$ loan value)	0.11	0.12	0.03	0.05	N/A	N/A
Administrative costs (including bank trustee/ master servicer) as a % of Total Cost	59%	65%	63%	28%	5%	9%

^a Source: CAEATFA estimate of historic REEL expenses provided on June 3, 2019 and REEL participant data.

^b Source: CAEATFA estimated annual REEL maintenance costs

^c Source: CAEATFA estimated costs for REEL through FY22–FY23. Note, however, that this is not to be interpreted as a proposal by CAEATFA.

^d Source: Opinion Dynamics and Dunsky. 2017. Regional Finance Program Attribution and Cost-Effectiveness Study. Final Report. Energy savings are ex ante (not evaluated) and may therefore be overestimated.

^e Source: CEDARS claimed program data for PGE2100 Residential HVAC, SCE Residential HVAC, SDG&E Residential HVAC Upstream, SCG Residential HVAC Upstream 2017. Accessed at: <https://cedars.sound-data.com/>. Note that reported budgets may include multifamily programs.

^f Sources: CEDARS claimed program data for BayREN01 Single Family, PGE21004 EUC, SCE-13-SW-001D EUC, SCG Residential Home Upgrade, SCE Flex Path Incentives, SDG&E SW-CALS-EUC WHRP 2017. <https://cedars.sound-data.com/>; DNV-GL. 2019. Impact Evaluation Report Home Upgrade Program – Residential Program Year 2017. Note that reported budgets may include multifamily.

REEL has significantly lower total costs compared to EUC and Residential HVAC but has significantly higher administrative costs than either other program when considered as a portion of the overall running costs. When the REEL pilot and REEL BAU program models are compared to the RFPs, it can be observed that the REEL models carry significantly more administrative weight than the RFPs, both in terms of the administrative cost per loan and in the cost per dollar of loan value delivered. However, under the REEL+ program projection, the cost per loan drops to less than half of that for the RFPs due to the significant rise in the REEL+ program volume. Beyond looking at these costs, it is also important to note that the pilot attracted more than seven times the total ratepayer funds contributed during the pilot in private capital (see Section 4.1).

Benefits/Outcomes

Assessing the multiple pilot benefits and outcomes provides insights into the value for dollars spent. Table 50 compares the various benefits and outcomes of each program.

Table 50. Comparison of Program Benefits and Outcomes

Benefits / Outcomes	REEL (Pilot) Fiscal Year 2017-2018	REEL BAU (Program Projection)	REEL + (Program Projection) Annualized	Regional Finance Pilots 2013-2015 Annualized	Residential HVAC 2017 Program Year	EUC (HUP and AHUP) 2017 Program Year
First year gross kWh savings	138,567	177,840	654,303	96,366 (Ex-Ante)	4,911,544	825,388
First year gross therm savings	2,057	2,640	9,713	22,924 (Ex-Ante)	-7,212	397,219
First year total gross MMBtu savings - all fuels - per participant	3.6	3.6	3.6	26.1 (Ex-Ante)	Not available	4.6
First year total net MMBtu savings all fuels - per participant	1.6	1.6	1.6	8.9 (Ex-Ante cut by at least 50% in Ex-Post)	Not available	2.9
Share gross electric savings	70%	70%	70%	13%	100%	7%
Share gross gas savings	30%	30%	30%	87%	Not applicable	93%
# of participating contractors	340	435 (estimated)	435 (estimated)	35	Not available	539 ^a
# of participating lenders	4	Not available	Not available	3	N/A	N/A

Benefits / Outcomes	REEL (Pilot) Fiscal Year 2017-2018	REEL BAU (Program Projection)	REEL + (Program Projection) Annualized	Regional Finance Pilots 2013-2015 Annualized	Residential HVAC 2017 Program Year	EUC (HUP and AHUP) 2017 Program Year
# of Participants (per year)	187	240	883	100	Not available	9,349
Average size of project (\$)	17,165	17,712	17,712	21,850	Not available	25,000
APR Benefits (Interest rate reduction)	4.6%	4.6%	4.6%	3.8%	N/A	N/A

^a Source: EMI Consulting. 2016. Energy Upgrade California – Home Upgrade Program Process Evaluation 2014–2015.

Notable observations are summarized below.

- The share of electric savings in the REEL pilot is closer to that of the Residential HVAC program and the savings per participant is like that of the HUP. This is not surprising as, on average, REEL participants completed two measures per project; HVAC was the most common measure type financed (69%), followed by building shell improvements (see Section 4.2 for details on measures supported by REEL). Note that the RFPs appear to have much larger savings per participant. However, only ex ante savings number were available at the time of that study. A more recent ex post evaluation of the HUP program (which includes all the RFP participants) indicated that ex post savings were on average only 25% of the ex ante savings values.⁶⁶
- **REEL offers low-cost financing (reduced APR).** While both financing pilots (REEL and Regional Finance) successfully delivered low-interest-rate financing, REEL offers somewhat better interest rate reduction benefits (4.5% APR reduction, which results in an average interest rate of 7.3% for REEL participants) compared to the RFPs (3.8% APR reduction). APR benefits make up a significant portion of the overall benefits and any further reductions could benefit the program. It is uncertain how much further REEL could reduce interest rates, but other jurisdictions offer loans with rates as low as 2.75%, (for example, Colorado's RENU program).

Cost-Effectiveness Ratios

Cost-effectiveness ratios allow for a C/B comparison to other residential DSM investments in California. Table 51 compares the results.

Table 51. Comparison of Program Cost-Effectiveness Ratios

Cost-effectiveness Ratios	REEL (Pilot) Fiscal Year 2016-2018	REEL BAU (Program Projection)	REEL + (Program Projection)	Regional Finance Pilots 2013-2015	Residential HVAC Program Year 2017	EUC (HUP and AHUP) Program Year 2017
TRC Ratio	0.50	0.63	0.84	0.97 - 1.40 (0.76 - 1.16) ^a	0.03 - 1.26	0.27
SCT Ratio	0.57	0.73	0.97	1.03 - 1.46	N/A	N/A

⁶⁶ DNV GL. 2019.

Cost-effectiveness Ratios	REEL (Pilot) Fiscal Year 2016-2018	REEL BAU (Program Projection)	REEL + (Program Projection)	Regional Finance Pilots 2013-2015	Residential HVAC Program Year 2017	EUC (HUP and AHUP) Program Year 2017
				(0.73 - 1.13) ^a		
PAC Ratio	0.14	0.23	0.52	0.36 - 0.59 (0.09 - 0.15) ^a	0.14 - 1.49	0.63

^a The cost-effectiveness results for the RFPs were adjusted to account for the impact of applying the HUP program ex post savings, which were 25% of the ex ante savings on average. All RFP participants were also participants of the HUP, but the ex ante/ex post savings ratio may differ between the RFP participants and the HUP participants as a whole.

Key insights emerge when comparing the cost-effectiveness of REEL to other programs.

- **The mature incentive-based EE programs struggle to achieve cost-effectiveness apart from some IOU Residential HVAC programs.** California has adopted very aggressive EE and RE goals; achieving these goals has become more difficult due to the state's stringent codes and standards that have increasingly raised the minimum EE performance baseline. While California's market transformation efforts are having a positive transformative impact, resource programs are challenged to deliver energy savings cost-effectively.
- **The REEL pilot and projected programs do not appear to be as cost-effective as the RFPs,** primarily due to the higher administrative costs relative to the size of the loan portfolios.⁶⁷ Comparing the cost-effectiveness results of the REEL pilot and REEL BAU programs to that of the RFPs demonstrates the impact of lower administrative costs and no LLR management costs.
- **Project size and depth of energy savings affects results.** There is a significant difference between REEL and the RFPs, in terms of both the share of electric and natural gas savings and the total energy savings achieved per participant. However, note that the RFPs' results were measured at a time when only ex ante savings were available. As noted above, based on the HUP ex post evaluated savings, on average, the RFP savings could be expected to drop to 25% of the ex ante savings. Energy savings make up a limited portion of the overall benefits compared to others like APR reduction, and therefore the RFP cost-effectiveness results are reduced somewhat (see Table 51). A larger driver of the difference in cost-effectiveness between REEL and the RFPs is the expenditures, as the RFPs had far fewer costs than REEL. Further, the estimated savings per REEL participant are based on the gross savings found in this evaluation; applying net savings would further reduce savings and REEL's ability to achieve cost-effectiveness.
- **Increased loan volume can help improve program cost-effectiveness.** The REEL+ program assumes a significant increase in participation without a significant change in costs or per-project energy savings, compared to the REEL BAU or pilot results. This leads to the REEL+ achieving a higher PAC, TRC, and SCT ratio, greater than the REEL pilot or the REEL BAU models.

⁶⁷ This result is also influenced by the use of ex ante savings in the RFP cost-effectiveness assessment, while ex post savings are used in the REEL cost-effectiveness assessment. A comparison of the PAC, TRC, and SCT values from the RFPs when estimated ex post savings are applied shows that the cost-effectiveness of the REEL pilot and BAU is closer to that of the RFPs, but still somewhat inferior.

7.2.2 Can the Current REEL Model Deliver Savings Cost-Effectively?

The evaluation team explored key variables that have the greatest impact on the cost-effectiveness results, such as NTGR, increased participation (loan volume), administration and LLR management costs, and energy savings, to determine whether the REEL model could be cost-effective going forward.

Net-to-Gross Ratio

Given that this evaluation was not tasked with doing a formal net savings analysis or cost-effectiveness test of the pilot, the evaluation team used gross savings in the C/B analysis. NTGRs affect energy benefits, NEBs, market transformation benefits, and net attributed investment costs (to the participant). To highlight the effect that NTGRs have on cost-effectiveness, for each “Mid” scenario, the team calculated what NTGR would be necessary for the REEL pilot and future programs to be cost-effective. Results are presented in Table 52, which shows that significant market effects and spillover would be required to achieve a NTGR of this magnitude, which is unlikely.

Table 52. NTGR Required for REEL to Be Cost-Effective

Program Evaluated	Required NTGR		
	PAC	TRC	SCT
REEL Pilot	7.1	6.3	4.9
REEL BAU	4.4	4.1	2.9
REEL+	2.0	2.0	1.1

Volume

The evaluation team tested what volume would be needed to achieve a TRC > 1.0 under the “Mid” scenario for REEL+ scaling the current volume by order of magnitude. The results, presented in Table 53, indicate that increasing the annual loan volume over and above the projected REEL+ volume could help bring the program closer to cost-effectiveness. However, as the volume rises, the ratio of the variable costs to fixed costs becomes higher, and therefore the incremental increase in cost-effectiveness diminishes with increasing program volume.

Table 53. Impacts of Volume on Cost-Effectiveness Results

REEL Evaluation	Required Volume (loans/year)		
	883	2,000	20,000
REEL+, TRC	0.84	0.92	0.99

Benefits and Costs

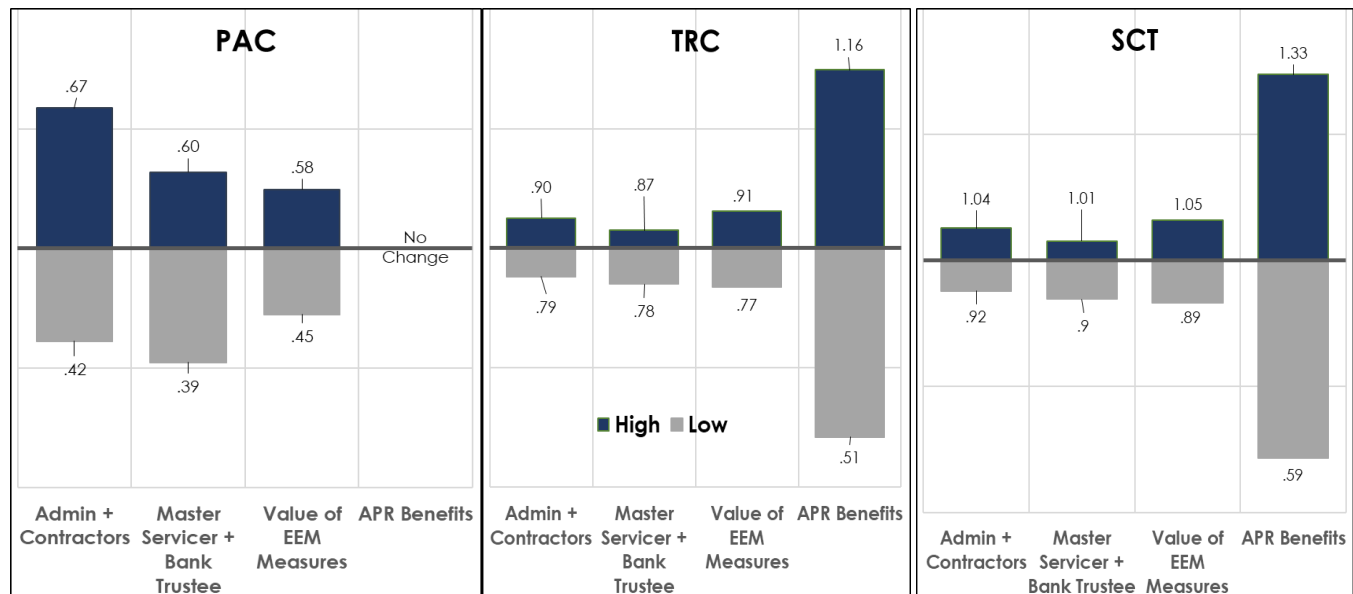
To determine how key program performance or configuration settings may influence the program, the evaluation team assessed the sensitivity of the REEL+ program cost-effectiveness in four key inputs variables, as outlined in Table 54.

Table 54. Variables Influencing Cost-Effectiveness Results

Variable	Description
Administration and Contractor Management Costs	The administration and contractor management costs ($\pm 50\%$) were varied to assess the impact of these costs rising or falling as the program matures.
Master Servicer and Bank Trustee Costs	The evaluation team tested the sensitivity of the results to a lower-end case, where the master servicer and bank trustee are not needed (that is, the REEL program no longer links to specific IOU ratepayer funds, as is the case with the RFPs) and a higher-end case where the REEL program would cover all of CAEATFA bank trustee fees (that is, it is the only program running) and that master servicer is required for the full loan duration (that is, the OBR feature is engaged).
Value of EEEMs	The evaluation team assessed the impact of varying the energy savings per project by $\pm 50\%$ to determine the sensitivity of the program cost-effectiveness.
APR Reduction	As the lenders gain experience with the program, they may be influenced to lower or raise interest rates to account for lower- or high-than-expected default losses, respectively. The evaluation team assessed the sensitivity of the results to a 2.3% increase or decrease of the APR reduction benefits.

Figure 20 summarizes the sensitivity analysis results. This reflects the impacts of each variable on overall REEL+ program cost-effectiveness. The blue bars reflect the impact of the “High” scenario of each variable alone on cost-effectiveness results, with all other things being equal. The grey bars reflect the impact of the “Low” scenario.

Figure 20. Impacts of Key Variables



Based on this sensitivity analysis, the evaluation team determined that:

- The PAC is most influenced by the administration and contractor management costs, LLR fees, and value of EEEMs, while the TRC and SCT are most influenced cost of capital savings (APR reductions) and LLR fees.

- Increasing the APR reduction benefits have the largest impact on the TRC and SCT values. Increasing the APR benefits to 6.9% would result in the REEL+ program achieving cost-effectiveness under both tests. This would equate to an average interest rate of 4.8% (assuming an average baseline interest rate of 11.7%, as determined from the pilot loan database). Given that the LLR covers such a significant portion of the lender risk, and based on experience in other jurisdictions where the initial credit enhancements were often found to exceed the amounts needed to cover lender risk, requiring the lenders to focus on high-risk borrowers and/or to lower their APRs within the REEL program may be the best path toward establishing a cost-effective REEL program.
- The administration, contractor management, master servicer, and bank trustee costs each have a notable impact on the program cost-effectiveness. However, even under the cases where there would be reduced administration costs or the master servicer and bank trustee become unnecessary (that is, if the requirement to link LLR funds to specific IOU service territories was removed), the savings are not sufficient to render the program cost-effective under the TRC. If these impacts could be combined, and the average savings per project also increased, it is possible that the program could exceed a TRC of 1.0.

7.2.3 Cost-Effectiveness Assessment Results Summary

From the evaluation team's cost-effectiveness analysis, the current REEL model does not appear to be cost-effective as a pilot or in any future models. The following takeaways should be considered from these results.

- **The mature incentive-based EE programs struggle to achieve cost-effectiveness**, apart from some IOU Residential HVAC programs. California has adopted very aggressive EE and RE goals; achieving these goals has become more difficult due to the state's stringent codes and standards that have increasingly raised the minimum EE performance baseline.⁶⁸ While California's market transformation efforts are having a positive transformative impact, resource programs are challenged to deliver energy savings cost-effectively.
- **Increasing REEL loan volumes may improve REEL program cost-effectiveness**. As participation increases from the REEL BAU to the REEL+ models, administration and LLR costs have less effect on cost-effectiveness results as they are largely fixed costs. Focusing efforts on increasing the loan volume to approach the REEL+ projections of more than 883 loans per year could play a key role in improving the program's cost-effectiveness.
- **REEL's ability to deliver low-cost loans causes non-energy savings (APR benefits primarily) to far outweigh energy savings benefits**. The APR reduction makes up the largest proportion of program benefits by far. While participating lenders currently offer competitive interest rates, with some as low as 4.50%, maintaining REEL in market and continuing to demonstrate that REEL loans are performing well, particularly in risky market segments, could provide lenders with confidence to pass on greater savings to borrowers. The MI Saves Home Energy Loan Program demonstrated strong LLR performance, resulting in lenders reducing interest rates, which led to increased loan volumes. Increasing these benefits could offer the best path forward toward a cost-effective REEL program.

⁶⁸ The California Title 24 Building Energy Efficiency Standards ensure new and existing buildings achieve EE. The standards are updated regularly by the California Energy Commission.

- **The REEL model as it is currently structured carries notable administrative weight**, which affects the ability of the program to operate cost-effectively while delivering low or moderate loan volumes. Finding solutions to reduce the administrative costs associated with the contractor management, bank trustee fees, and the master servicer could collectively improve the program cost-effectiveness.

Finding a REEL program model that can achieve a TRC threshold > 1.0 will likely require leveraging a number of the factors outlined above. A cost-effective REEL model would need to reduce program costs (administration and LLR management fees) *and* increase program volume and benefits (energy savings, accounting for other NEBs, and further APR reductions). REEL offers a variety of social, economic, and environmental benefits that are not fully accounted for in the model: helping underserved Californian's make improvements that improve their comfort, reducing energy poverty, improving people's health; boosting the value of housing stock; increasing economic opportunities for partners; and accounting for the social cost of carbon. Finding opportunities to reduce costs, applying a longer-term lens to measure market impacts, and reevaluating how ratepayer funds are used to support California's climate-related goals should be considered.

8. Participant Survey Topline Results

In May 2019, the evaluation team fielded a survey to REEL pilot participants. The primary goals of the survey were to understand the influence of the REEL loan on participants' decisions to complete home upgrades, collect information about their households, and understand any nonroutine adjustments participants made to their homes or behaviors after the home upgrade.

8.1 Survey Approach

The survey was administered via telephone to all 339 households who received REEL loans from July 2016 through December 2018. To maximize responses, the evaluation team offered a \$50 incentive. A total of 49 participants completed the survey, as shown in Table 55 below, and the response rate was 15.6%.

Table 55. REEL Participant Survey Sample Frame

Number of Participants	Participants with Telephone Contact Information	Total Respondents
339	337	49

8.2 Survey Structure

Table 56 summarizes the purpose of each survey section.

Table 56. Participant Survey Structure

Section	Purpose
Payment Methods	<ul style="list-style-type: none"> Determine if other sources of payment or financing were used in addition to the REEL loan Determine if the respondent used utility rebates in addition to the REEL loan
Home Upgrade Motivations	<ul style="list-style-type: none"> Determine if the respondent lives/lived at the property, or if it is rented Understand the respondent's motivations for getting an upgrade
Relative Influence of Rebates and Financing	<ul style="list-style-type: none"> Understand the relative influence of financing and utility rebates on the respondent's decision to do a home upgrade
General Financing Influence	<ul style="list-style-type: none"> Understand, qualitatively, why the respondent sought financing Collect data on how, absent financing, the home upgrade project would have been affected (that is, overall, on timing, on EE, on size)
REEL Financing Influence	<ul style="list-style-type: none"> Understand how the respondent learned about REEL and if his/her contractor recommended REEL Determine if the respondent shopped for/researched other financing options and how these options compared to REEL <ul style="list-style-type: none"> Qualitatively understand why the respondent chose REEL over other options Understand, absent REEL, the overall likelihood to use a financing option other than REEL Understand how, absent REEL, the respondent's decision to seek and/or ability to access financing would have been affected
Demographics and Property Changes	<ul style="list-style-type: none"> Collect data on relevant household characteristics, physical changes to the property, occupancy changes, etc. that may affect energy savings <ul style="list-style-type: none"> Identify respondents who are LMI or using government assistance <ul style="list-style-type: none"> Collect self-reported creditworthiness Collect self-reported intentions to pay the loan off earlier or make additional payments

8.3 Results

Below are the detailed survey responses from which the evaluation team drew out key findings. Please note that some questions are “multiple response” and do not sum to 100% (totals are excluded from these tables). In some cases, the percentages do not sum to 100% due to rounding. Unless italicized with quotations, open-ended responses are coded. Tables are broken out by participants in the first two years (the evaluation period) and after the first two years for comparison purposes.

8.3.1 Payment Method

P1. In addition to the Residential Energy Efficiency Loan, did you use any of the following ways to pay for your project? **[MULTIPLE RESPONSE]**

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Nothing else	34	69%	20	63%	14	82%
Cash	10	20%	8	25%	2	12%
A credit card (intent to pay off with interest)	2	4%	1	3%	1	6%
Utility rebates	6	12%	6	19% ^a	0	0%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

P4. You mentioned that you received utility rebates. Approximately, what was the total rebate amount in dollars that you received? Your best guess is fine.

Response	All	First Two Years of Pilot	After First Two Years
\$5,000	1	1	0
\$3,000	1	1	0
\$1,500	1	1	0
\$600	1	1	0
\$175	1	1	0
\$50	1	1	0

Note: Only asked if P1 = “Utility rebates”.

8.3.2 Home Upgrade Motivations

M1. Did you live at the property at the time of the upgrade, or did you rent it to someone else?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Lived there	48	98%	31	97%	17	100%
Rented to someone else	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

M2. Do you still own the property?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Yes	46	94%	30	94%	16	94%
No	3	6%	2	6%	1	6%
Total	49	100%	32	100%	17	100%

M2a. Do you CURRENTLY live at the property or rent it to someone else?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Lives at the property	44	90%	29	91%	15	88%
Rents to someone else	1	2%	1	3%	0	0%
Moved (<i>Recode based on M2</i>)	3	6%	2	6%	1	6%
Refused	1	2%	0	0%	1	6%
Total	49	100%	32	100%	17	100%

M3. I am going to read a list of reasons why you may have chosen to do a home upgrade. When I finish reading the list, please tell me which reason was the MOST IMPORTANT. If none of these was the most important reason, just say “none of these.”

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
I wanted to reduce my energy bills	14	29%	10	31%	4	24%
My property was uncomfortable, too cold, or too hot	12	24%	9	28%	3	18%
I wanted to improve the property in preparation for selling it	2	4%	0	0%	2	12% ^a
I wanted to improve the property in preparation for renting it	0	0%	0	0%	0	0%
I had broken equipment in my home that needed to be fixed	10	20%	5	16%	5	29%
I needed to make repairs to my home's structure, such as the roof, flooring, or foundation	4	8%	3	9%	1	6%
I wanted the property to be more environmentally friendly	6	12%	4	13%	2	12%
<i>“Replaced it for preventive maintenance”</i>	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

8.3.3 Relative Influence of Rebates and Financing

A1. Earlier you mentioned that you received a utility rebate to help pay for the home upgrade project. Thinking about both the rebates and the Residential Energy Efficiency Loan, please complete the following statement. “In terms of my decision to complete a home upgrade project...”

Response	Count	Percent
The loan was SIGNIFICANTLY MORE important than the rebate.	4	67%
The loan was SOMEWHAT LESS important than the rebate.	1	17%
The loan was SIGNIFICANTLY LESS important than the rebate.	1	17%
Total	6	100%

Note: Only asked if P1 = “Utility rebates”. No non-first-two-year participants indicated that they received rebates.

A2. Which of the following statements best describes the influence of the rebate and the Residential Energy Efficiency Loan on your decision to complete a home upgrade project?

Response	Count	Percent
I would have done the project without either the rebate or the loan.	1	2%
I needed the loan to complete the project but did not need the rebate.	4	8%
I needed BOTH the rebate and the loan in order to do the project.	1	2%
Total	6	100%

Note: Only asked if P1 = “Utility rebates”. No non-first-two-year participants indicated that they received rebates.

8.3.4 General Financing Influence

F0. To start, please briefly describe why you chose to use financing to pay for your home upgrade project. [OPEN END]

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
Comment on Financing in General						
Not enough cash on hand	24	49%	15	47%	9	53%
Did not want to pay out of pocket	4	8%	3	9%	1	6%
Enabled to do the project sooner	2	4%	2	6%	0	0%
Contractor recommended financing	1	2%	0	0%	1	6%
Did not want to use a credit card	1	2%	1	3%	0	0%
Received discount if used financing	1	2%	1	3%	0	0%
Comment Specific to REEL¹						
Low interest rate	7	14%	3	9%	4	24%
Easy/quick approval	4	8%	1	3%	3	18% ^a
No property lien	1	2%	1	3%	0	0%

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
Longer term available	1	2%	1	3%	0	0%
Low monthly payment	1	2%	1	3%	0	0%
Other/Invalid						
<i>"I didn't want to go into debt to finance this project."</i>	1	2%	1	3%	0	0%
<i>"Energy savings"</i>	1	2%	1	3%	0	0%
<i>"Did not use financing"</i>	1	2%	1	3%	0	0%
Don't know	1	2%	1	3%	0	0%

¹ Several respondents did not appropriately answer the question, which was intended to be about financing in general; rather, they commented on REEL's benefits specifically.

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

F1. Did you decide to do a home upgrade before you knew about financing options or afterwards?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Before	28	57%	22	69% ^a	6	35%
After	21	43%	10	31%	11	65% ^a
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level.

For the next four questions, I would like you to think about a hypothetical situation where you did not have any financing to pay for your home upgrade project. In other words, all you could use was a credit card, cash, or any utility rebates available.

F2. Without financing, how likely would you have been to undertake this project?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Very likely	17	35%	13	41%	4	24%
Somewhat likely	8	16%	7	22%	1	6%
Somewhat unlikely	8	16%	5	16%	3	18%
Very unlikely	16	33%	7	22%	9	53% ^a
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level.

F3. Without any financing, WHEN would you have undertaken this project?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
At the same time or sooner	10	20%	7	22%	3	18%
Within six months	12	24%	9	28%	3	18%
Within a year	4	8%	2	6%	2	12%
Within a year and a half	5	10%	5	16% ^a	0	0%
Within two years	1	2%	0	0%	1	6%
Two years or longer	13	27%	8	25%	5	29%
Never	4	8%	1	3%	3	18% ^a
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

F4. Energy-efficient equipment can help reduce your energy bill, but it tends to be more expensive than standard equipment. Without any financing, would you have installed equipment that was...?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
The same or higher efficiency as what you installed	29	59%	19	59%	10	59%
Above the minimum efficiency standards or building code but lower efficiency than what you installed	6	12%	5	16%	1	6%
The minimum efficiency standards or building code	9	18%	5	16%	4	24%
Don't know	3	6%	2	6%	1	6%
Refused	2	4%	1	3%	1	6%
Total	49	100%	32	100%	17	100%

F5. Without any financing, what is the likelihood that you would have done a project that cost the same as the project you did?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Very likely	18	37%	13	41%	5	29%
Somewhat likely	7	14%	3	9%	4	24%
Somewhat unlikely	9	18%	4	13%	5	29%
Very unlikely	15	31%	12	38%	3	18%
Total	49	100%	32	100%	17	100%

8.3.5 REEL Financing Influence

Next, I would like to understand why you chose to use a Residential Energy Efficiency Loan specifically. R0. To start, please briefly describe why you chose to use a Residential Energy Efficiency Loan instead of other financing options. [OPEN END]

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
Loan Terms						
Low interest rate	26	53%	20	63%	6	35%
No lien on house	5	10%	3	9%	2	12%
Monthly payment	3	6%	3	9% ^a	0	0%
Loan duration	3	6%	3	9% ^a	0	0%
No pre-payment penalty	1	2%	1	3%	0	0%
Loan amount	1	2%	1	3%	0	0%
No down payment	1	2%	1	3%	0	0%
Attractive loan terms (general)	6	12%	3	9%	3	18%
Connection to Contractor or Other Organization						
Contractor recommendation	8	16%	6	19%	2	12%
Connected to credit union	2	4%	1	3%	1	6%
Connected to the CPUC	1	2%	0	0%	1	6%
Qualification and Application Process						
Easy qualification	4	8%	2	6%	2	12%
Ability to Qualify						
Only financing offered to them	1	2%	0	0%	1	6%
Could not qualify for other financing	1	2%	0	0%	1	6%
Able to qualify	1	2%	1	3%	0	0%
Other – Not REEL-Related						
Rebates available	2	4%	1	3%	1	6%
Not enough cash on hand	1	2%	0	0%	1	6%
Wanted to save money	1	2%	1	3%	0	0%
Interest in EE	1	2%	1	3%	0	0%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

R1. How did you FIRST learn about the Residential Energy Efficiency Loan?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Contractor	15	31%	9	28%	6	35%
A website	11	22%	9	28%	2	12%
Utility website	5		3		2	
City website	1		1		0	
Contractor website	1		1		0	
Don't recall	1		1		0	
Energy Upgrade California website	1		1		0	
Google	1		1		0	
Home repair website	1		1		0	
REEL Lender or another lender	8	16%	4	13%	4	24%
Did their own research	8	16%	6	19%	2	12%
Other advertisement	5	10%	3	9%	2	12%
E-mail	2		0		2	
Radio advertisement	2		2		0	
State Fair	1		1		0	
Friend, family member, or acquaintance	2	4%	1	3%	1	6%
Total	49	100%	32	100%	17	100%

R2. Did your contractor tell you about any other financing options?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	27	55%	18	56%	9	53%
Yes	20	41%	12	38%	8	47%
Don't know	2	4%	2	6%	0	0%
Total	49	100%	32	100%	17	100%

R3. Did you seek out any other financing options?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	39	80%	24	75%	15	88%
Yes	10	20%	8	25%	2	12%
Total	49	100%	32	100%	17	100%

R3a. Did you find any other financing options you would have qualified for?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	10	63%	7	58%	3	75%
Yes	5	31%	4	33%	1	25%
Refused	1	6%	1	8%	0	0%
Total	16	100%	12	100%	4	100%

Note: Only asked if the respondent researched other financing options according to R1 ("Did their own research") or R3 ("Yes").

R3b. Did the any of the other financing options you qualified for have a lower interest rate?

Response	All	First Two Years of Pilot	After First Two Years
No	4	4	0
Yes	1	0	1
Total	5	4	1

Note: Only asked if R3a= "Yes".

R3c. Did any of the other financing options you qualified have a longer loan term, which is the number of months you have for paying the loan back?

Response	All	First Two Years of Pilot	After First Two Years
Yes	4	3	1
No	1	1	0
Total	5	4	1

R3d. Why did you choose the Residential Energy Efficiency Loan over an option with a lower interest rate and/or a longer loan term? [OPEN END]

Response	All	First Two Years of Pilot	After First Two Years
"Because we wanted to pay it off sooner"	1	1	0
"Better rate"	1	1	0
"Timeframe for approval"	1	0	1
"Want to pay off as soon as possible"	1	1	0
Total	4	3	1

Note: Only asked if R3b and/or R3c= "Yes".

For the next set of questions, please imagine a hypothetical scenario where the Residential Energy Efficiency Loan was NOT available. In other words, you could choose to just use cash or credit card, or you could try to apply for some other type of financing instead.

R5a. If the Residential Energy Efficiency Loan was not available, would you have taken the time to research other options?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Yes, would have shopped	24	49%	14	44%	10	59%
Yes, did shop other options (Recode based on R1/R3)	16	33%	12	38%	4	24%
No	7	14%	4	13%	3	18%
Maybe	2	4%	2	6%	0	0%
Total	49	100%	32	100%	17	100%

R5b. If the Residential Energy Efficiency Loan was not available, do you think you would have considered something OTHER THAN what the contractor offered?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Yes	9	45%	4	33%	5	63%
No	8	40%	6	50%	2	25%
Maybe	3	15%	2	17%	1	13%
Total	20	100%	12	100%	8	100%

Note: Only asked if R2 = contractor told them about other financing options.

R6. What do you think is the likelihood you would have qualified for any another type of financing based on your credit score and income? Your best guess is fine.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Very likely	38	78%	25	78%	13	76%
Somewhat likely	6	12%	5	16%	1	6%
Somewhat unlikely	4	8%	1	3%	3	18% ^a
Very unlikely	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

R7. If you had been able to qualify for another type of financing, do you think the monthly payment would have been about the same as, higher than, or lower than the monthly payment for your Residential Energy Efficiency Loan?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Less affordable/higher payment	35	71%	24	75%	11	65%
As affordable/similar payment	5	10%	2	6%	3	18%
More affordable/lower payment	3	6%	1	3%	2	12%
Very unlikely to qualify for any other financing (Recode based on R6)	1	2%	1	3%	0	0%
Don't know	5	10%	4	13%	1	6%
Total	49	100%	32	100%	17	100%

R8. If all the other financing options you could find would have required a higher monthly payment, would you have...?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Done a much smaller project to significantly reduce the monthly payment	10	25%	6	21%	4	33%
Done the exact same project with a higher monthly payment	11	28%	8	29%	3	25%
Done a somewhat smaller project to slightly reduce the monthly payment	9	23%	7	25%	2	17%
Not used financing at all	8	20%	6	21%	2	17%
Don't know	2	5%	1	4%	1	8%
Total	40	100%	28	100%	12	100%

Note: Only asked if R7 = "More affordable/lower payment" or "Don't know". Skipped if "Very unlikely" to qualify for other financing (R6) or other financing would have been "As affordable/similar payment" or "Less affordable/higher payment" (R7).

8.3.6 Demographics and Property Changes

D1a. Including yourself, how many people live at the property that was upgraded?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
1	4	9%	3	10%	1	6%
2	9	20%	5	17%	4	25%
3	9	20%	7	23%	2	13%
4	13	28%	7	23%	6	38%
5	6	13%	5	17%	1	6%
6	3	7%	2	7%	1	6%
8	2	4%	1	3%	1	6%
Total	46	100%	30	100%	16	100%

Note: Skipped if M2 = no longer owns the property.

D1b. Did the number of people who live at the property change increase, decrease, or stay the same after the home upgrade project?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Increased	6	13%	3	10%	3	19%
Decreased	4	9%	4	13%	0	0% ^a
Stayed the same	36	78%	23	77%	13	81%
Total	46	100%	30	100%	16	100%

Note: Skipped if M2 = no longer owns the property.

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants

D1c. In approximately what month and year did this change occur? If changes occurred at different times, then please tell me when the first change occurred.

Response	All	First Two Years of Pilot	After First Two Years
June 2017	1	1	0
September 2017	1	1	0
February 2018	1	1	0
June 2018	2	2	0
July 2018	1	0	1
November 2018	2	1	1
January 2019	1	1	0
April 2019	1	0	1
Total	10	7	3

Note: Only asked if D1b = occupancy increased or decreased.

D1d. How many more/fewer people live at the property now?

Response	All	First Two Years of Pilot	After First Two Years
One more	4	3	1
One fewer	3	3	0
Two more	1	0	1
Four fewer	1	1	0
Ten more (<i>note: possibly invalid</i>)	1	0	1
Total	10	7	3

Note: Only asked if D1b = occupancy increased or decreased.

D1e. How often is the property occupied?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Year-round	46	100%	30	100%	16	100%
Total	46	100%	30	100%	16	100%

Note: Skipped if M2 = no longer owns the property.

D2. In what year was your home built?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Before the 1970s	20	41%	15	47%	5	29%
1970s	14	29%	8	25%	6	35%
1980s	4	8%	2	6%	2	12%
1990-1994	4	8%	3	9%	1	6%
1994-1999	2	4%	1	3%	1	6%
2000s	3	6%	2	6%	1	6%
2010 to present	2	4%	1	3%	1	6%
Total	49	100%	32	100%	17	100%

D3a. Did you add square footage to your property during or after the home upgrade project?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	46	94%	30	94%	16	94%
Yes	2	4%	1	3%	1	6%
Refused	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

D3b. Approximately how many square feet were added to the property?

Response	All	First Two Years of Pilot	After First Two Years
4,000 square feet	1	1	0
2,100 square feet	1	0	1
Total	2	1	1

Note: Only asked if D3a = "Yes".

D3c. Approximately what month and year did you make these changes in square footage? If you made changes at different times, then please tell me when you made the first change.

Response	All	First Two Years of Pilot	After First Two Years
Don't know (4,000 square foot change)	1	1	0
May 2019 (2,100 square foot change)	1	0	1
Total	2	1	1

Note: Only asked if D3a = "Yes".

D3d. Roughly how many square feet was the property when you last owned it/is the property currently?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
1,000 to 1,500	19	39%	9	28%	10	59%
1,501 to 2,000	9	18%	7	22%	2	12%
2,001 to 2,500	12	24%	8	25%	4	24%
2,501 to 3,000	3	6%	2	6%	1	6%
Less than 1,000	3	6%	3	9%	0	0%
More than 3,000	2	4%	2	6%	0	0%
Refused	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

D4a. Did you make any other additions or changes to this property since completing the home upgrade project? This could include additional home repairs or retrofits.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	30	61%	21	66%	9	53%
Yes	19	39%	11	34%	8	47%
Total	49	100%	32	100%	17	100%

D4b. Please briefly describe what changes you made. [OPEN END]

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
No changes	30	61%	21	66%	9	53%
Added solar	4	8%	3	9%	1	6%
Building Shell and HVAC						
New HVAC	2	4%	0	0%	2	12%*
Windows	1	2%	1	3%	0	0%
New roof	1	2%	1	3%	0	0%
Lighting and Appliances						
Energy-efficient lighting	3	6%	2	6%	1	6%
New appliances	2	4%	2	6%	0	0%
Removed hot tub	1	2%	1	3%	0	0%
Remodeling						
Floor refurbishing/carpeting	3	6%	2	6%	1	6%
Doors (general)	2	4%	2	6%	0	0%
Kitchen remodel	2	4%	0	0%	2	12% ^a
Bathroom remodel	1	2%	1	3%	0	0%

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
Remodel (general)	1	2%	0	0%	1	6%
Exterior Changes						
New porch	1	2%	0	0%	1	6%
Outdoor changes (general)	1	2%	0	0%	1	6%
New deck	1	2%	1	3%	0	0%
Swimming pool	1	2%	1	3%	0	0%
Upgraded backyard	1	2%	1	3%	0	0%
Added cement and flagpole	1	2%	0	0%	1	6%
Work on driveway	1	2%	1	3%	1	0%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants

D4c. Approximately what month and year did you make these changes? If you made changes at different times, then please tell me when you made the first change.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
July 2016	2	11%	1	9%	1	13%
September 2016	1	5%	1	9%	0	0%
March 2017	1	5%	0	0%	1	13%
June 2017	1	5%	1	9%	0	0%
August 2017	2	11%	2	18%	0	0%
September 2017	1	5%	1	9%	0	0%
July 2018	1	5%		0%	1	13%
August 2018	1	5%	0	0%	1	13%
September 2018	1	5%	1	9%	0	0%
November 2018	2	11%	1	9%	1	13%
January 2019	2	11%	1	9%	1	13%
February 2019	1	5%	1	9%	0	0%
April 2019	1	5%	1	9%	0	0%
May 2019	2	11%	0	0%	2	25%
Total	19	100%	11	100%	8	100%

D5a. Since the home upgrade, have you or members of your household changed the way you think about or use energy in your home? This could include changes in how you use lights and/or appliances in your home.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	23	52%	15	52%	8	53%
Yes	20	45%	13	45%	7	47%
Don't know	1	2%	1	3%	0	0%
Total	44	100%	29	100%	15	100%

Note: Only asked if M2a = lives at property.

D5b. Please briefly describe how your household's thoughts or behaviors about energy use have changed since the home upgrade.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=49)	Count	Percent (n=32)	Count	Percent (n=17)
No changes	28	57%	19	59%	9	53%
Skipped - no longer lives there	5	10%	3	9%	2	12%
No other changes (<i>action recoded to D4b</i>)	3	6%	2	6%	1	6%
More aware/thoughtful about energy Use	3	6%	3	9% ^a	0	0%
Behavioral Changes						
Reduced AC use	3	6%	1	3%	2	12%
Turns off lights when not in use	3	6%	2	6%	1	6%
Turns appliances off when not in use	2	4%	2	6%	0	0%
Changed thermostat settings	3	6%	3	9% ^a	0	0%
Avoids using appliances at peak times	1	2%	0	0%	1	6%
Preference to purchase energy-efficient equipment	2	4%	0	0%	2	12% ^a

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

D6a. Have you noticed any change in your utility bill for the property since completing the home upgrade?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Yes	37	76%	28	88% ^a	9	53%
No	10	20%	3	9%	7	41%
Don't know	2	4%	1	3%	1	6%
Total	49	100%	32	100%	17	100%

^a Indicates statistical significance at the 90% confidence level between first-two-year and non-first-two-year participants.

D6b. Have you noticed an increase or decrease in your utility bill?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Decrease in bill	33	67%	26	81%	7	41%
No noticeable change in bill (Recoded based on D6a)	12	24%	4	13%	8	47%
Increase in bill	4	8%	2	6%	2	12%
Total	49	100%	32	100%	17	100%

D6c. Please describe what you think caused this change. [MULTIPLE RESPONSE]

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent (n=37)	Count	Percent (n=28)	Count	Percent (n=9)
The home upgrade project	31	84%	23	82%	8	89%
The weather	2	5%	2	7%	0	0%
A change in utility rates	1	3%	1	4%	0	0%
Other changes made to the property	2	5%	2	7%	0	0%
"Never had a bill due to not having a system" (increased bill)	1	3%	1	4%	0	0%
"Central heating and A/C" (increased bill)	1	3%	1	4%	0	0%
Refused	1	3%	0	0%	1	11%

D7. What was your annual household income from all sources in 2018, before taxes? Your best estimate is fine.

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Less than \$25,000	0	0%	0	0%	0	0%
\$25,000 to less than \$35,000	1	2%	1	3%	0	0%
\$35,000 to less than 50,000	1	2%	1	3%	0	0%
\$50,000 to less than \$75,000	6	12%	2	6%	4	24%
\$75,000 to less than \$100,000	6	12%	4	13%	2	12%
\$100,000 to less than \$150,000	9	18%	5	16%	4	24%
\$150,000 to less than \$200,000	5	10%	3	9%	2	12%
\$200,000 or more	8	16%	8	25%	0	0%
Refused	13	27%	8	25%	5	29%
Total	49	100%	32	100%	17	100%

Note: Originally this was a battery of two questions. If respondents did not provide a specific number, the survey asked them for an income range. The table above is a combination of the open-ended responses from D7a and ranges from D7b.

D7c. Does your household qualify for any state or government assistance, such as MediCal, the CalFresh/SNAP/Foodstamp program, CalWorks, or some other type of welfare program?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
No	44	90%	29	91%	15	88%
Yes	3	6%	2	6%	1	6%
Don't know	2	4%	1	3%	1	6%
Total	49	100%	32	100%	17	100%

D8. How would you describe your credit score? Would you say...?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Excellent	22	45%	15	47%	7	41%
Good	14	29%	8	25%	6	35%
Average	6	12%	3	9%	3	18%
Total	49	100%	32	100%	17	100%

D9. Are you still paying back your Residential Energy Efficiency Loan?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Yes	39	80%	22	69%	17	100%
No	9	18%	9	28%	0	0%
Refused	1	2%	1	3%	0	0%
Total	49	100%	32	100%	17	100%

D10. Do any of the following situations apply to you in terms of how you are paying back the Residential Energy Efficiency Loan?

Response	All		First Two Years of Pilot		After First Two Years	
	Count	Percent	Count	Percent	Count	Percent
Attempting to pay the loan off early	34	69%	20	63%	14	82%
I intend to pay the loan off early	18		10		8	
I regularly pay more than the minimum payment on the loan	13		7		6	
I am ahead of schedule on paying off the loan	5		3		2	
Already paid off early (recoded based on D9)	9	18%	9	28%	0	0%
I intend to just pay the minimum payment	6	12%	3	9%	3	18%
Total	49	100%	32	100%	17	100%

9. Contractor Survey Topline Results

9.1 Introduction and Approach

The evaluation team conducted online surveys with contractors who participated in CAEATFA's online REEL compliance and enrollment training and enrolled as contractors for the REEL program. The survey relates to Task 6 of the Year 1 Finance Sector Area Work Plan and the objectives are as follows:

- Gain feedback on REEL's design and implementation model from the contractors' perspective, as well as their overall satisfaction with the program
- Assess the scalability potential of the pilot in terms of the impact contractors see it having on their business and customers, and whether or not such an impact could be similarly produced with existing EE financing mechanisms on the market
- Determine whether/how REEL has helped contractors overcome barriers associated with EE projects (in terms of number of EE projects, breadth of EE projects, new types of customers served with EE projects, etc.)

9.1.1 Survey Approach

This survey was administered via the internet and the sample included the 269 REEL-certified contractors listed on the CHEEF website.⁶⁹ All contractors were contacted via e-mail up to four times. To maximize responses, the evaluation team offered a \$100 incentive. A total of 57 contractors completed the survey.

9.1.2 Survey Structure

Table 57 summarizes the purpose of each survey section.

Table 57. Contractor Survey Structure

Survey Section	Section Objectives
Introduction/Screener	<ul style="list-style-type: none"> ■ Introduces the survey to respondents and confirms that they are familiar with the REEL program and qualify for the survey
Promotion of Finance Options	<ul style="list-style-type: none"> ■ Promotion of general financing options and REEL; why contractors are not promoting REEL ■ Promotion of rebates ■ Perceived impact of financing versus rebates on helping close sales
Program Design and Implementation Feedback	<ul style="list-style-type: none"> ■ Explore contractor knowledge, impressions, and satisfaction with the REEL program ■ Identify, from the contractor's perspective, what components of program design and implementation are effective and what components need improvement ■ For contractors who verify completion of REEL projects, collect feedback on the loan application process

⁶⁹ <http://www.sto.ca.gov/caeatfa/cheef/reel/index.asp>.

Survey Section	Section Objectives
REEL's Influence on the Market, and Interest in and Barriers to Future Participation	<ul style="list-style-type: none"> Explore the impact that contractors see REEL having on their business and customers Identify if, and how, REEL has influenced contractor's sales (in terms of the number of projects, the breadth of projects, and the customers reached through REEL loans) Understand the role contractors see REEL playing in the future of their business
Contractor Characteristics	<ul style="list-style-type: none"> Collects firmographic information about contractors

9.2 Results

Below are the detailed survey responses from which the evaluation team drew out key findings. Please note that some questions are “multiple response” and do not sum to 100% (totals are excluded from these tables). In some cases, the percentages do not sum to 100% due to rounding. Unless italicized with quotations, open-ended responses are coded. Where a statistically significant difference exists, tables are broken out to show the difference between those who have completed a REEL project and those who have not.

9.2.1 Promotion of Finance Options and Rebates

A1. Which of the following financing options are you promoting to your customers? This could include verbally explaining the option to them, providing informational materials, or including information on your website.

Response (Multiple Response)	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent (n=57)	Count	Percent (n=23)	Count	Percent (n=34)
REEL loans	41	72%	14	61%	27	79%
PACE loans	36	63%	16	70%	20	59%
EE fixed-term loans from banks or credit unions besides REEL	22	39%	12	52%	10	29%
Traditional fixed-term loans from bank or credit unions (no energy-related requirements)	16	28%	8	35%	8	24%
Home equity lines of credit	14	25%	7	30%	7	21% ^a
Financing options through my company	11	19%	6	26%	5	15%
Other [OPEN END]:						
<ul style="list-style-type: none"> Synchrony Bank Financing Retail Credit Cards (n=3) Sacramento Municipal Utility District Financing (n=1) 	4	7%	1	4%	3	9%
I do not promote any financing options	1	2%	1	4%	0	0%

^a Indicates statistical significance at the 95% confidence level.

A2. Please select the statements below, if any, that describe why you are not promoting REEL.

Responses (Multiple Response)	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent (n=15)	Count	Percent (n=8)	Count	Percent (n=7)
It takes too much time or effort on my part to facilitate REEL loans.	4	31%	3	38%	1	14%
I prefer to promote other finance offerings.	3	23%	2	25%	1	14%
I don't have enough marketing support for promoting REEL.	3	23%	3	38% ^a	0	0%
Only a few of my customers would be interested in REEL.	3	23%	1	13%	2	29%
I prefer to work with lenders I or my customers are more familiar with.	3	23%	2	25%	1	14%
The measures required by REEL are too restrictive.	2	15%	2	25%	0	0%
Only a few of my customers would be able to qualify for a REEL loan.	1	8%	1	13%	0	0%

^a Indicates statistical significance at the 90% confidence level.

Note: This question was given only to respondents if they did not select REEL in A1 or if they said that they did not promote any type of financing in A1.

A3. When selling jobs to your customers, how often do you mention REEL financing?

Response	Count	Percent
Always	19	46%
Sometimes	21	51%
Never	1	2%
Total	41	100%

Note: Only asked if respondent indicated their promotion of REEL in A1.

A4. How helpful is REEL financing to your ability to sell projects?

Response	Count	Percent
Very helpful	17	41%
Somewhat helpful	19	46%
Not helpful at all	5	12%
Total	41	100%

Note: Only asked if respondent indicated their promotion of REEL in A1.

A5. And how often do you mention utility rebates or incentives available to customers?

Response	Count	Percent
Always	37	65%
Sometimes	17	30%
Never	3	5%
Total	57	100%

A6. When selling jobs to your customers, how helpful is energy efficiency financing compared to utility rebates and incentives? Would you say:

Response	Count	Percent
Energy efficiency financing is more helpful than rebates	12	21%
Rebates are more helpful than energy efficiency financing	17	30%
Energy efficiency financing and rebates are equally helpful	28	49%
Total	57	100%

9.2.2 Impact on Sales

R1. Since becoming REEL-certified, how many projects have you completed that used REEL loans? If you're unsure, your best estimate is fine.

Number of Projects	Count	Percent
Have Yet to Complete a REEL-financed Project	23	40%
1	10	18%
2	8	14%
4	5	9%
5	1	2%
7	1	2%
8	1	2%
9	1	2%
10	4	7%
12	1	2%
24	1	2%
50	1	2%
Total	57	100%

R1a. Why have you not completed any REEL loans so far? [OPEN END]

Reason for Not Completing	Total (n=23)	
	Count	Percent
Too Complicated (for Homeowner and/or Contractor)	9	39%
Lack of homeowner interest/awareness of REEL	4	17%
Haven't had the opportunity	4	17%
Customers chose to pay cash	3	13%
Homeowner did not qualify	2	9%
Invalid	1	4%

Note: Only asked this question if respondent indicated that they did not complete any REEL loans in R1.

R2. Of all the jobs your company completed last year in California, how many would you say were residential **retrofit** projects?

Number of Residential Retrofit Projects	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent (n=23)	Count	Percent (n=34)
Between 1 and 10 Projects	18	32%	6	26%	12	35%
Between 10 and 100 Projects	23	40%	8	35%	15	44%
More than 100 Projects	10	18%	3	13%	7	21%
No Residential Retrofit Projects	6	11%	6	26% ^a	0	0%
Total	57	100%	23	100%	34	100%

^a Indicates statistical significance at the 95% confidence level.

R2a. And of these residential retrofit projects, how many would you say likely led to energy bill savings for your customers?

Projects Leading to Energy Savings (as a Percentage of all Residential Retrofits)	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
25% or less	1	2%	0	0%	1	3%
25% to 50%	1	2%	1	6%	0	0%
50% to 75%	6	12%	2	12%	4	12%
75% up to 100%	7	14%	4	24%	3	9%
100%	36	71%	10	59%	26	76%
Total	51	100%	17	100%	34	100%

Note: Calculated percentages based on numerical open-ends provided in R2 and R2a. The six respondents who indicated that they completed no residential retrofits last year were not asked R2a and as a result are not shown in the calculations above.

R3. What percent of project(s) you sold last year were funded by each of the following payment mechanisms?

Funding Mechanism	Number of Residential Energy-Related Projects	% of Total Projects
REEL	155	4%
Other EE Financing (including PACE, Green Mortgages, PowerSaver, and EE term loans)	844	19%
Financing with No EE Requirements (Home Equity Line of Credit, Credit Card, Bank Loan)	1,331	30%
Financing Offered through Contractor's Company	173	4%
Paid Up-Front and in Full	1,863	43%
Total EE Projects Completed by REEL-Certified Contractors	4,365	100%

Note: Project counts calculated based on R3-reported percentages applied to the total number of energy-related retrofits a respondent reported to have completed in R2a. Calculations will not exactly equal R1 due to discrepancies between reported number of projects and percentage of funding. Six participants said that they did not perform any retrofit projects that resulted in energy savings and were therefore not included in this count.

9.2.3 Contractor Feedback on REEL Program Design and Implementation

R4. How often do customers ask you about REEL?

Response	Count	Percent
Never	21	37%
Rarely	23	40%
Sometimes	11	19%
Often	1	2%
Always	1	2%
Total	57	100%

R5. Below are some reasons why contractors might decide to enroll in the REEL program. Please select the statements, if any, that describe why you decided to enroll. **[MULTIPLE RESPONSE]**

Response	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
Some of my prospective customers require financing to do their projects.	34	60%	13	57%	21	62%
I wanted to learn about all energy efficiency financing options available for my customers.	33	58%	14	61%	19	56%
I thought the REEL program would allow my customers to complete larger projects than they could otherwise.	32	56%	15	65%	17	50%
I thought the REEL program would provide an opportunity to get new customers.	31	54%	13	57%	18	53%

Response	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
I thought being associated with a loan program that is supported by the State of California would lend credibility to my company.	30	53%	14	61%	16	47%
I wanted to be able to offer a complete retrofit package to my customers, including financing.	30	53%	12	52%	18	53%
I thought being associated with a loan program that is supported by the California energy companies would lend credibility to my company.	27	47%	12	52%	15	44%
Something else, please describe what motivated you to enroll [OPEN END]: <ul style="list-style-type: none"> Customers did not qualify for other types of financing (n=2) Customers requested (n=3) Low Fees/Rates (n=3) 	8	14%	0	0%	8	24% ^a

^a Indicates statistical significance at the 95% confidence level.

R6. How satisfied are you with the REEL program overall?

Response	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
1 - Very dissatisfied	3	5%	2	9%	1	3%
2 - Somewhat dissatisfied	3	5%	1	4%	2	6%
3 - Neutral (neither satisfied nor dissatisfied)	16	28%	12	52%	4	12% ^a
4 - Somewhat satisfied	10	18%	3	13%	7	21%
5 - Very satisfied	25	44%	5	22%	20	59% ^a
Total	57	100%	23	100%	34	100%
Mean	3.9		3.4		4.3**	
Standard Deviation	1.2		1.2		1.1	

^a Indicates statistical significance at the 95% confidence level.

R7. Using the chart below, please indicate which components of the REEL program currently work as-is (and therefore do not need improvement) and which, in your opinion, need improvement.

Component	Respondents Indicating Program Component <i>Does NOT Need Improvement</i>					
	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
The customer eligibility requirements (that is, income, credit score) for REEL loans	47	82%	16	70% ^a	31	91% ^a

Component	Respondents Indicating Program Component <i>Does NOT Need Improvement</i>					
	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
The loan application process for REEL	44	77%	16	70%	28	82%
The details of REEL loan terms (that is, interest rates, durations, max/min amounts)	43	75%	15	65%	28	82%
The lenders who offer REEL loans	42	74%	15	65%	27	79%
The key benefits of REEL loans compared to other financing options	40	70%	15	65%	25	74%
The project eligibility requirements for REEL loans	40	70%	12	52% ^a	28	82% ^a
The websites available for contractors and customers	36	63%	12	52%	24	71%
The marketing support available to contractors	28	49%	11	48%	17	50%

^a Indicates statistical significance at the 95% confidence level.

Component	Respondents Indicating Program Component <i>Needs Improvement</i>					
	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
The marketing support available to contractors	29	51%	12	52%	17	50%
The websites available for contractors and customers	21	37%	11	48%	10	29%
The key benefits of REEL loans compared to other financing options	17	30%	8	35%	9	26%
The project eligibility requirements for REEL loans	17	30%	11	48% ^a	6	18% ^a
The lenders who offer REEL loans	15	26%	8	35%	7	21%
The details of REEL loan terms (that is, interest rates, durations, max/min amounts)	14	25%	8	35%	6	18%
The loan application process for REEL	13	23%	7	30%	6	18%
The customer eligibility requirements (that is, income, credit score) for REEL loans	10	18%	7	30% ^a	3	9% ^a

^a Indicates statistical significance at the 95% confidence level.

R8a-h. Please elaborate on why you think <INSERT R7a-h> needs improvement. [OPEN END]

Reason for Needs Improvement	Count
Not user-friendly: <ul style="list-style-type: none"> ▪ <i>"It's hard to find easy answers and guidelines"</i> ▪ Application process is overly complex and confuses homeowners (n=7) ▪ Website difficult to navigate and hard to use (n=12) 	27
Need to enhance marketing, education, and outreach to increase awareness of REEL program and educate potential REEL borrowers on the details of REEL: <ul style="list-style-type: none"> ▪ Better advertisement and promotion of the program (n=7) ▪ Comparison sheet of benefits of REEL versus competing financial products (n=4) ▪ Options to allow contractors to customize marketing materials (cobranded templates, REEL logo etc.) (n=3) ▪ Need term examples based on different mixes of duration, credit etc. (n=3) <i>"The marketing sheets have way too much fluffy language and no term examples leaving me to create my own side sheet to show loan examples. People don't read and they want to see the bottom line impact. Period."</i> 	25
Little to no marketing assistance given to contractors: <ul style="list-style-type: none"> ▪ <i>"For example, my E3 rep is in the office right now. My Ygrene and PACE Lending reps stop by once a week."</i> ▪ <i>"We have not received any marketing assistance from the program."</i> ▪ <i>"What marketing?"</i> 	9
Web-based features such as contractor CRM, online application, and/or payment calculator needed <i>"An actual payment calculator based on the rate would be nice on the website so the customer could estimate the payments. Some of the loan officers/managers do not know the specifics and misinform the client..."</i>	8
Expand eligible measures	8
Increase the number of participating Lenders	6
Increase the speed of loan approval or offer instant approval	6
Flexibility and transparency with customer eligibility requirements: <i>"Soften eligibility requirements and documentation needed. Had a customer declined because after her raise she didn't have enough paystubs to show the increased income to qualify."</i>	6
Lack of information available on the details of REEL loan terms and/or lack limited understanding/awareness of the various terms	5
Lenders need better training and knowledge of the REEL product	5
The application process and REEL loan terms need to be standardized across the different Lenders	4
Higher rates than PACE or other financing options	4
Increase loan duration from up to 15 to up to 20 years	1
Option to receive portion of the loan up front to pay for project start-up costs	1
Option to allow contractor to "buy down" some of the interest rate so they could offer a special rate as an incentive during slower periods	1
<i>"In San Diego, there are no regional lenders. The 2 statewide lenders don't have the best rate/term combinations. Clients are payment driven."</i>	1

Note: Responses enclosed in quotation marks are verbatim responses from the respondent(s). Count of comment type will not sum to counts by component (see R7) as responses covered multiple back-coded categories and 28 of the 136 open-end responses from R8a-h were not applicable.

R9-R9a. You mentioned in earlier that you have yet to complete a REEL loan project to date. Do you plan to use REEL in the future [YES/NO]? Why not? [OPEN END]

Response	Count	Percent	Reason for Not Planning to Use REEL in the Future (n=2)
Yes	21	91%	<ul style="list-style-type: none"> ▪ Lack of information (n=1) ▪ "It would complicate my sales process and I don't see a lot of value." (n=1)
No	2	9%	
Total	23	100%	

Note: Respondents were asked this question if they reported to have completed a REEL-financed project.

Source: Combined responses from R9–R9a.

R10a-h. We would like to get a bit more detail on your opinion about REEL's details and processes. Please select which elements of the REEL loan application process currently work as-is, and which, in your opinion need improvement.

Component	Respondents Indicating Component Does NOT Need Improvement (n=34)		Respondents Indicating Component Needs Improvement (n=34)	
	Count	Percent	Count	Percent
Maximum loan amount	31	91%	3	9%
Loan duration	30	88%	4	12%
Financing fees paid by customers	30	88%	4	12%
The ability to finance non-energy-related improvements	30	88%	4	12%
Speed of loan approval	29	85%	5	15%
The responsiveness or turnaround time from lenders	29	85%	5	15%
Finance process support provided to contractors by lender	29	85%	5	15%
Interest rate	28	82%	6	18%
The effort required to fill out required paperwork	28	82%	6	18%
The time it takes to see if a customer will qualify for the loan	27	79%	7	21%
Incentives/rewards provided by the lender to contractors	14	41%	20	59%

Note: Respondents were only asked this question if they reported to have completed a REEL-financed project.

R11. What do you think should be changed in the REEL loan product to help you sell more retrofit projects that lead to energy savings? [OPEN END]

Responses	Count	Percent (n=34)
More promotion and marketing of REEL <i>"The REEL loan programs need to put up a few large billboards, not the electronic boards but the old school boards that one can actually read throughout neighborhoods that normally run high electrical bills due to non-energy efficiency AC (HVAC), a few commercials wouldn't hurt either."</i>	5	15%
Improve interest rates	4	12%
Simplify loan application process	3	9%
Option to receive portion of the loan up front to fund project start-up costs <i>"As a small business my only issue is with the no money down part. It can become difficult to pay out over \$5000 for a few weeks in order use this program."</i>	3	9%
Speed up approval turn-around time or offer instant approval	3	9%
Add incentives and/or rebates	2	6%
Flexibility in eligibility requirements for lower-income and elderly	1	3%
Increase 30% limit on loan amount towards non-energy improvements	1	3%
Increase loan amount	1	3%
Training for employees of REEL-certified contractors	1	3%
Web Portal	1	3%

Note: Respondents were asked this question if they reported to have completed a REEL-financed project. Total does not sum to total answering due to respondents mentioning multiple components in their open-end responses. Eleven of the 34 respondents had no additional feedback or non-applicable comments.

REEL's Influence on the Market

IN1-2. Thinking of your business since your enrollment in the REEL program, which of the following statements is true? How much of an influence would you say REEL had on your ability to **[IF INa=01, INSERT “to complete more residential retrofit projects”; IF INb=01, INSERT “complete larger projects”; IF INC=01, INSERT “increase the number of new customers”; IF IND=01, INSERT “get more customers to afford your services”?]**

Statement	Total Answering “True”	Influence Rating (n=34)										Mean Score
		1 - Not at all Influential		2 - Slightly Influential		3 - Moderately Influential		4 - Very Influential		5 - Extremely Influential		
		Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
I have been able to get more customers to afford my services	20	2	10%	7	35%	7	35%	3	15%	1	5%	2.7
I have completed more residential retrofit projects that involved energy-efficient measures or upgrades	15	2	13%	6	40%	4	27%	3	20%	0	0%	2.5
I have increased the number of new customers that my business serves	11	2	18%	4	36%	4	36%	1	9%	0	0%	2.4
I have completed larger projects which involve a broader scope of work (more services and installations per project and therefore project size, or price, is higher)	11	3	27%	2	18%	4	36%	1	9%	1	9%	2.6

Note: Respondents were asked to rate the influence of REEL on each of the statements they marked as true in question IN1. While all respondents (n=57) were given IN1a-d and IN2a-d, the evaluation team excludes the results of those REEL-certified contractors who did not complete a REEL project from the table above, as the ambiguous wording on IN1 may have led respondents to think that they were being asked to comment on how participating in REEL affected their business (as opposed to how their business has changed in the time period since their enrollment).

Source: Combined responses from IN1a-d and IN2a-d.

IN3b. What role do you see REEL playing in the future of your business? [OPEN END]

Responses (Coded Open-Ends)	Count	Percent
An expanded and/or increased role (complete more projects, generate more customers, help grow the business)	13	50%
Continued role	7	27%
Work on behalf of contractors in marketing efforts, help with customer targeting and relationship building	4	15%
Be the alternative to PACE	2	8%
Total	26	100%

Note: This question was asked to 29 respondents who said REEL would play a moderately influential, very influential, or extremely influential role in the future of their business (see IN3). Three responses were not applicable and therefore removed from the total counts presented above.

IN4. What kind of financing would you offer to customers if REEL was not available?

Response	Total (n=57)	
	Count	Percent
None	11	19%
Something else. Please Describe: [OPEN END]:	46	81%
▪ PACE (including HERO)	21	37%
▪ Traditional Secured Loans (through banks or credit unions)	9	16%
▪ Financing through a Financial Technology Company (institution that partners with banks to originate loans and with home improvement contractors to provide point-of-sale financing); includes Greensky, Energy Loan Network, and Synchrony Financing	8	14%
▪ Unsecured Loans (for example, credit cards)	5	9%
▪ Traditional Loans with EE requirements (for example, EnerBank USA)	4	7%
▪ In-House Financing	4	7%
▪ Non-Specific Answer	3	5%
▪ Home Equity Line of Credit	3	5%
▪ Construction Loan	2	4%
▪ Manufacturer Financing	1	2%

Note: Open-ended responses included multiple financing alternatives. Italicized percentages are not intended to sum to the total who chose an alternative financing option (n=46), but rather the proportion of total answering that identified a given financing type.

IN4b. How would you compare the REEL product to the alternative financing option you just described? Would you say...

Response	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
REEL is <u>better</u> than the alternative financing option	18	39%	3	17%	15	54% ^a
REEL is <u>equal</u> to the alternative financing option	17	37%	7	39%	10	36%
REEL is <u>inferior</u> to the alternative financing option	11	24%	8	44%	3	11% ^a
Total	46	100%	18	100%	28	100%

^a Indicates statistical significance at the 95% confidence level.

Note: Respondents were only asked this question if they provided an alternative financing option in IN4 (n=46).

9.2.4 Contractor Characteristics

D1. What is your gross annual business revenue in California?

Response	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
Less than \$100,000	4	8%	3	15%	1	3%
\$100,000 to less than \$500,000	12	23%	2	10%	10	31% ^a
\$500,000 to less than \$1 million	9	17%	4	20%	5	16%
\$1 million or more	27	52%	11	55%	16	50%
Total	52	100%	20	100%	32	100%

Note: Excludes five respondents who preferred not to answer.

^a Indicates statistical significance at the 90% confidence level.

D2. Including yourself, how many employees does your company have in California?

Number of Employees	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
5 or less	23	40%	10	43%	13	38%
6 to 10	13	23%	5	22%	8	24%
11 to 50	15	26%	5	22%	10	29%
51 to 99	4	7%	2	9%	2	6%
100 or more	2	4%	1	4%	1	3%
Total	57	100%	23	100%	34	100%

D3. For how many years has your company been offering services to the residential market in California?

Years	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
1 to 3	8	15%	5	24%	3	9%
4 to 10	6	11%	2	10%	4	12%
11 to 20	14	26%	8	38%	6	18%
21 to 30	11	20%	3	14%	8	24%
31 to 40	9	17%	2	10%	7	21%
41 to 50	3	6%	0	0%	3	9%
More than 50	3	6%	1	5%	2	6%
Total	54	100%	21	100%	33	100%

Note: Excludes three respondents who preferred not to answer

D4. Using the table below, please select the services your company offers to the residential market. [ROTATE]

Service Offered by Company	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
Do renovations or building additions	27	47%	15	65%**	12	35%
Weatherize and insulate homes	39	68%	15	65%	24	71%
Install windows ^a	31	55%	14	64%	17	50%
Install water heating systems ^a	41	73%	17	77%	24	71%
Install space heating systems	44	77%	17	74%	27	79%
Install space cooling systems such as air conditioners	50	88%	19	83%	31	91%
Install lighting ^a	24	43%	12	55%	12	35%
Install solar panels	25	44%	13	57%	12	35%
Install swimming pool equipment such as pool pumps ^a	18	32%	10	45%*	8	24%
Other [OPEN END]: Landscaping and/or paving	3	5%	2	9%	1	3%

^a One respondent who indicated “I’m not sure if we offer this service” was excluded from the percentage calculations for total answering (n=56) and “No REEL Projects” (n=22). In all other instances, percentage calculations are out of 57 for “Total,” 23 for “No REEL Projects,” and 34 for “Completed REEL Projects.”

* Indicates statistical significance at the 90% confidence level.

**Indicates statistical significance at the 95% confidence level.

Table 58. Geographic Distribution of Contractors

Region	County	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
		Count	Percent	Count	Percent	Count	Percent
Central	Amador	5	9%	2	9%	3	9%
Central	Calaveras	1	2%	0	0%	1	3%
Central	El Dorado	4	7%	0	0%	3	9%
Central	Fresno	4	7%	1	4%	3	9%
Central	Kings	4	7%	2	9%	2	6%
Central	Madera	3	5%	2	9%	1	3%
Central	Mariposa	1	2%	1	4%	0	0%
Central	Merced	2	4%	2	9%	0	0%
Central	Placer	5	9%	3	13%	2	6%
Central	San Joaquin	4	7%	3	13%	1	3%
Central	Stanislaus	3	5%	3	13%	0	0%
Central	Tulare	7	12%	3	13%	3	9%
Central	Tuolumne	3	5%	2	9%	1	3%
North	Alameda	8	14%	4	17%	4	12%
North	Contra Costa	5	9%	1	4%	4	12%

Region	County	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
		Count	Percent	Count	Percent	Count	Percent
North	Humboldt	1	2%	1	4%	0	0%
North	Lake	1	2%	1	4%	0	0%
North	Marin	2	4%	2	9%	0	0%
North	Mendocino	1	2%	1	4%	0	0%
North	Napa	1	2%	0	0%	1	3%
North	Sacramento	7	12%	4	17%	3	9%
North	San Francisco	2	4%	1	4%	1	3%
North	San Mateo	4	7%	2	9%	2	6%
North	Santa Clara	6	11%	3	13%	3	9%
North	Solano	2	4%	0	0%	2	6%
North	Sonoma	2	4%	2	9%	0	0%
North	Tehama	1	2%	0	0%	1	3%
North	Yolo	2	4%	0	0%	2	6%
North	Yuba	1	2%	0	0%	1	3%
North	Shasta	1	2%	0	0%	1	3%
South	Kern	8	14%	4	17%	4	12%
South	Los Angeles	20	35%	5	22%	15	44%
South	Orange	12	21%	1	4%	11	32%
South	Riverside	11	19%	1	4%	10	29%
South	San Bernardino	11	19%	1	4%	10	29%
South	San Diego	6	11%	2	9%	4	12%
South	San Luis Obispo	1	2%	0	0%	1	3%
South	Santa Barbara	3	5%	1	4%	2	6%
South	Ventura	6	11%	2	9%	4	12%

Note: Counties served determined using Geographic Area Served variable from “Residential Energy Efficiency Loan (REEL) Program Enrolled Contractors as of 10/26/18” report downloaded from CHEEF website.

Table 59. Region-Level Summary (Mutually Exclusive Categories)

Region Served	Total		No REEL Projects		Completed REEL Projects	
	Count	Percent	Count	Percent	Count	Percent
South	27	24%	9	39%	18	53%
North	12	11%	6	26%	6	18%
North and Central	7	6%	4	17%	3	9%
Central	5	4%	3	13%	2	6%
South and Central	4	4%	1	4%	3	9%
North and South	2	2%	0	0%	2	6%
Total	57	100%	23	100%	34	100%

Table 60. Region-Level Summary (Multiple Regions Per Contractor)

Region Served	Total (n=57)		No REEL Projects (n=23)		Completed REEL Projects (n=34)	
	Count	Percent	Count	Percent	Count	Percent
South	33	58%	10	43%	23	68%
North	21	37%	10	43%	11	32%
Central	16	28%	8	35%	8	24%

10. Detailed Stakeholder Interview Results

Semi-structured in-depth interviews were conducted with the following groups.

- **CAEATFA:** Staff were interviewed to understand the pilot processes and implementation model. The evaluation team also captured their experience with the REEL model over the two-year pilot period and determined which elements of the pilot design they felt had been most successful and where improvements could be made. Finally, the evaluation team gathered perspectives on REEL scalability, considering how a program could enroll more lenders, generate larger volume, and be administered most effectively.
- **Enrolled Lenders:** All seven enrolled lenders were interviewed to find out how REEL compares to other financing products offered, the impact REEL has on their business and members, and their level of satisfaction with REEL and coordination with CAEATFA. Interviews also explored lenders' intentions to continue offering specialized EE loans and to what degree their experiences with REEL influenced that decision. This is beyond the initial four lenders that were enrolled as of July 30, 2018.
- **Efficiency PAs:** The evaluation team interviewed representatives from six PAs, including financing subject matter experts and/or EUC Home Upgrade and Residential HVAC program managers (that is, staff involved in programs who were most likely to have overlap with REEL participants, based on the observed mix of measures financed). The PAs included the four IOUs (PG&E, SCG, SDG&E, and SCE) and two RENs (BayREN and SoCalREN). The in-depth interviews focused on collecting market insights, PAs' assessment of pilot scalability, and coordination with CAEATFA.

Overall, these interviews play a central role in evaluating REEL's processes and identifying opportunities to fine tune the program to attract greater participation and support deeper savings.

10.1 CAEATFA and Program Administrators

To simplify reporting, CAEATFA and the PAs' findings are combined and summarized below.

A state-backed program is beneficial, but REEL's pilot status, the regulatory process, and several structural challenges are hindering REEL from scaling up.

- **A state-backed program adds credibility, trust, and security, but the regulatory process slows the ability to adapt.** Having to make regulatory requests for each change prevents REEL from being as nimble as it could be and adjusting more quickly to learnings as they emerge. Experience in other jurisdictions shows that the most successful EE lenders are constantly adjusting and updating their programs.
- **REEL's status as a pilot is hindering growth.** CAEATFA reported that it was challenging to recruit larger lenders to a pilot program because they do not want to invest the time and money to set up a new lending product that may exist over a short timeframe. This sentiment was echoed by other stakeholders, who indicated that they struggled to see the long-term benefits from joining a pilot.
- **Several challenges with the current program structure.** CAEATFA and the PAs reported several pilot design challenges related to the customer and contractor experience, and complications to verify

participant eligibility. It was felt that investing in IT infrastructure may improve contractor and customer experience; extending REEL to POU territories would streamline eligibility for participants who are not served by an IOU (for gas or electricity); and, although several changes have helped streamline the process, administrative requirements like loan-by-loan eligibility checks take time and create complexity.

“CAEATFA needs freedom and flexibility to make decisions.”

— Program Administrator

- **All PAs recognized the challenge REEL faced as a pilot and that CAEATFA needs latitude to implement.** PAs recognized that their programs and the REEL pilot are heavily regulated and complex and CAEATFA is balancing REEL and other pilots with limited resources.

Financing is not viewed as the best solution for low-income homeowners.

- **Offering EE loans (even with low interest rates) was not viewed as a solution for truly low-income borrowers.** All those interviewed were weary of programs that put customers under additional financial stress and pointed to other options available to low-income homeowners (for example, Direct Install, ESAP, and CARE) where homeowners do not pay anything.
- **REEL could be a better option for moderate-income borrowers, but how moderate-income borrowers are defined must be carefully considered.** While REEL offers attractive interest rates and longer payback periods to lower monthly payments, moderate-income households may be vulnerable to falling into low-income status. It was suggested that REEL may be most appropriate for moderate-, upper-moderate- and high-income borrowers or that, if lower-income homeowners are participating, that the savings-to-investment ratio be greater than 1.0, so that the energy savings exceed the costs to pay for the EE upgrades.

There is demand for EE financing and, as PACE declines, there are opportunities for REEL to fill the market gap. However, REEL needs to expand the eligible measures list and reduce barriers to make inroads.

- **New state PACE regulations have resulted in declining PACE volumes, but REEL is not growing at the same rate.** State legislation has changed underwriting guidelines, making PACE more like a traditional finance program. Borrowers must show they income qualify, not just based on property equity, to verify the ability to repay. One PA noted that conversations with PACE lenders indicated PACE volumes are down 80% from a year ago. Indeed, legislative changes in 2017 and 2018 have led to lower PACE financing uptake. California’s PACE financing experienced a one-third drop in the first six months of 2018 (relative to the prior year).

“For the most part, PACE worked for people who used it voluntarily. PACE got a lot of dollars invested in energy efficiency and renewable energy that hasn’t been achieved in the past, but was driven by wrong motivations (for example, projects didn’t always achieve large savings, not necessarily best for customer, people didn’t understand the nature of PACE).”

— Program Administrator

- **Demand for HVAC and windows are never going to go away, and PACE’s decline is not indicative of declining demand.** All PAs felt there was a need and desire to upgrade building envelopes, HVAC, and windows, even if it is not the primary motivator. Many reported that financing inquiries are frequent,

and one PA's recent market characterization study showed 38%–44% of customers would be interested in financing options.

- **Allowing REEL to become a more comprehensive solution may increase participation and loan volume.** PACE veered to general home improvements allowing RE, EE, windows, etc. REEL currently credit enhances only IOU EE projects, excluding municipal and others. Several PAs mentioned opportunities to include solar, electrification, storage, demand response, EV charging, and water-saving measures.
- **State policy goals for GHG and electrification are changing, and there is a need to reevaluate what customers and the market really need, how REEL can best serve the market, and whether ratepayer funds can be used.** There is a lot of interest in electrification and renewables, and many customers in California are looking to go "green" to help the environment and mitigate climate change. REEL should include other energy solutions to align with state policies, for example, solar.
- **OBR should continue to be explored to increase participation.** The infrastructure for the EFLIC was built with PG&E but was challenged when the lending partner changed senior management and priorities and decided not to proceed. One PA noted that, on the commercial side, utility OBR/OBF has steadily become customers' first choice because it avoids the complexity of going through lenders, has different underwriting requirements, and allows repayment on a homeowner's utility bill.
- **The HUP is complex with a lot of steps in the process that people do not understand, creating mistrust and uncertainty – and financing adds to that uncertainty.** Broadly, it was felt that there are a lot of options in the market (for example, EE financing, personal loans, and contractor loans). It confuses the market to have to weigh the benefits of each. Financing raises the bar on uncertainty: "Am I borrowing money for the right reasons?"

The multilender model, with CAEATFA as PA is a strength, but there is interest in exploring other options.

- **The multilender model offers borrower's choice and the ability to work directly with lenders.** It was also viewed as creating healthy competition among lenders and avoids being locked into one option and terms. However, one PA suggested that using a single lending partner may encourage that lender to make greater investments in technology and marketing needed to scale up REEL.
- **CAEATFA's experience with REEL has supported the integration and coordination of other pilots.** The experience with REEL has helped CAEATFA know where to be referred, how IOUs are organized, and what questions to ask. The small business pilot is estimated to take three months to launch versus one year with REEL. PAs agreed, mentioning that CAEATFA had a good understanding of what is needed to be successful, are inclusive, and communicate well. Moreover, having built the infrastructure and team over the last three years comes with advantages.
- **CAEATFA believes REEL will get to scale with large FIs, RICs, or a single originator that could standardize and sell to the secondary market – and a substantial IT investment.** "We think there is room for both if REEL becomes permanent." One PA suggested that there are benefits to going

"We would need to carefully consider what we would gain with someone else."

— Program Administrator

through one lender rather than having to evaluate two, three, or four rates and terms: “Anything in the process that adds time limits the ability to close.”

Contractors drive the market, therefore focus on educating contractors, streamlining processes, and offering incentives to entice contractors.

- **Make it easy for contractors to participate.** There is a perception among PAs that REEL is too long a process. PAs suggested improving the contractor experience with technology, minimizing paperwork, developing a support network, staggering payments for larger projects, and considering incentives to reduce administrative costs.
- **Whole-home contractors versus single-trade contractors creates tension between achieving volume and depth of savings.** Customers want a contractor who presents their approach well, does quality work, has whole-home experience, and is Building Performance Institute certified, but there are not many of them. There is certainly value in training whole-home contractors who have more training and certification, but the program also needs single-trade contractors who can get volume, even if savings are shallower.

“Contractors do not shop for the best offer for customers; they promote the one that is easiest to work with.”

— Program Administrator

REEL could complement other resource programs, but better integration and streamlining of processes is needed.

- **Not all EUC/HVAC contractors are REEL contractors, but once onboard, some view REEL financing as an alternative.** Several PAs believe that contractors may be pushing one or the other. “Whatever helps them close the project quickly is going to win.” One PA noted that once a contractor signs up with REEL, the contractor no longer promotes its HUP anymore. Another PA felt that if all contractors present financing, this could formally align the single-family home upgrade, REEL, and other programs.
- Resource programs are declining in general, but the number of REEL participants getting rebates may be higher than what is reported. California’s resource programs are required to deliver net cost-effective savings and HUPs’ TRC ratios are extremely low.⁷⁰ This has resulted in programs ending altogether — or incentives and EEEMs being scaled back — and the number of home upgrade participants dropping. For example, the HUP expenditures have declined for all IOUs in the past few years and a similar trend has been experienced across all residential market transformation programming in the state, with expenditures falling from \$80M in 2016, to \$62M in 2017, and \$30M in 2018. CAEATFA simply asks participants whether they anticipate getting, or have gotten, rebates but acknowledged that the accuracy of the self-report surveys is questionable. Similarly, PAs reported that participants report whether they intend to go through a rebate program, but it is not

“People are familiar with rebates; they are a natural lead in. Someone needs to come up with the perfect pitch to combine the two.”

— Program Administrator

⁷⁰ As California’s standards become more stringent and baselines increase, it is increasingly harder for resource programs to achieve TRC ratios > 1.

always correct. Finance has a quicker closeout than rebates and some PAs reported going back to earlier REEL reports to match with rebates due to the lag time.

- **Balancing safety and a desire to reduce complexity is challenging.** Early on, CAEATFA chose to align REEL with IOU processes. For quality assurance, health, and safety for HUPs, a CAS test is triggered whenever gas lines are involved. CAEATFA believes that contractors may not be suggesting larger projects because they do not want to trigger a CAS test. Alternatively, the CAS may be influencing homeowner's decision to apply for rebates. One PA shared his experience: When upgrading his building envelope, he also replaced his gas furnace to a heat pump. He was eligible for \$2,000 in rebates. The CAS test found that the domestic water heater was not venting properly and, although the water heater was out of scope, he had to fix it to receive the rebates. He is still undecided: "The full [heat pump water heater] solves the venting issue, but that requires an additional \$6,000 expense to get a \$2,000 rebate."

10.2 Lenders

The lender interviews revealed five overarching findings.

There is strong demand for EE financing. While there are comparable loan products, REEL offers many advantages, particularly for underserved Californians.

- **Lenders are offering other EE home improvement products but, in most cases, REEL is preferred.** Efficiency is a popular topic with lenders' members. All lenders offer an EE or home improvement loan, but they are secured by the home. Lenders have experienced difficulties with secured loans and the priority lien in court: "People were confused and didn't understand it even though the UCC-1⁷¹ financing statement was fully disclosed." Borrowers like that REEL is unsecured.
- **Lenders would not be able to offer the same interest rates, terms, and loan amounts without the LLR.** Without the LLR, all lenders stated that they would have to adjust their offer. Unsecured personal loans are quicker, but no one (even high-FICO borrowers) would have access to the same rates offered by REEL. People also like the fact that REEL is unsecured.
- **Lenders did not look favorably at PACE and this presents an opportunity for REEL.** All lenders reported negative experiences with PACE. Lenders were often not aware of the PACE lien until borrowers refinanced their mortgages and details were unclear to consumers. "PACE is not good for the borrower or the institution." But most lenders did not think REEL was an alternative to PACE unless it included solar and EV charging.
- **Lenders agreed that REEL was supporting those who would otherwise not have access.** Although majority of REEL borrowers are in moderate-to-high FICO tiers, lenders pointed out that those with good credit may not have a lot of income and REEL is a better option. Moreover, the LLR has

"CAEATFA should be promoting the fact that REEL is not PACE."

— Lender

⁷¹ A UCC-1 (Unified Commercial Code-1) financing statement is a legal form that a lender files to give notice that it has or may have an interest in the personal property of a borrower. This form is filed to "perfect" a creditor's security interest with the right to take possession of and sell assets (for example, car or home) for repayment of debt. Once the form has been filed, the lender establishes a relative priority with other creditors of the borrower.

increased lenders' comfort to offer better rates and be more lenient on DTI ratios. One lender reported that one contractor it works with regularly prefers REEL because its current financing arm is turning its customers down.

REEL has positively affected participating lenders by helping them grow their membership and sell more products, but lenders would like to see volume increase.

- **REEL is a business opportunity.** Several lenders reported that the majority of REEL loans are with new members and that REEL allows them to build relationships and sell more products. While other loan options are presented to members, REEL is often more favorable with lower rates, longer terms, and reduced monthly payments. One lender is considering a business development position to build relationships with reputable contractors, while another is automating processes to improve contractor experience and build membership.

“One borrower had such a good experience with REEL, they wanted to do more business with us.”
— Lender
- **REEL helps credit unions spread risk.** Auto loans make up a large percentage of credit unions' loan portfolio and REEL offers an opportunity to diversify and spread risk.
- **While some lenders were not happy with the level of activity, others were not concerned.** Several lenders were disappointed in the volume, but one lender in rural California was thrilled with the number of loans in its area. REEL makes up small portion of all lenders' total loan portfolio, but REEL is considered important in helping the community and serving those who would otherwise not have access.

REEL's multilender model is creating healthy competition, but there are lost opportunities, notably, excluding POUs, solar, and limited traction with other credit unions.

- **Most participating lenders welcome more lenders into the fold.** Multiple lenders are viewed as increasing REEL's ability to provide more options; promote better service, rates, and terms; and broaden the target market.

“Of course, everyone wants to be the one, but I'm not sure that would help the program. If you have one lender, you are stuck with their terms.”
— Lender
- **Lenders are comfortable with loosening guidelines and expanding loan amounts based on loan performance and competing with other lenders offering better rates.** Several lenders reported gaining comfort with REEL over time. One lender's recent assessment of the risk profile of all its existing borrowers revealed their REEL loans are performing well.
- **Excluding POUs may be hindering REEL's ability to scale.** To participate in REEL, homeowners must be receiving electric and/or gas from the IOUs. One lender reported that its field of membership is in a dozen counties, but borrowers in regions served by POUs may not be eligible to participate, or may be eligible for only some measures (electric or gas).

“We started with minimum FICOs of 640 and decreased it to 580 to align with other lenders. We were losing two deals per month because of the FICO difference with other lenders.”
— Lender

- **Increasing the eligible measures list is viewed as an opportunity to increase interest and participation.** All lenders felt solar should be included. One lender with a similar loan product (but secured) reported that 90% of potential REEL participants choose their secured loan over REEL because it includes solar. Another lender reported that one out of five applicants want solar. As of June 2019, the average cost of solar panels per watt in California is \$4.06. A typical 6000 watt (6 kW) solar system is \$24,390 before the federal solar credit and \$17,073 after claiming the federal solar tax credit.⁷² While 30% of the REEL loans can be used for non-eligible measures, with an average REEL loan being almost \$18,000, solar would push borrowers over the 30% non-EEEM threshold.
- **Leverage participating credit unions to gain traction with other FIs.** Several lenders suggest promoting REEL through trade associations like the California Credit Union League. The Credit Union League hosts a statewide conference once a year that brings together 40–50 executives. This is an opportune time to promote REEL and have participating lenders share their experiences.
- **Credit unions are hindered by their field of membership and operating hours.** Rates are competitive in some rural and underserved areas, but they are limited by their field of membership. One lender reported that “80%–90% of inquiries are turned away because they are outside our field of membership.” While two participating lenders operate statewide, their branch locations are concentrated in one area, limiting their ability to build direct relationships, and there is a sense that they may not understand specific community needs. Moreover, many contractors work on weekends when credit unions are closed. One lender is in the process of making changes to accommodate a large contractor that does a lot of Saturday appointments by automating its underwriting.

There are enough REEL-certified contractors across California, but more education, support, and quality assurance checks (for both contractors and DIYers) is needed.

- **Finding REEL-certified contractors is no longer an issue, but there is greater need to educate them about REEL.** Lenders reported that getting contractors took a while and the ones that eventually came onboard were not always interested, not comfortable with the process, or not knowledgeable on how REEL works. While streamlining of processes has helped, lenders are still hand-holding new contractors. “This is not our role, but we do it because they want the business.”
- **Larger contractors are driving applications.** One lender recently stumbled on a new contractor that is driving most of its volume; its loan volume increased 150% in 2019 as a result. This contractor is bigger, employs sales staff, and has administrative support to manage paperwork. REEL is much more onerous for smaller contractors.
- **There is a need to conduct more quality assurance, particularly for non-EEEM DIYers.** Lenders agreed that REEL-certified contractors provided a level of quality assurance, but there is a downside: There is a perception that REEL contractors automatically increase rates. This may very well be because REEL contractors have higher levels of training and certification; those who do not operate a legitimate business can charge lower rates, but quality is reduced. One lender flagged the potential for self-certification to be manipulated, that is, people self-certify that 30% of non-EEEMs are DIY work, but may use funds for something else. However, CAEATFA’s contractor manager conducts site inspections on approximately 20% of participants.

⁷² <https://www.solarreviews.com/solar-panels/solar-panel-cost/cost-of-solar-panels-in-california>.

Lenders are very satisfied with REEL and the support that they receive from CAEATFA, but there are areas to improve, notably in marketing, supporting contractors and borrowers, and relaxing guidelines.

- **CAEATFA has built strong partnerships with lenders.** Lenders reported high satisfaction with REEL and CAEATFA. “Great to work with.” REEL is very hands-on, accessible, and communicates well. All lenders hoped REEL would continue.
- **REEL is labor intensive.** Lenders reported that the time to enroll and book REEL loans is much greater than their other loan products. One lender stated, “Each loan is unique, but some can take a couple of hours or more — one took weeks.” Additional time is also spent with borrowers and contractors. One lender reported that several emails are required for every single loan. An online interface between lenders and contractors would help. Others recognized that this is the cost of participating in a pilot; the time to get up and running is all for the greater good.
- **There are opportunities to improve marketing.** Lenders reported that utility bill inserts tend to drive most applications.⁷³ One lender mentioned that they get 10–15 applications within a week of utility bill inserts. Others suggested co-promoting REEL may help increase applications. Some reported a notable increase in applications with co-marketing.
- **Relax guidelines and let lenders do what they do best: lend.** Lenders expressed frustration with the state getting caught up in details, inspecting each loan, and manual reporting. Lenders suggested more automation and reducing monthly reporting to quarterly.

“We’re happy. The program took us a while to get rolling but has potential to move now. We’re all in favor of the program continuing.”

— Lender

“It is a hassle to go through government. A permanent program should consider how to reduce manpower.”

— Lender

⁷³ Note that utility bill inserts occurred after the pilot evaluation period.

11. Secondary Research Findings

The pilot implementation model was compared to other similar programs to extract insights on best practices and suggest program improvements in three topic areas:

1. LLR management and underwriting practices
2. Management of lenders
3. Marketing and integration with resource programs

Five programs were selected as the focus for the secondary research based on the following criteria. They:

- Offer financing to **residential customers**
- Aim to support **EE upgrades**
- Have lender **statewide coverage**⁷⁴
- Incorporate **credit enhancement features**, such as LLRs⁷⁵
- Showcase different **lending model options** (both single- and multiple lenders)

The evaluation team's research approach involved a review of relevant program documentation and studies, complementary online research, and interviews with two PAs (Michigan Saves and CT Green Bank).

The programs analyzed are briefly described below.

<p>NYSERDA, SMART ENERGY LOANS and OBR</p>	<p>NYSERDA has established a revolving loan fund to support EE financing for owners of one- to four-unit residential buildings. Acting as single lender, using its own funds, NYSERDA offers two types of loans: an unsecured consumer loan (Smart Energy Loan) and OBR loans. The loans are managed by two external contractors. Energy Finance Solutions (EFS) originates and approves loans based on NYSERDA's underwriting criteria; closes and disburses funds to contractors; and submits loans to NYSERDA's loan servicer, Concord Servicing Corporation. Concord is responsible for billing and loan collection and monitoring the origination process for quality assurance. NYSERDA reimburses EFS for the loan disbursement from the revolving loan fund. The fund is replenished through loan repayments and bond proceeds.⁷⁶ Interest rates range from 3.49% to 7.99% based on income level and payment mechanism.⁷⁷</p>
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⁷⁴ Not all programs are statewide from an IOU perspective. Enhabit does not appear to cover all IOU territories (PGE, NW Natural, Pacific Power are included, but not Idaho Power). Similarly, NYSERDA states in its 2019 Green Jobs – Green New York report that its OBR loan is available only to certain electric and gas utilities (Central Hudson, Con Edison, Long Island Power Authority, National Grid - Upstate, New York State Electric and Gas Corporation, Rochester Gas and Electric Corporation, or Orange and Rockland Utilities). Based on the evidence available, other programs do not appear restricted by IOU territory.

⁷⁵ All programs except NY's NYSERDA contain an LLR feature. Although NYSERDA's program does not yet offer an LLR (this feature is under consideration), it does offer other credit enhancement mechanisms.

⁷⁶ Dunskey Energy Consulting, Opinion Dynamics. 2016. *California Public Utilities Commission, Energy Division: Finance Partner Outreach Strategy Study Report*. Retrieved from:

<https://pda.energydataweb.com/api/view/1761/CPUC%20-%20Partner%20Study%20-%20Report%20-%20FINAL.pdf>.

⁷⁷ NYSERDA. 2018. *Green Jobs – Green New York: 2018 Annual Report*. Retrieved from: <https://www.nyserdera.ny.gov/About/Publications/GJGNY-Advisory-Council-Reports>, pg. 29.

MICHIGAN SAVES, HOME ENERGY LOAN	The MI Saves Home Energy Loan Program offers available financing of up to \$40,000 over 12–15 years for EE projects. ⁷⁸ Loans are provided through lender partners based on standard underwriting criteria with interest rates of 4.25%–7.00% APR, which vary by lender and loan term. ⁷⁹ MI Saves sets aside 5% of total outstanding loan value for the program’s LLR. After 90 days of nonpayment, MI Saves covers 75%–80% of the loan; the exact amount is dependent on FICO scores.
ENHABIT (OR)	Enhabit helps homeowners conduct home improvements through an initial home assessment, matching with certified local contractors, no-money-down secure financing products through local lenders, and third-party oversight. Loans are provided through partner lenders based on the lender’s standard underwriting criteria. Enhabit serves as an intermediary, standardizing and aggregating financial products and services. Cash incentives through the Energy Trust of Oregon to Enhabit subsidize the cost of financing, ⁸⁰ and select utility customers have an OBR option. ⁸¹
CONNECTICUT GREEN BANK, SMART-E LOANS	Smart-E Loans offer no-money-down, low-interest financing with terms of 5–20 years to help homeowners upgrade their home’s energy performance. Applicants are preapproved by a participating lender and must complete work using certified Smart-E contractors. CT Green Bank approves the financing based on guidelines, such as DTI ratio, credit score, eligible measures, and minimum/maximum loan amounts. Lenders have the final say on underwriting, providing them with the ability to approve or decline loans even if they meet minimum CT Green Bank criteria. Smart-E loans are supported by credit enhancements (LLR and interest rate buydowns), ^{82, 83} and interest rates range between 4.49% and 6.99%.
COLORADO ENERGY OFFICE, RENU	The RENU Loan is a statewide program offering financing for home EE and RE projects, backstopped by an LLR. The program currently works with a single lending partner (Elevations Credit Union) and is looking to recruit more. Loans ranging from \$500 to \$50,000 are available for FICO scores as low as 580 for terms up to 15 years. Interest rates as low as 2.75% are available, depending on the applicant FICO score and the term length (2.75% APR available for FICO >740 and three-year term). ⁸⁴

The REEL implementation model was compared with these financing programs. Table 61 summarizes these programs, followed by a detailed assessment of their LLR management and underwriting practices, management of lenders, and marketing and integration with resource programs.

⁷⁸ <https://michigansaves.org/residential-financing/>.

⁷⁹ Dunskey Energy Consulting, Opinion Dynamics. 2016.

⁸⁰ Ibid.

⁸¹ As of July 2018, the day-to-day delivery of Enhabit’s residential program has been transitioned to Community Energy Project, another nonprofit. See <https://enhabit.org/news/enhabit-joins-forces-with-community-energy-project-to-advance-home-energy-score-and-residential-improvement-services/>.

⁸² Dunskey Energy Consulting, Opinion Dynamics. 2016.

⁸³ <https://aceee.org/sites/default/files/pdf/conferences/eeff/2018/3A-Elliott-Hill-0%27Neill.pdf>.

⁸⁴ Colorado Energy Office. 2018. *Annual Report 2017–18*. Retrieved from: <https://www.colorado.gov/pacific/energyoffice/reports>.

Table 61. Comparison of Residential Financing Programs Studied

Program and PA (state)	Start Date	Number (and type) of Lenders	Loan Volume (total to date)	Average Loan Size (\$)	Loan Volume as % of Single-Family Homes in the State ^a	Amount Set Aside for LLR
Smart-E Loans, CT Green Bank (CT)	2011	12 local lenders ^b (Credit Unions, Community Banks, CDFI)	As of May 2018, 2,700 loans closed (\$48M)	17,778	0.28%	7.5% for Class A loan (680+ FICO); 15% for Class B (<680 FICO)
Enhabit (OR)	2009	4 local participating lenders (Local Banks)	As of June 2015, 1 lender issued more than 3,000 loans (exceeding \$40M)	13,333	0.25%	N/P
Smart Energy Loans and OBR, NYSEDA (NY)	2010 and 2012	1 lender (NYSEDA) + 1 loan originator + 1 loan master servicer	As of June 30, 2018, 14,000 Smart Energy Loans and 9,000 OBR loans issued (over \$263M combined)	11,435	0.59%	N/A
Home Energy Loan Program, Michigan Saves ^c (MI)	2009	5 local lenders (Credit Unions)	As of July 2016, 6,200 loans have been issued (over \$57M)	9,194	0.18%	5%
RENU, Colorado Energy Office (CO)	2018	1 local lender (Credit Union)	As of 2018, 38 loans closed (\$0.5M) ^d	13,158	0.002%	N/P
REEL, CPUC (CA)	2017	7 lenders (Credit Unions) 1 master servicer	As of Dec. 2018, 339 loans closed (\$5M)	17,165	0.004%	11% (regular), 20% (LMI borrowers)

N/A = Not applicable, N/P = Information not publicly available.

^a Data for number of occupied single-family homes (one-unit attached and detached homes) per state sourced from American FactFinder (https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml).

^b As of May 2018. See <https://aceee.org/sites/default/files/pdf/conferences/eeff/2018/3A-Elliott-Hill-0%27Neill.pdf>.

^c As of July 2016. Based on Dunsky Energy Consulting. 2018. *Green Ontario Fund, Report 2: Single Family Residential Financing*, pg. 29.

^d Colorado Energy Office. 2018. *Annual Report 2017–18*. Retrieved from: <https://www.colorado.gov/pacific/energyoffice/reports>, pg. 7.

Table 62 provides a summary of the insights that emerged from the comparative analysis, which were presented in the summary section. These insights are elaborated on in the subsections below.

Table 62. Summary of Insights for Pilot Design and Implementation

Comparative Analysis Insights
■ REEL incurs significantly higher costs for LLR and lender management than other programs, likely because of complex setup and reporting requirements.
■ REEL can seize opportunities to iterate and adapt LLR and underwriting practices to improve program accessibility.
■ Most programs find success with multiple local community lenders.
■ Invest in training contractors – driving force behind marketing and quality of the program.
■ Consider expanding to RE and beneficial electrification.

11.1 LLR Management and Underwriting Practices

Four of the five programs analyzed include an LLR as part of their credit enhancement measures. This section presents findings on how other programs keep LLR management costs down by administering the LLR internally; aggregating funds by lender, rather than tracking each borrower individually; and iterating and leveraging LLR and underwriting practices.

Minimize program costs by managing LLR internally at a higher level of aggregation and seeking leveraging opportunities.

- **Administer the LLR internally.** Two PAs, MI Saves and CT Green Bank, incur minimal costs to administer their LLR.⁸⁵ Both hold LLR funds directly on their books and disburse funds to lenders only if a default occurs. Both programs aggregate LLR funds by lender and periodically review and match the amount allocated to each lender with its issued loan volumes (monthly for MI Saves, quarterly for CT Green Bank). This reconciliation takes minimal effort (1–2 hours per month for MI Saves and half a day per quarter for CT Green Bank, where a centralized platform collects lender reports). Furthermore, holding the LLR funds on their books allows them to invest and earn returns. In comparison, REEL is incurring significant costs to administer the LLR. LLR funds are held by a bank trustee, which not only prevents the funds from being reinvested for a profit, but also charges REEL for this service.
- **Aggregate reporting level to reduce costs** A major barrier for REEL is its inability to administer LLR funds independently. As REEL uses utility ratepayer funds in its LLR, funds must be matched to each borrower through the master servicer and reconciled monthly with the borrower’s utility. This is a much more tedious and onerous process than MI Save and CT Green Bank, where LLR funds are aggregated by lender and do not require utility reconciliation. Both those programs can independently administer their LLR thanks to their funding sources (MI Saves received funds from ARRA and the state; CT Green Bank initially received funds from ARRA and is now using CT Green Bank funds).^{86, 87} REEL is not the only program to face challenges. The Colorado RENU Loan program

⁸⁵ Note that CT Green Bank acts as a second, not first, LLR.

⁸⁶ Dunsy Energy Consulting. 2019. Phone interview with Kerry O’Neill (CT Green Bank).

⁸⁷ Dunsy Energy Consulting. 2019. Phone interview with Mary Templeton (MI Saves).

has also run into issues while using the State Housing Finance Authority to administer its LLR on its behalf (including difficulties adding a new lender to the program and managing information).

- **Ensure that the program is privately leveraged.** Several programs monitor leverage as a success metric (that is, ratio of private funds attracted to the program to the initial state or ratepayer investment). In MI Saves, one of the pilot program objectives was to achieve a 5:1 ratio of leveraging of grant funds.⁸⁸ This objective was met by the end of its pilot in 2013; it has now increased to 20:1 in 2019.⁸⁹ The leveraged funds include private capital backed by the LLR and funds from homeowners and business owners,⁹⁰ as well as supplementary sources, such as commercial, utility, or low-income housing sources. In comparison, REEL, in the first two and a half years, had a 7:1 leverage ratio, attracting \$5.8M in private capital, compared to the \$0.8M of ratepayer funds invested in the LLR in its first two years.

Iterate and adapt LLR and underwriting practices to improve accessibility.

- **“Spend” good LLR performance on improving programs.** Several programs, such as the MI Saves and CT Green Bank programs, experienced better-than-expected LLR performance, and were able to “re-invest” this performance to improve programs. In CT, for example, by 2016, the program had experienced only a single loan default and under 1% delinquencies.⁹¹ In contrast, the applicant decline rate was high (28%) and so was the average FICO score (753). CT Green Bank leveraged the LLR’s strong performance to expand underwriting and reduce the decline rate (by introducing a “Credit-Challenged Smart-E” to customers with lower minimum FICO scores) and to offer longer terms (up from 12 to 15–20 years).⁹² Furthermore, CT Green Bank also seized this opportunity to review its LLR agreement with lenders to free up liquidity. The bank negotiated to keep its financial obligations to lenders in case of defaults, but no longer set aside the money in an idle account. The program is now free to reinvest designated LLR funds, giving extra flexibility. In the MI program, which also experienced better-than-expected LLR performance thanks to low default rates, lenders were incented to reduce interest rates, which in turn resulted in increased loan volumes.⁹³ In comparison, REEL sets aside 11%–20% of loans and does not currently promote reports on LLR performance that is easily accessible to lenders and others.
- **Create tiered underwriting to improve program-access.** Several programs, such as the NYSERDA program, have introduced tiered underwriting to expand program access to borrowers who would not qualify for loans with traditional criteria. This program introduced Tier 2 loans, which consider mortgage payment history as a trade-off for lower FICO scores and have flexible options for maximum DTI ratio. As of June 2017, Tier 2 loans constituted 20%–25% of monthly loan volumes in NYSERDA.⁹⁴

⁸⁸ Better Buildings for Michigan. 2013. *Final Report*. Retrieved from: <https://2wajqs10j6572p9ni53oi7r4-wpengine.netdna-ssl.com/wp-content/uploads/2016/06/BetterBuildings-for-Michigan-Final-Report.pdf>, p. iii.

⁸⁹ Dunsy Energy Consulting. 2019. Phone interview with Mary Templeton (MI Saves).

⁹⁰ The pilot program, Better Buildings for Michigan, included both residential and commercial components.

⁹¹ CT Green Bank defines “delinquency” according to its lender’s definition, that is, CT Green Bank considers a borrower delinquent if it is reported as such by the concerned lender.

⁹² <https://aceee.org/sites/default/files/pdf/conferences/eeff/2018/3A-Elliott-Hill-0%27Neill.pdf>.

⁹³ Dunsy Energy Consulting. 2018. Pg. 56.

⁹⁴ NYSERDA. 2017. *Green Jobs – Green New York: 2017 Annual Report*. Retrieved from: <https://www.nyserda.ny.gov/About/Publications/GJGNY-Advisory-Council-Reports>, pg. 42.

- **Use differentiated rates to target customers most in need and recover costs.** In 2016, NYSERDA, as a direct lender, adjusted its program interest rates to provide “different rates based on household income and credit considerations.”⁹⁵ The change seeks to offset administration costs linked to serving households with higher income and high credit ratings and who have other financing options in the market by charging them higher interest rates, while continuing to offer subsidized lending to low-credit applicants. This has redirected many higher-income households away from NYSERDA loans and toward other options, such as home equity loans offered by banks, or third-party options offered by contractors. While a viable option, care should be taken that this does not create a barrier to higher-income households undertaking energy improvements, especially as they typically live in bigger houses that consume more energy.

11.2 Managing Lenders: Multiple or Single-Model Approach

Most programs whose operations were deemed successful use a multiple-lender model, working with several local mission-driven private lending partners. Only NYSERDA, which uses its own funds for lending, has adopted a single-lender model; it uses a master servicer to externalize loan management activities. In comparison, REEL uses a hybrid model, working both with multiple private lenders *and* with a master servicer who acts as an intermediary between private lending partners, borrowers, and IOUs. REEL’s complex financing setup (where loans must be tracked individually to enable matching to the appropriate utility funds based on borrower territory) creates administrative hurdles. As a result, **REEL is experiencing significantly higher program administration costs than its counterparts.** Indeed, most programs with multiple lenders incur minimal loan LLR-related costs; compared to NYSERDA’s single-lender model, REEL’s costs are close to 2.5x higher.

This section provides an overview of the benefits and challenges of both, to help REEL navigate how elements of its own management of lenders could be improved. Additionally, suggestions on best practices for lender-communication are presented.

Most residential programs find success with local community lenders, although these bear challenges.

- **Leverage the value-alignment, customer familiarity, and approachability of mission-driven lenders.** The 2016 Partner Study identified that most residential programs find success with local community lenders. This finding still stands true, as three out of the five programs analyzed use multiple lenders. Of those, MI Saves and CT Green Bank work almost entirely with local credit unions and community banks, and found them to be best-fit lending partners.⁹⁶ These private lenders are generally mission-driven and have strong links with the community, making them more likely to share and support the values that drive the financing program. Other lenders could be brought in over time for specific purposes, such as CT Green Bank, which introduced a CDFI to address high decline rates.⁹⁷ In terms of approachability, MI Saves and CT Green Bank also found local lenders easier to approach, as they “valued smaller loan volumes as sizable.”⁹⁸ Both had tried to approach larger FIs, but generally found that larger lenders were not interested in joining a program or offering a product

⁹⁵ Ibid., pg. 40.

⁹⁶ Dunsy Energy Consulting. 2018. Pg. 56.

⁹⁷ Ibid.

⁹⁸ Dunsy Energy Consulting, Opinion Dynamics. 2016. Pg. 10.

that had not demonstrated significant market demand. Similarly, REEL faced difficulties attracting large FIs due to its modest size of loans and pilot status.

- **Ensure coverage and consider customer convenience.** Both the MI Saves and CT Green Bank programs work with lenders who can cumulatively ensure statewide coverage. In the MI program, for example, one lender offers statewide coverage, while others focus on certain counties only.⁹⁹ Similarly, in the REEL pilot, lender coverage overlaps. Most loans are issued by two statewide credit unions with branch locations limited to Southern California; the other lenders enrolled in the pilot are very rural with a limited field of membership. Although statewide coverage could be achieved with the two leading lenders alone, smaller regional lenders add value by having direct knowledge of their communities and their challenges. Rural lenders can also offer face-to-face service that is not always available from a large statewide lender (not everyone wants to deal with a bank online).
- **Private lending partners undertake loan servicing activities, lowering costs.** The advantage of working with private lending partners is the simplification and cost reduction of loan servicing. Interviews with CT Green Bank and MI Saves PAs revealed that the loan servicing activities of both programs (underwriting, loan collection, billing) are entirely borne by the lending partners, as part of their regular activities. One administrator commented: “It is part of [lenders’] business: providing capital, charging interests. They then give us the data on all the loans.” PAs still have a role in shaping and monitoring the program through key steps — providing guidelines for lender underwriting criteria, capping interest rates, coordinating the project approval process between contractors and lenders — but are freed from day-to-day handling of loan servicing, paying a master servicer to manage the flow of funds between lenders, IOUs, and the bank trustee, and having a separate entity managing the LLR (bank trustee). While REEL’s partner lenders undertake loan servicing, REEL uses a master servicer to develop and manage the centralized platform to collect financing enrollments and utility bill data and a bank trustee to hold utility funds and the LLR accounts.

Mitigate challenges of working with multiple lenders by being prepared for multiple rates, coverage, and increased management complexity.

- **Multiple rates:** Allowing multiple lenders to operate under the program might lead to different interest rates being offered, which could create some confusion in the market. In California, for example, REEL lenders with the most aggressive rates reported that customers typically see them listed on the statewide website and apply but are declined because they reside outside their service area. However, this issue has since been addressed through a front-end evaluation on gogreenfinancing.com, which helps participants identify lenders in their county. Furthermore, multiple rates could also be considered an advantage. Indeed, allowing multiple lenders with statewide or overlapping coverage to operate gives customers a choice, creating market competition and possibly reducing rates for customers.
- **Coverage:** Programs using multiple lenders (as in MI, CT, and OR) often partner with *local* lenders. This could pose a challenge for ensuring statewide coverage. MI addressed this by working with the Michigan Credit Union League, to easily enlist the initial nine credit unions in the program. For REEL, this raises the possibility of simplifying its model, and removing the need for a master servicer, by

⁹⁹ Based on lenders enrolled in August 2019.

dealing with a single lender operating per IOU territory (similar to the RFPs). Different from the MI Saves and CT Green Bank route, this option would raise its own set of challenges.

- **Managing complexity:** Managing multiple lenders may increase complexity. Some programs, such as Enhabit, have chosen to “minimize the number of lenders (if all desired financing products are offered),” and instead focus on maintaining “a closer and more flexible relationship with partners.”¹⁰⁰ Other programs, such as MI Saves, have set restrictions, such as requiring lenders to have a minimum loan volume (100 loans per month) to participate in the program.¹⁰¹

NYSERDA’s single-lender model incurs significantly lower costs per loan than REEL’s.

- **A single-lender model can simplify management and lower costs.** Unlike the other programs analyzed, NYSERDA uses a single-lender model. The program uses its own funds for financing; however, it outsources financing activities (loan origination and servicing and OBR) to two external providers, EFS and Concord. EFS originates all loans based on NYSERDA’s underwriting criteria, disburses funds to the contractor (from a cash advance pool provided by NYSERDA), and submits the loan to its master servicer (Concord). Concord is then responsible for loan payment collection (either directly from the borrower or via remittances from utilities), borrower billing, and monitoring of the origination process.¹⁰² For NYSERDA’s OBR program, the participating utilities (seven in 2019) remit repayments to Concord, which coordinates data communications with each utility. In comparison, REEL uses the master servicer (also Concord) to enroll loans into the program to manage and match the flow of ratepayer funds and data between the IOUs, lenders and bank trustee, and OBR (although it is important to note that OBR has yet to be established for REEL). All loans are enrolled with Concord by the private lenders. Private lenders also verify project eligibility and originate and service the loans. However, Table 63 shows that REEL incurs a cost per loan close 2.5x higher than NYSERDA.

Table 63. Loan Servicing Cost Comparison: NYSERDA vs REEL

	NYSERDA (Program Start–2018)	REEL (July 2016–July 2018)
Cost per loan	\$520	\$1,328
Cost per loan dollar	\$0.04	\$0.08

^a NYSERDA costs include origination and servicing fees, while REEL costs include master servicer and bank trustee costs.

Maintain good communications with lenders; tackle pain points together.

- **Although most lenders are independent, programs maintain open communications.** The 2016 Partner Study found that most lenders are independent and need “relatively little support beyond the occasional training.” Although this insight still applies, a 2018 study finds successful programs, such as MI Saves, maintain good communication with lenders by setting up a dedicated liaison and through biannual meetings to allow for feedback and sharing of program updates and news regarding contractors and/or marketing.¹⁰³ Comparing this to REEL, all lenders interviewed said communications have been very good, and described CAEATFA as open and accessible. It will be

¹⁰⁰ Dunskey Energy Consulting, Opinion Dynamics. 2016. Pg. 20.

¹⁰¹ Dunskey Energy Consulting. 2018.

¹⁰² NYSERDA. 2017. Pg. 12.

¹⁰³ Dunskey Energy Consulting. 2018.

important for REEL to leverage this great onboarding experience and establish clear future communication paths with lenders.

- **Reporting no longer seen as a pain point.** Previous studies and evaluations of REEL showed that information systems and reporting emerged as pain points. The 2016 Partner Study found that reporting was a pain point for lenders in programs such as MI Saves, often due to reporting requirements not always integrating perfectly with lender systems. In the case of REEL, initial insufficient funding in IT infrastructure created challenges for data exchange. However, this concern did not emerge in the most recent set of interviews, as lenders felt reporting was not too heavy or a big issue. Instead, lenders point to the application verification and project approval as a pain point.

11.3 Marketing and Integration with Resource Programs

This last subsection presents best practices surrounding successful marketing, as well as recommendations to ensure that the credit enhancement program is well integrated with existing resource programs.

Expand eligible measures list to include RE and beneficial electrification, to increase program attractiveness.

- **All other programs analyzed include both EE and RE measures.** RE typically includes solar panel installation and/or battery storage systems. REEL currently does not include RE. Beyond this being a common practice in other programs, RE was also mentioned as a key program gap during lender interviews. Interviewees mentioned that expansion to renewables would position REEL as a “one-stop shop” to fill the market gap left by the decline of PACE in California, thereby increasing its attractiveness. Expanding eligible measures under REEL would likely require changing its scope from an “energy efficiency” to an “energy efficacy” scheme at the Commission level and/or perhaps at the state level.

Program promotion is driven by contractors and REEL would be more successful if all program actors acted in coordination toward a high close rate.

- **Contractors drive programs:** Contractors are identified as the main marketing mechanism behind the EE programs analyzed. According to CT Green Bank, the Smart-E program is viewed by contractors as a “tool to close the sale.” To leverage this value proposition further, CT Green Bank pays contractors a portion of the work (one-third) at loan close, and the rest at project completion.¹⁰⁴ All PAs invest efforts to recruit and train contractors, for example, through targeted outreach to trade organizations (CT Green Bank); regularly attending utility trade ally meetings or email blasts to its authorized contractors (MI Saves)¹⁰⁵; or providing regular training, including “Techie Brekkies” (Enhabit).¹⁰⁶ The MI Saves program goes as far as requesting authorized contractors to pay a fee (1.9% of the total amount financed) for contractors to receive operations and sales training, marketing materials, etc. This has not hindered contractor engagement (MI Saves has a network of more than 300 authorized contractors).¹⁰⁷ Similarly, REEL also recognized the importance of contractors. In 2017, the program

¹⁰⁴ Dunskey Energy Consulting. 2018. Pg. 56.

¹⁰⁵ Dunskey Energy Consulting, Opinion Dynamics. 2016.

¹⁰⁶ <https://enhabit.org/programs/clean-energy-works/>.

¹⁰⁷ Dunskey Energy Consulting. 2018. Pg. 59.

set up a contractor manager, responsible for recruiting, training, and managing the then 160 (now 340) enrolled REEL contractors.^{108, 109} However, all lenders interviewed said contractors still need further training.

- **Streamline the application process while maintaining adequate safeguards:** Not surprisingly, a more streamlined application process helps increase the loan volume and program success. Previous studies, confirmed by lenders during the most recent interviews, have found that the initial financing application and paperwork is a bottleneck. Several programs have attempted to minimize this. MI Saves has set up a centralized call center to take customer calls and provides conditional approval before transferring customer to lenders. NYSERDA revised the audit application approval process to facilitate automation. In 2017, approximately 83% of audit applications were approved upon submission; the remainder were reviewed in one business day.¹¹⁰ In general, PAs suggested “checklists, guides, and one-on-one support” as possible ways to address this issue.¹¹¹ Similarly, REEL encountered this issue and identified opportunities to streamline the application process, while respecting the safeguards necessary with the use of ratepayer funds. For example, the Customer Information Standardized Request (CISR) form was eliminated.¹¹²
- **Special promotions and marketing campaigns can have a big impact on the market:** Programs such as CT Green Bank’s have effectively used limited-time promotions to achieve lasting impact. For example, the Smart-E Loan program launched a seven-month, 0.99% interest rate buydown campaign, which had several benefits, including increasing the loan volume sixfold during the campaign and creating customer “pull” for contractors, which recruited 54 new contractors to the program. This short but impactful marketing strategy could be useful to draw customers to REEL and could help the program fill the gap left by the declining PACE market.
- **Conduct quality control:** Conducting sporadic project quality control is important to ensure program success, specifically with new contractors.¹¹³ In interviews, MI Saves insisted that investing in contractor training, and spot checking in the back end, has seen great results. The program no longer requires project preapproval (streamlining the application process) and instead relies on contractors to know which projects to undertake, taking remediation action if necessary. MI Saves performs post-installation site inspections on around 20% of upgrade projects,¹¹⁴ CO RENU inspects 10% of projects and requires all improvements be installed by an approved contractor,¹¹⁵ and NYSERDA performs quality assurance inspections on 10%–15% of contractor projects and follows up with contractors to “ensure remediation takes place” if projects failed to meet standards. In all programs, repeated contractor failure to meet program standards may lead to removal from their certified contractor list.¹¹⁶ Quality control is especially important to REEL, as one lender interviewed underlined that the self-certified DIY option (for the 30% non-EE measures) risks funds being misused. In terms of contractor quality assurance, REEL established a contractor manager

¹⁰⁸ Evergreen Economics. 2017. *California Statewide Finance Pilots Early EM&V: Draft Report*, pg. 20.

¹⁰⁹ <https://gogreenfinancing.com/residential>.

¹¹⁰ NYSERDA. 2017. Pg. 35.

¹¹¹ Dunskey Energy Consulting, Opinion Dynamics. 2016. Pg. 24.

¹¹² Evergreen Economics. 2017. Pg. 20.

¹¹³ Dunskey Energy Consulting, Opinion Dynamics. 2016. Pg. 34.

¹¹⁴ Better Buildings for Michigan. 2013. Pg. 28.

¹¹⁵ https://www.colorado.gov/pacific/sites/default/files/atoms/files/CO%20RENU%20Loan%20contractor%20training_v11.pdf.

¹¹⁶ NYSERDA. 2017. Pg. 33.

responsible for, among other things, contractor training and conducting quality assurance and quality control for contractors.¹¹⁷

Ensure program is integrated with resource programs.

- **Many eligible financing participants do not access rebates:** An interesting finding from early REEL data shows that fewer than a third of borrowers applied for a rebate, despite several participants likely being eligible to do so. One possible explanation emerging from the interviews is that contractors may be presenting financing and resource programs as “either-or” solutions in order to leverage the most appropriate program to close the sale and avoid having to complete paperwork for both. However, credit enhancement programs benefit from being integrated with resource programs. In the MI Saves pilot, available rebates were described and included in estimates to homeowners, and presented as program “perks,” along with low interest rates. Furthermore, the program benefited from utility marketing; several utilities provided information on their website and on letters and e-mails to customers.¹¹⁸ This is echoed in the Smart-E loan program, where PAs have monthly meetings with utilities to align and strategically collaborate,¹¹⁹ and in Enhabit, where the program markets itself as a “financing solution” integrated with “utility rebates and instant rebates.”¹²⁰ NYSERDA created guidelines to help contractors determine “how best to coordinate services between two programs” for households who qualified for two different financing programs.¹²¹

¹¹⁷ Evergreen Economics. 2017. Pg. 20.

¹¹⁸ Better Buildings for Michigan. 2013.Pg. 28.

¹¹⁹ Dunsy Energy Consulting. 2019. Phone interview with Kerry O’Neill (CT Green Bank).

¹²⁰ <https://enhabit.org/programs/clean-energy-works/>.

¹²¹ NYSERDA. 2017. Pg. 36.

Appendix A. Early Participant Characterization Memo

Below is a memo that the evaluation team submitted to the CPUC in April 2019, prior to the completion of several evaluation tasks, including the impact analysis, cost-effectiveness analyses, and several surveys and interviews. As such, it summarizes only what was ascertainable through CAEATFA tracking data at the time of the memo and should not be considered as the final conclusions of the evaluation team.

Memorandum

To: Kevin Feizi, California Public Utilities Commission

From: Opinion Dynamics Evaluation Team

Date: April 2019

Re: REEL Pilot Early Participant Characterization Memo

Introduction

As the first step in the Residential Energy Efficiency Loan Assistance Pilot evaluation, this memorandum characterizes the pilot participants based on the data that California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) collects from participants. The purpose of this first evaluation step is to characterize what is known about participants and pilot performance based on CAEATFA's tracking records.

Limitations and Future Research

Notably, this memo summarizes data for two time periods; inception through July 2018 and progress through December 2018. Per CPUC directive, the pilot was expected to be evaluated for the first time based on its first two years of implementation. However, given the timing of the evaluation, the pilot provided all of its data through December 2018. As such, the primary time period for analysis in this evaluation is through July 2018, however additional data on pilot performance after July 2018 is included if it helps to further assess the pilot performance and scalability potential moving forward.

The findings in this memo represent the first step in assessing the accomplishments of the REEL pilot and are intended to provide **early** characteristics of pilot participants based on CAEATFA's tracking data. A significant amount of additional data collection and analysis are required to fully evaluate the pilot. The evaluation team will deliver a full evaluation report to the CPUC in June 2019. Please refer to the full evaluation plan for comprehensive view of all of the research objectives and planned tasks for this evaluation.

Data Sources

The evaluation team received tracking data from CAEATFA covering pilot participation from July 19, 2016 (the first loan) to December 26, 2018. This included the following data files:

- REEL loan tracking data with approximately 75 data points related to the loan terms and rates, project measures and costs, and underserved determinants;
- Participant contact information for all REEL borrowers included in the REEL loan tracking data;
- A list of all EEEMs
- A lender product comparison file which provides a detailed breakdown by FICO credit score of the interest rates REEL Lenders offer customers in comparison with their “signature” (that is, regular) products
- Supplemental materials including an accounting of requested data points, answers to LLR questions posed by the evaluation team, and a list of significant program design and implementation modifications to REEL and their associated impact.

Energy Efficiency Financing Pilot Metrics

CPUC Resolution E-4900 established metrics for evaluating the success of REEL and the other EEFPs* (see Table 64).

Table 64. EE Financing Pilot Metrics

Goal	Metric	CPUC Comments
The financing tool is scalable	Number of loans made by the pilot, with breakdown by: <ul style="list-style-type: none"> ▪ 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 	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: <ul style="list-style-type: none"> ▪ Number of FIs (Lenders) participating in the pilot, and types of FIs participating ▪ Amount of private capital attracted 	Data should be presented to indicate whether these financing tools can become partially or entirely self-supporting, that is can they 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: <ul style="list-style-type: none"> ▪ 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 CalEnviro data, AMI, or other poverty statistics ▪ Whether participants would have qualified for existing private EE 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 – and analysis done by Evaluation, Measurement & Verification contractors can also be consulted. Lower-income participants may prefer longer loan pay back periods, so the length of time allowed for repayment may offer a proxy for ability to reach low-income communities
The financing tool produces energy savings	Energy savings that resulted, as measured: <ul style="list-style-type: none"> ▪ Through customer meter data provided by the utilities via Energy Division data request (customer privacy must be maintained) ▪ Through 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

* D. 17-03-026.

Key Findings

Loan Characteristics

The REEL pilot distributed 339 loans over two and a half years (July 2016–December 2018) and generated a total of \$5,784,229 in financing through seven participating Lenders. Notably, the bulk of REEL financing (92% of the loans to date) has been through the two statewide credit unions, California Coast Credit Union and Matadors Community Credit Union. As shown in Table 65, the average loan size was \$17K, the average loan term is about 10 years and on average, customers are paying about \$200 per month to repay the loan and pay an average of 7% in interest.

Table 65. REEL Loan Product Summary Inception through December 2018 (N=339)

Characteristic	Average	Median	Range
Loan Amount	\$17,063	\$14,350	\$2,500 – \$50,000
Interest Rate	7.04%	6.88%	4.50% – 8.95%
Loan Term	117 months	120 months	24 – 180 months
Monthly Payment	\$216	\$189	\$50 – \$801

Source: CAEATFA tracking data.

Table 66. REEL Loan Product Summary Inception through July 2018 (N=212)

Characteristic	Average	Median	Range
Loan Amount	\$17,246	\$14,174	\$3,366 – \$50,000
Interest Rate	6.95%	6.88%	4.50% – 8.95%
Loan Term	117 months	120 months	24 – 180 months
Monthly Payment	\$219	\$181	\$50 – \$801

Source: CAEATFA tracking data.

The REEL program requires participants to hire contractors through a network of REEL-certified contractors. In the two-and-a-half-year period, REEL certified 282 contractors but less than half (42% or 119) of them completed projects with REEL financing. Of those that completed REEL-financed projects, most (79 of 119, or 66%) completed one to two projects. The most projects completed by any one contractor company (based on Contractor State License Board number) was 28.

Summary of Achievements

Table 67 below summarizes what the REEL pilot has accomplished according to CAEATFA's tracking data, organized by Resolution E-4900 metrics. Notably, many of the data points in the table below will require further investigation by the evaluation team to confirm the pilot's achievements.

Table 67. REEL Participant Characteristics Related to Resolution E-4900 Metrics

Goal	Summary of CAEATFA Data for Evaluation Period (Inception through July 2018)	Summary of CAEATFA Data for All Data Received (Inception through Dec 2018)
The financing tool is scalable	<ul style="list-style-type: none"> 212 loans issued; generally positive growth in loan volume month-to-month, despite some seasonal fluctuations \$3.7M in financing generated Concentration of participation in Southern California, and gradual expansion into Northern California and the Central Valley 	<ul style="list-style-type: none"> 339 loans issued; generally positive growth in loan volume month-to-month, despite some seasonal fluctuations \$5.8M in financing generated Concentration of participation in Southern California, and gradual expansion into Northern California and the Central Valley
The financing tool is leveraged by private capital and support	<ul style="list-style-type: none"> Four Lenders, all of which are credit unions Participation was concentrated within one lender; California Coast Credit Union represents 71% of private capital \$3.7M in private capital attracted 	<ul style="list-style-type: none"> Seven Lenders, all of which are credit unions Participation was concentrated within one lender; California Coast Credit Union represents 65% of private capital \$5.8M in private capital attracted
The financing tool reaches underserved Californians who would not otherwise have participated in EE upgrades	<ul style="list-style-type: none"> 76% of participants have “good” or “excellent” credit (FICO above 700); 8% had “very poor” or “fair” credit (FICO below 641); the remaining 16% had moderate credit scores Average loan term was 117 months; 142 loans (67%) had longer terms than the Lenders’ comparable signature products 30% of loans received the “underserved” credit enhancement based on census tract (29) or household income (35) (none on FICO score); however, it is necessary to conduct further research to confirm the number of “underserved” borrowers 13% of loans were issued to borrowers in the most vulnerable communities as defined by CalEnviro Score (above the 75th percentile) 	<ul style="list-style-type: none"> 75% of participants have “good” or “excellent” credit (FICO above 700); 6% had “very poor” or “fair” credit (FICO below 641); the remaining 19% had moderate credit scores Average loan term was 117 months; 236 loans (70%) had longer terms than the Lenders’ comparable signature products 38% of loans received the “underserved” credit enhancement based on census tract (92), household income (37), or FICO score (1); however, it is necessary to conduct further research to confirm the number of “underserved” borrowers 14% of loans were issued to borrowers in the most vulnerable communities as defined by CalEnviro Score (above the 75th percentile)
The financing tool produces energy savings	<ul style="list-style-type: none"> Participants, on average, saved 12.8% of their gross annual electric usage and 2.6% of their gross annual gas usage, which amounts to 741 kWh and 11 therms in annual savings per participant. On average, participants completed two measures. HVAC (151 measures) and building shell (123 measures) were the most common types of measures. 	<ul style="list-style-type: none"> On average, participants completed two measures. HVAC (241 measures) and building shell (199 measures) were the most common types of measures.

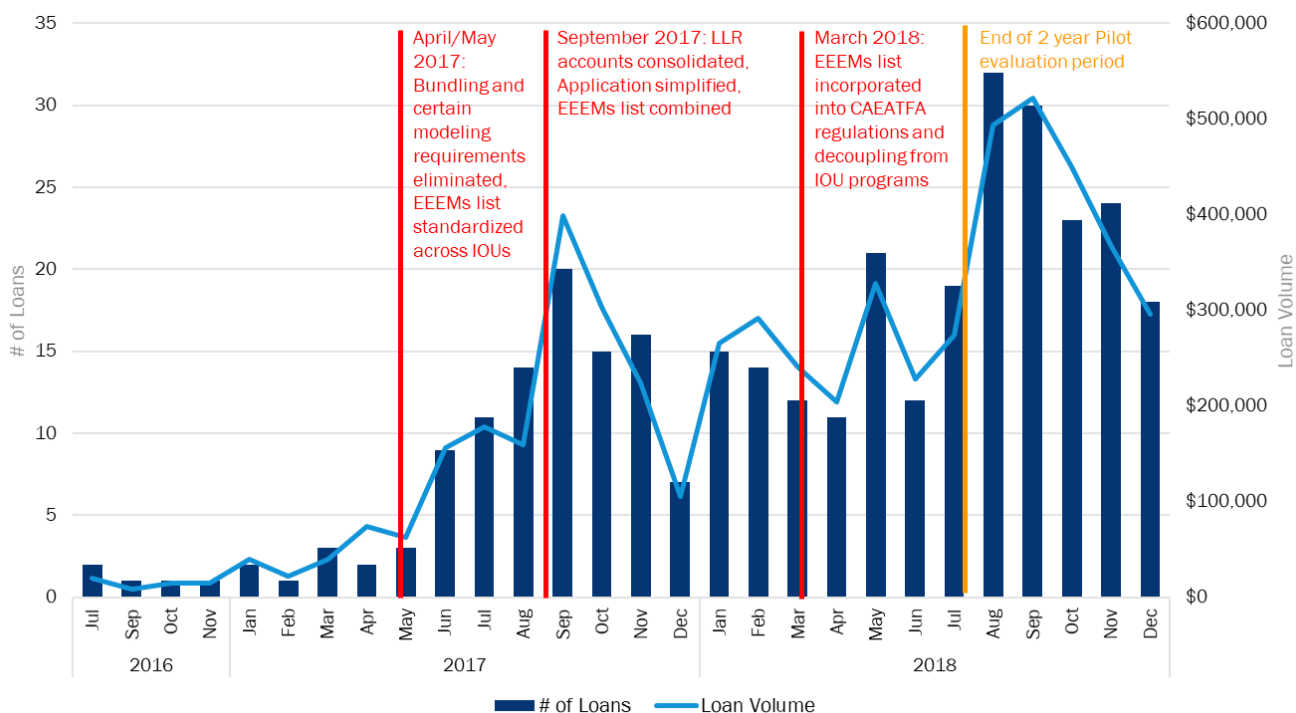
Source: CAEATFA tracking data.

The next sections provide further detail on characteristics to-date by metric category.

Scalability

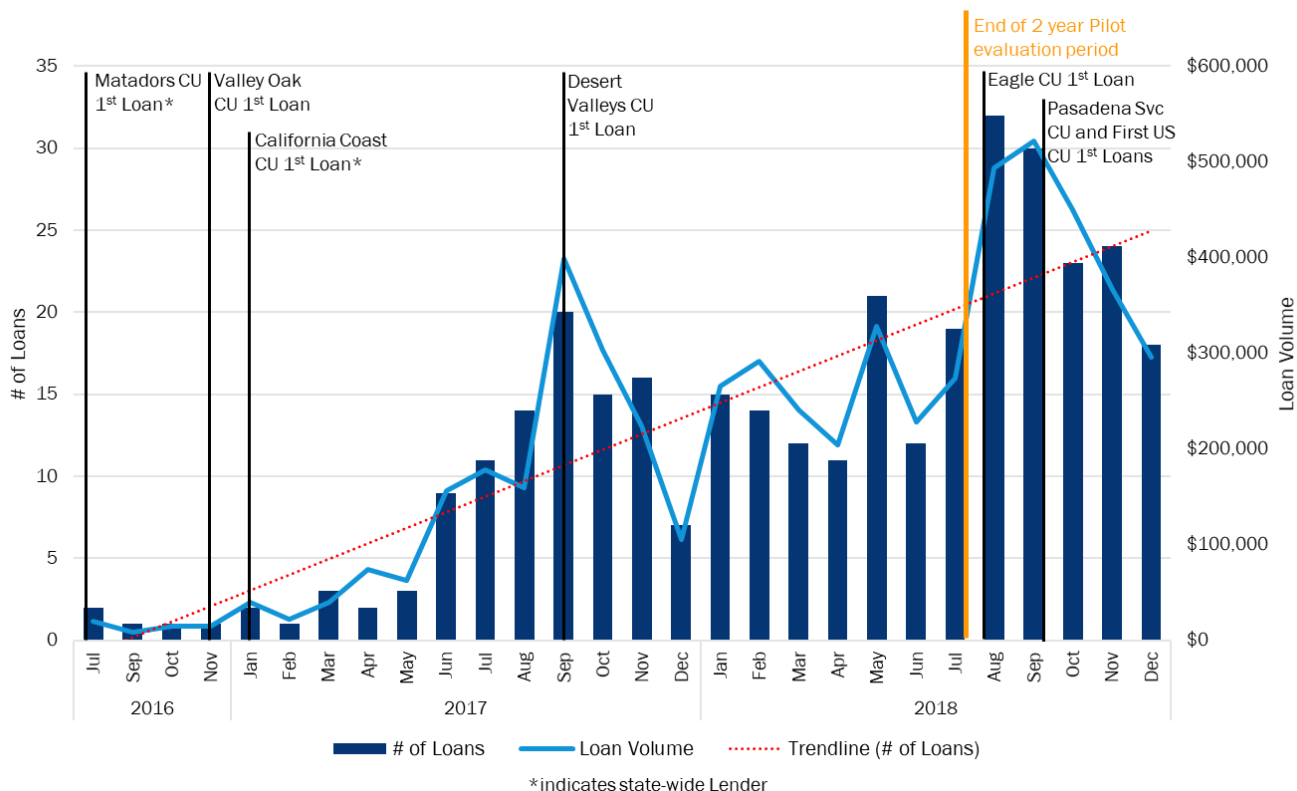
The number of loans closed per month has grown steadily over time. Specifically, half of the months during this period saw a positive increase in number of loans, thirteen saw a decrease, and two were neutral. According to CAEATFA, the summer peaks in activity may be because many projects were in areas where the cooling season is more of a concern for homeowners than the heating season (for example, Southern California). The upward trend could be due in part to several program design changes related to the EEEMs list, LLR account organization, decoupling from IOU programs, and loan application requirements and processes – all of which potentially made REEL loans more attractive for lenders, contractors, and borrowers. Figure 21 and Figure 22 show the growth in the number of loans and the loan volume on a month-by-month basis. Although there can be a lag between the initiation of pilot changes and their effects on the enrollment of REEL loans, the red lines in Figure 1 mark the date of key design changes and the red lines in Figure 22 mark the dates that each Lender enrolled their first REEL loan. While more research is needed to assess the extent to which such changes contributed to increased participation, these dates provide useful context for understanding progress-to-date. For instance, the largest uptick in loan volume occurred after California Coast Credit Union enrolled their first loan in January 2017, and another notable uptick occurred after CAEATFA made design changes in March 2018.

Figure 21. Month-to-Month REEL Loan Growth over Program Design Changes



Source: CAEATFA tracking data

Figure 22. Month-to-Month REEL Loan Growth over Lender 1st Loan Date



Source: CAEATFA tracking data

REEL loans were used to finance home upgrades in 30 counties, which is just over half of the 54 counties in California served by the IOUs. Notably, 18 of these counties saw five loans or less, with the bulk of participation coming from Southern California. Four counties in particular— Los Angeles, Kern, San Diego and Orange County— accounted for over half of the loans enrolled in REEL (163 of 339, or 48%) and 47% of the total financing generated by the pilot (\$2.7M). Given the total number of REEL Lenders (four as of July 2017 and seven as of January 2019) and the pilot phase of REEL at this time, it is natural to see a geographic concentration of the loans in the areas where both statewide and local Lenders operate (as is the case for Kern, Orange and Los Angeles counties) and then a gradual expansion to other areas after establishing a foothold. Over time, participation has continued to grow in the San Francisco Bay Area and Greater Northern California (especially Sacramento County), and there has been a notable expansion into the Central California (for example, Fresno County).

Figure 23 depicts the distribution of REEL loans at the county-level at four distinct points in time: 1.25 years into the pilot (November 2017), 1.75 years into the pilot (May 2018), 2 years into the pilot (July 2018) and two and a half years into the pilot (December 2018). The first two dates were chosen to assess the impact, if any, that program design changes occurring in the preceding months had on the geographic distribution of loans. The fourth map provides the most current spread of REEL loan products.

Figure 23. REEL Loan Distribution Over Time (by County)

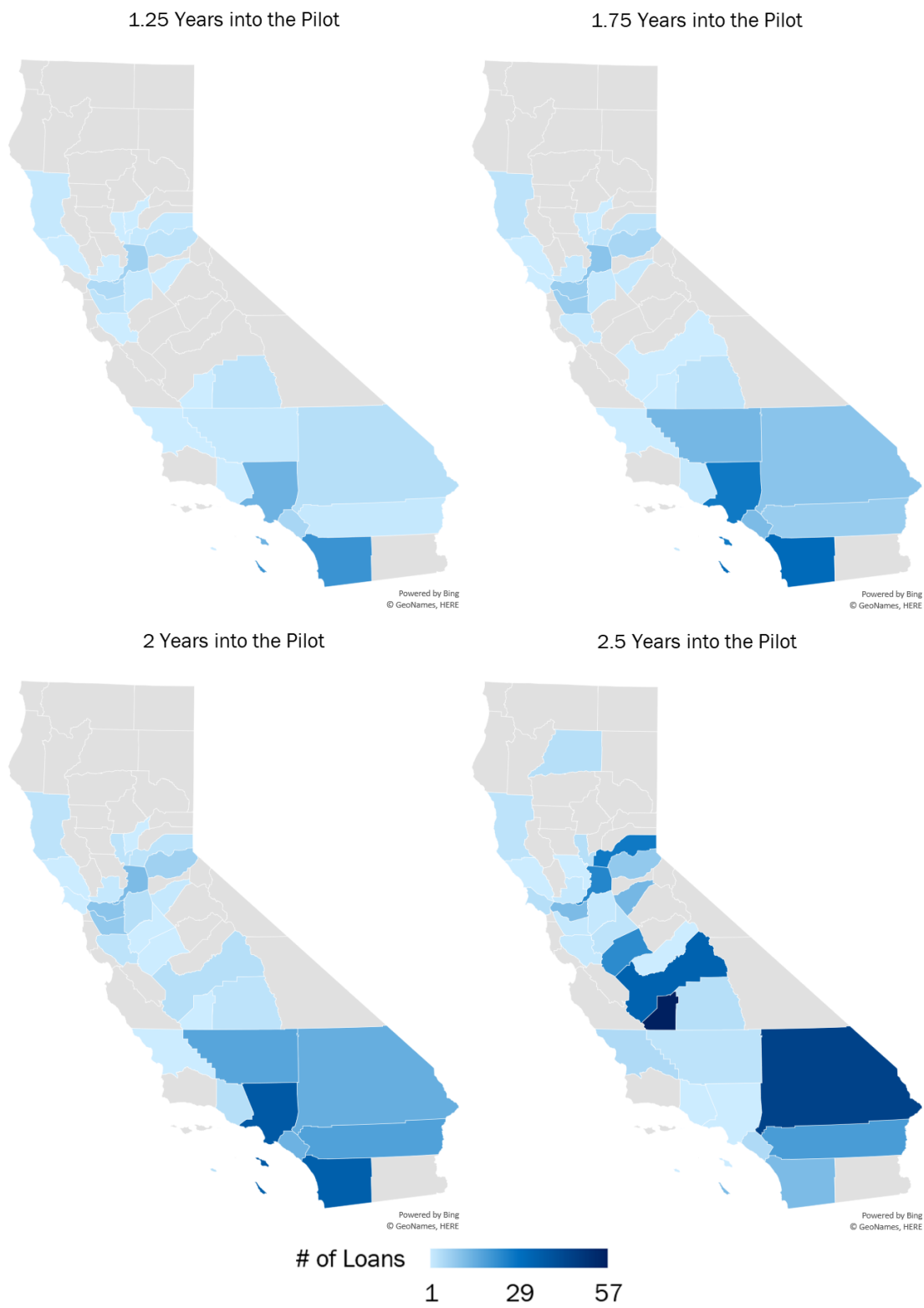
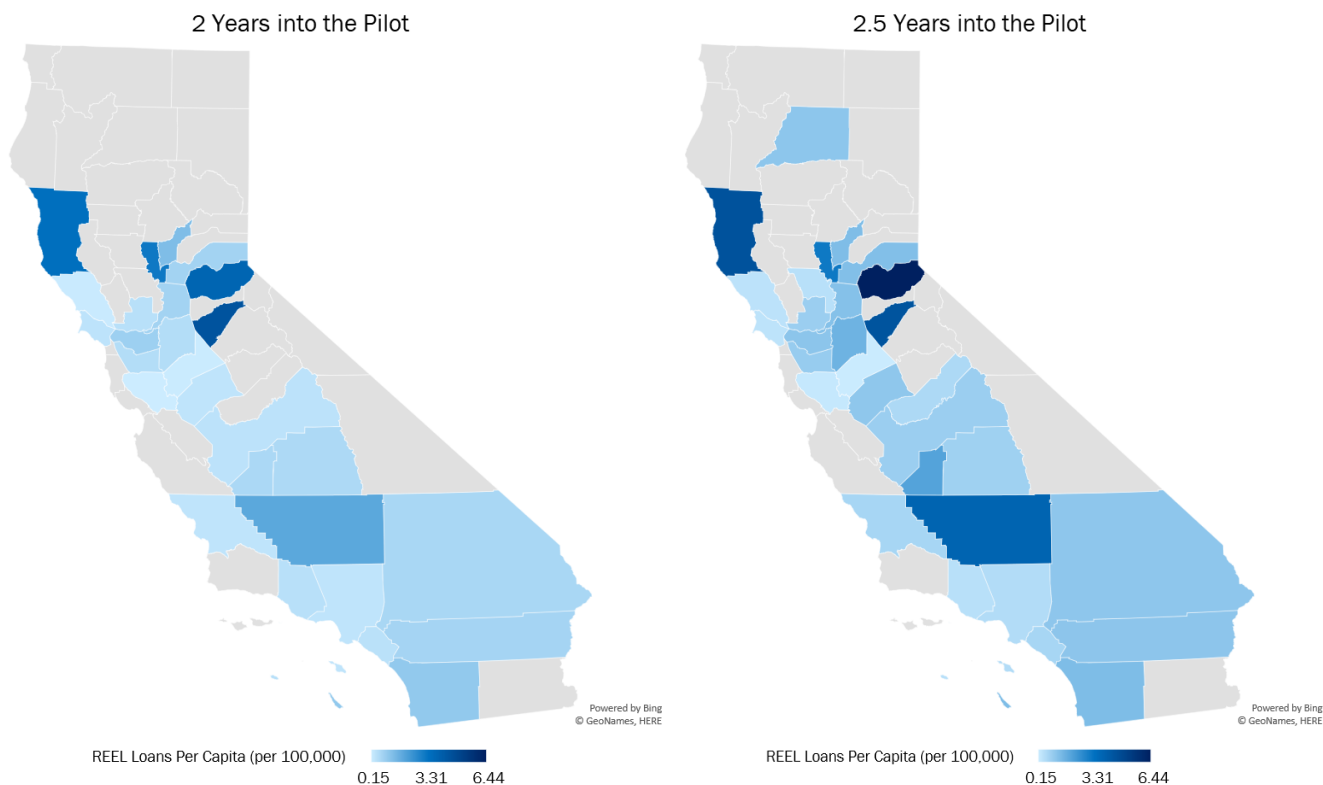


Figure 24 provides a slightly different view of the current spread of participation by examining REEL loans per capita, thereby controlling for Southern California's high population density. While the general spread of participation still holds, Figure 24 shows that the program has gained significant penetration in lower population areas such as the north coast and the Sierra Nevada.

Figure 24. REEL Loans per Capita



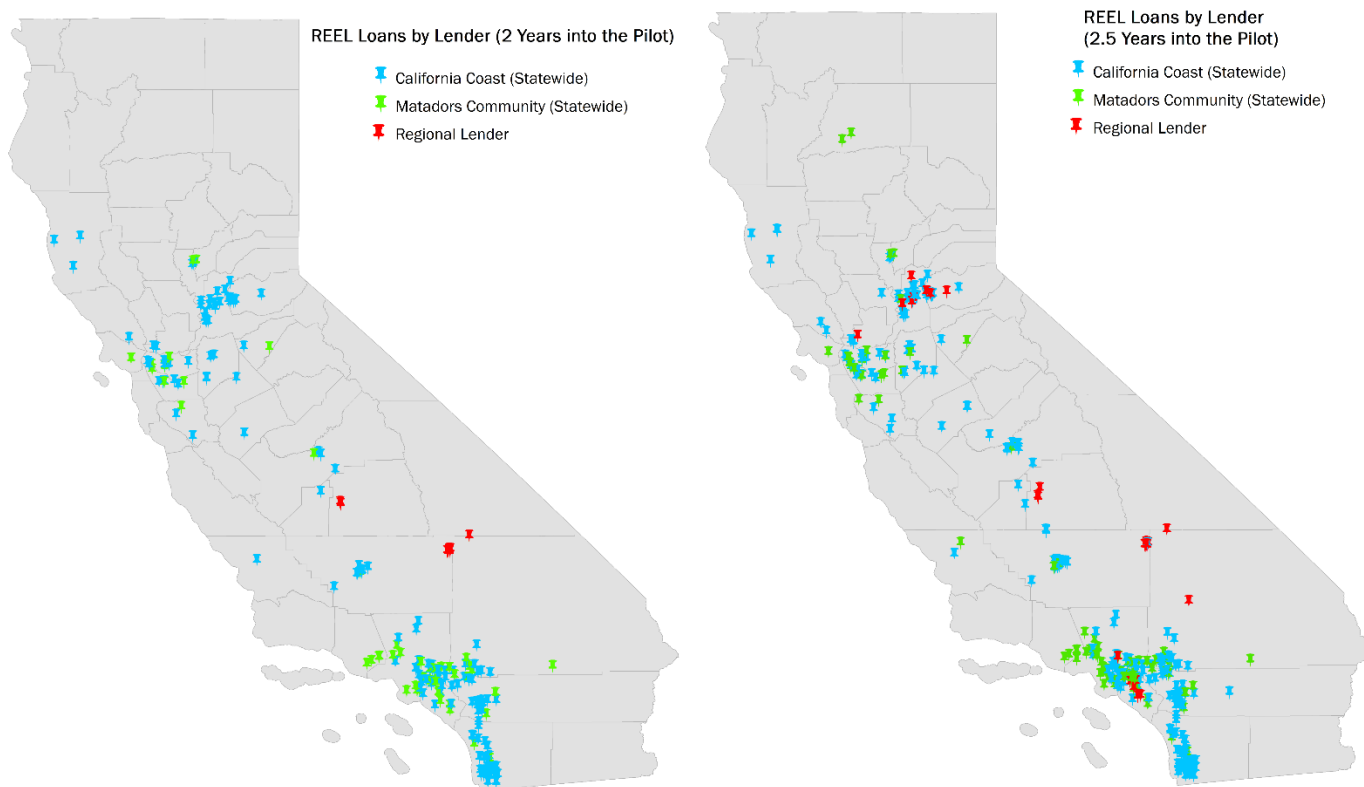
Source: CAEATFA tracking data for Loan Volume and Demographic Research Unit of the California Department of Finance for 2017 population estimates by county. (Available here: <http://www.dof.ca.gov/Forecasting/Demographics/>)

Privately Leveraged

The pilot contributed \$787,737 in ratepayer funds to the LLR for the 339 REEL loans during this period. In response, the pilot attracted more than seven times that amount in private capital (\$5,784,229 in loans).

REEL currently partners with seven FIs (Lenders), all of which are credit unions. Of the seven lenders, five are local credit unions (that is, serving a specific region) and two are statewide credit unions. Figure 25 shows the distribution of REEL loans throughout California, distinguishing between the two statewide Lenders (California Coast Credit Union and Matadors Community Credit Union) and the regional Lenders, and shows that the statewide Lenders represent most of the loan activity (see Table 68 for detailed statistics). Further, while California Coast Credit Union and Matadors Community Credit Union branch locations are limited to Southern California, they have successfully closed loans throughout the state.

Figure 25. Distribution of REEL Loans by Lender



Source: CAEATFA tracking data

Table 68 shows the breakout of loans, private financing and ratepayer LLR contribution by Lender. Again, the bulk of REEL financing has been through the two statewide credit unions, California Coast and Matadors Community Credit Unions.

Table 68. REEL Loan Summary by Lender (Inception through December 2018)

Lender	Date of First Loan	# of Loans	Original Loan Amount (Private Capital)	LLR Contribution	Private Capital by Lender (%)
California Coast Credit Union	1/13/2017	224	\$3,756,058	\$496,250	65%
Matadors Community Credit Union	7/19/2016	85	\$1,560,791	\$227,760	27%
Desert Valleys Federal Credit Union	9/11/2017	12	\$189,553	\$25,701	3%
First US Community Credit Union	9/28/2018	8	\$116,526	\$15,925	2%
Eagle Community Credit Union	8/10/2018	5	\$79,337	\$12,615	1%
Valley Oak Credit Union	11/28/2016	4	\$62,645	\$7,581	1%
Pasadena Service Federal Credit Union	9/20/2018	1	\$19,319	\$1,905	0%
Total		339	\$5,784,229	\$787,737	100%

Source: CAEATFA tracking data.

Table 69. REEL Loan Summary by Lender (Inception through July 2018)

Lender	Date of First Loan	# of Loans	Original Loan Amount (Private Capital)	LLR Contribution	Private Capital by Lender (%)
California Coast Credit Union	1/13/2017	150	\$2,608,491	\$331,106	71%
Matadors Community Credit Union	7/19/2016	50	\$829,341	\$116,711	23%
Desert Valleys Federal Credit Union	9/11/2017	9	\$167,935	\$22,711	5%
Valley Oak Credit Union	11/28/2016	3	\$50,368	\$5,293	1%
Total		212	\$3,656,135	\$475,821	100%

The extent to which the private market would offer REEL loans without the ratepayer-funded credit enhancement is a topic of exploration for future evaluation activities. Lenders already have “signature” lending products for residential customers but made a number of changes when they participated in the REEL pilot.

- All seven lenders increased their maximum loan amount for REEL loans, with increases ranging from \$10,000 to \$47,500 compared to the Lenders “signature” (that is, regular) lending products.
- All seven lenders increased their maximum loan term to 15 years for REEL loans, compared to the Lenders “signature” lending products.

While most (96%) of the REEL loans during this period are still active, thirteen participants have already paid the loan in full (with the credit enhancement returned in full to the REEL LLR for future loans), and one participant has defaulted (resulting in a direct-loss of \$2,250), although the default was outside the two year evaluation period.

Reaching Underserved Californians

The REEL pilot has a target of disbursing approximately one-third of the total credit enhancements to “underserved” single family residents.¹²² This is supported through two REEL pilot design features:¹²³

- The LLR for underserved borrowers will be set at 20% of the loan value, while it is set at 11% for other borrowers (to provide a stronger risk mitigation tool for the underserved market).
- Borrowers with FICO scores as low as 580 will be considered for loans under REEL. However, for applicants with FICO scores between 580 and 640 the lender must verify the borrower’s income as part of the underwriting process.

¹²² D. 13-09-044, pg. 33.

¹²³ California Code of Regulations Title 4 Business Regulations, Division 13. CAEATFA. Regulations Implementing the Residential Energy Efficiency Loan Assistance Program.

CAEATFA's implementation of these design features includes a 20% credit enhancement to borrowers who meet any of the following criteria:

1. **LMI: Household Income:** CAEATFA initially provided the 20% enhancement to borrowers whose Lender-reported household income falls below the LMI threshold for the area in which the borrower resides. However, CAEATFA has noted several issues with this approach, including that Lenders calculated household income inconsistently, assumed a household of four, and typically excluded spousal income. As a result, CAEATFA discontinued this approach in March 2018 in favor of the Census Tract approach below
2. **LMI: Census Tract:** The property upgraded with the REEL loan resides in a census tract in which the median income does not exceed 120% of AMI.
3. **Credit-Challenged:** The borrower has a credit score below 640 and the Lender participates in the Credit-Challenged Program. This program entails an additional agreement between CAEATFA and the Lender to provide lower rates and longer terms to credit-challenged individuals.

Over the two-and-a-half-year period, CAEATFA has provided the 20% credit enhancement to 130 of the 339 borrowers (38%) according to these criteria listed above, with the reason for their classification summarized in Table 70. This totals to \$389,091 in credit enhancements, or 49% of total enhancements.

Table 70. REEL Loans by Underserved Designation (Inception through December 2018)

Credit Enhancement Level	# of Loans	% of Loans (n=339)
Not Underserved - 11% enhancement	209	62%
Underserved – 20% enhancement	130	38%
<i>Credit-Challenged</i>	1	0%
<i>LMI: Household Income (Lender-Reported)</i>	37	11%
<i>LMI: Census Tract</i>	92	27%

Source: CAEATFA data/

Table 71. REEL Loans by Underserved Designation (Inception through July 2018)

Credit Enhancement Level	# of Loans	% of Loans (n=212)
Not Underserved - 11% enhancement	148	70%
Underserved – 20% enhancement	64	30%
<i>Credit-Challenged</i>	0	0%
<i>LMI: Household Income (Lender-Reported)</i>	35	17%
<i>LMI: Census Tract</i>	29	14%

Source: CAEATFA data

Through review of the data and discussions with CAEATFA, the evaluation team noted several cases related to LMI qualification that suggest the true percentage of credit enhancements going to underserved borrowers may be understated. Specifically, as shown in Table 72, 102 borrowers who live in LMI census tracts did not receive the underserved credit enhancement and 56 who do not live in LMI census tracts did receive it. In the latter case, the Lender had reported the household as LMI based on household income. To address this issue, CAEATFA's quarterly reports provide the percentage of borrowers whose properties are in LMI census tracts,

regardless of the initial credit enhancement level. The evaluation team will investigate this topic further by collecting data on the characteristics of REEL borrowers who respond to the participant survey.

Table 72. REEL Loans by LMI Tract and Credit Enhancement Level (Inception through December 2018)

Credit Enhancement Level	LMI Census Tract		
	Yes	No	Total
Underserved – 20% enhancement	74	56	130
Not Underserved - 11% enhancement	102	107	209
Total	176	163	339

Source: CAEATFA data.

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

Table 73. REEL Loans by LMI Tract and Credit Enhancement Level (Inception through July 2018)

Credit Enhancement Level	LMI Census Tract		
	Yes	No	Total
Underserved – 20% enhancement	35	29	64
Not Underserved - 11% enhancement	69	79	148
Total	104	108	212

Source: CAEATFA data.

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

Only one loan in the two-and-a-half-year period has qualified for the 20% credit assessment based on FICO score (notably, this customer's property is also in an LMI census tract). As mentioned earlier, Lenders must participate in the Credit-Challenged Program to receive the higher credit enhancement for credit-challenged individuals. As such, Table 74 and Table 76 show a number of borrowers who did not qualify for the higher credit enhancement yet have credit scores under 641 or have DTI ratios exceeding 36%. These are both generally-accepted indicators of low creditworthiness and likely make it difficult for borrowers to qualify for traditional loans in the market. This provides further evidence to suggest that the pilot has provided more benefit to underserved segments than CAEATFA's initial credit enhancement classification depicts.

Table 74. REEL Loans by FICO Score and Credit Enhancement Level (Inception through December 2018)

Credit Enhancement Level	FICO Score					Total
	580-640	641-700	701-760	761-820	821+	
Underserved – 20% enhancement	10	22	55	32	11	130
Not Underserved - 11% enhancement	12	42	81	61	13	209
Total	22	64	136	93	24	339

Source: CAEATFA data.

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

Table 75. REEL Loans by FICO Score and Credit Enhancement Level (Inception through July 2018)

Credit Enhancement Level	FICO Score					Total
	580-640	641-700	701-760	761-820	821+	
Underserved – 20% enhancement	5	5	33	14	7	64
Not Underserved - 11% enhancement	11	29	57	42	9	148
Total	16	34	90	56	16	212

Source: CAEATFA data.

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

Table 76. REEL Loans by DTI Ratio and Credit Enhancement Level (Inception through December 2018)

Credit Enhancement Level	DTI Ratio				Total
	Under 25%	25-35%	36-45%	46-55%	
Underserved – 20% enhancement	28	29	50	23	130
Not Underserved - 11% enhancement	28	78	63	40	209
Total	56	107	113	63	339

Source: CAEATFA data.

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

Table 77. REEL Loans DTI Ratio and Credit Enhancement Level (Inception through July 2018)

Credit Enhancement Level	DTI Ratio				Total
	Under 25%	25-35%	36-45%	46-55%	
Underserved – 20% enhancement	14	10	23	17	64
Not Underserved - 11% enhancement	15	57	48	28	148
Total	29	67	71	45	212

Source: CAEATFA data.

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

Aside from the LMI and creditworthiness characteristics, CalEnviro Scores for REEL borrowers' census tracts offer additional insight into how the REEL loan product is penetrating vulnerable or harder-to-reach communities. Table 78 indicates that more than a third of REEL loans (in terms of products and volume of financing) are going to the least vulnerable census tracts (with scores between the 1st and 25th percentile). The most vulnerable census tracts, with CalEnviro Scores above the 75th percentile (that is, those with the highest 25% of scores for pollution burden and socioeconomic vulnerability) received just over 12% of the total loan volume and only 14% of all REEL loans.

Table 78. REEL Loan Summary by CalEnviro Score (Inception through December 2018)

CalEnviro Score (Percentile)		# of Loans	# of Loans (%)	Total Loan Volume	Total Loan Volume (%)	Average Loan Size
Less Vulnerable	1-25	112	33%	\$2,057,450	36%	\$18,370
	26-50	100	29%	\$1,678,806	29%	\$16,788
	51-75	81	24%	\$1,341,605	23%	\$16,563
More Vulnerable	76-100	46	14%	\$702,345	12%	\$15,268
Grand Total		339	100%	\$5,780,206	100%	\$17,051

Source: CAEATFA tracking data.

Table 79. REEL Loan Summary by CalEnviro Score (Inception through July 2018)

CalEnviro Score (Percentile)		# of Loans	# of Loans (%)	Total Loan Volume	Total Loan Volume (%)	Average Loan Size
Less Vulnerable	1-25	71	33%	\$1,299,764	36%	\$18,307
	26-50	69	33%	\$1,085,289	30%	\$15,729
	51-75	45	21%	\$825,671	23%	\$18,348
More Vulnerable	76-100	27	13%	\$445,325	12%	\$16,494
Grand Total		212	100%	\$3,656,049	100%	\$17,246

Source: CAEATFA tracking data.

The pilot's design is intended to attract underserved borrowers by offering more favorable loan terms (for example, longer pay-back periods or lowered interest rates) compared to alternative financing options. REEL has notable success in this area, with expanding financing to lower FICO-score borrowers at three of the seven Lenders, as well as increasing the loan term periods, and offering no pre-payment penalties or closing costs. On the other hand, the 12 loans that have already been paid back in full suggest the possibility that the lack of a pre-payment penalty and the low monthly payment may encourage some customers who did not truly need the financing to use REEL financing as "bridge funding" (that is, with the intention to pay the loan back very quickly).

Energy Savings

CAEATFA data does not calculate ex-ante energy savings associated with REEL projects. A review of the measures received to date provides a glimpse into the potential sources and end-uses of REEL energy savings. Out of 34 unique measure categories, on average, borrowers installed two measures at a time and the most common measure type was HVAC equipment and/or ductwork. This trend has remained consistent between the first-two-year evaluation period (F2Y) and the post-evaluation period (post-F2Y). Table 80 summarizes the measure mix of REEL-financed projects by electric and gas service provider.

Table 80. Measure Types Financed by REEL Projects

Measure	F2Y (N=212)	Post F2Y (N=127)	All (N=339)
Average Number of Measures	2	2	2
HVAC			
HVAC Equipment	69%	64%	67%
Ductwork	27%	37%	31%
Building Envelope			
Windows	33%	23%	29%
Insulation	31%	24%	28%
Air Seal	11%	8%	10%
Cool Roof	10%	16%	12%
Radiant Barrier	2%	-	1%
Water Heating			
Water heater	10%	3%	9%
Low-flow shower head or faucet	1%	6%	1%

Measure	F2Y (N=212)	Post F2Y (N=127)	All (N=339)
Other			
Smart Thermostat	5.7%	9%	7%
Lighting	2.4%	6%	2%
Pool products	1.9%	0%	2%
Refrigerator/Freezer	1%	2%	1%
Dishwasher	1%	2%	1%
Clothes Washer/Dryer	0.5%	1%	1%
Air purifier	0.5%	-	0.3%
Other - unspecified	1%	1%	1%

Source: CAEATFA tracking data.

The evaluation team plans to conduct a consumption analysis to estimate energy savings from the REEL pilot. Notably, this analysis will not be able to include all REEL projects during this period, as some projects completed in late 2018 or 2019 do not have sufficient post-participation period data at this time. Based on loan enrollment date,¹²⁴ the evaluation team estimates that the consumption analysis will include 179 projects (approximately 52% of all REEL loans). For the remaining 160 loans, the evaluation team will explore the feasibility of summarizing the potential savings based on prescriptive values for EEEMs measures.

In general, there is no strong evidence that average savings per project will be significantly different between the F2Y and post-F2Y periods. Half of customers in the pilot (50%, N=339) did either HVAC Equipment only or Building Envelope only, which are likely the measures with the most energy savings. The proportion of Building Envelope projects has slightly increased in the post-F2Y period, but not significantly. The remaining half of participants did a wide range of bundles with no dominant type of bundle, with the most common being HVAC Equipment + Ductwork (10%), followed by HVAC Equipment + Building Envelope (9%). Notably, while still small, the number of “Other” measures has generally increased post-F2Y. However, these measures tend to be relatively low savers compared to Building Envelope and HVAC Equipment.

Table 81 compares the types of projects completed in the F2Y and post-F2Y periods. The table is ordered by the potential for energy savings, assuming HVAC Equipment and Building Envelope generally have the most potential for savings. Table 82 provides additional detail on how many projects contain “Other” measures versus just HVAC Equipment, Building Shell, and/or Ductwork. The final report will include a similar comparison of project included and not included in the consumption analysis to identify any potential sources of bias.

Table 81. Percentage of Participants by Project Type, F2Y vs. Post-F2Y

Period	HVAC Equipment + Building Envelope + Ductwork	HVAC Equipment + Building Envelope	HVAC Equipment + Ductwork	HVAC Equipment	Building Envelope	Everyone Else (No HVAC or Building Envelope)	Total
F2Y (N=212)	12%	16%	13%	28%	28%	3%	100%
Post F2Y (N=127)	16%	10%	14%	24%	29%	7%	100%
All (N=339)	13%	14%	13%	27%	28%	5%	100%

¹²⁴ Per CAEATFA, this is the date that the loan is considered enrolled in the pilot.

Source: CAEATFA tracking data.

Table 82. Percentage of Participants by Project Type Detail, F2Y vs. Post-F2Y

Period	F2Y (N=212)	Post F2Y (N=127)	All (N=339)
HVAC Equipment + Building Envelope + Ductwork Only	6%	8%	7%
HVAC Equipment + Building Envelope + Ductwork + Other	6%	8%	6%
HVAC Equipment + Building Envelope Only	10%	6%	9%
HVAC Equipment + Building Envelope + Other	6%	4%	5%
HVAC Equipment + Ductwork Only	11%	9%	10%
HVAC Equipment + Ductwork + Other	2%	5%	3%
HVAC Equipment Only	25%	22%	24%
HVAC Equipment + Other	4%	2%	3%
Building Envelope Only	25%	27%	26%
Building Envelope + Other	2%	2%	2%
Everyone Else (No HVAC or Building Envelope)	3%	7%	5%
Total	100%	100%	100%

Source: CAEATFA tracking data.

A key attribution question for this study is the extent to which REEL is supporting other ratepayer resource programs. According to CAEATFA's records, less than a third of borrowers (n=93) applied for a rebate in a ratepayer program (as reported by the contractor). Through the participant survey, the evaluation team plans to confirm the extent of ratepayer program participation and the influence of the REEL loan on that participation. Table 83 details the rebate type by loan volume and loan amounts.

Table 83. REEL Loans by Participation in Rebate Programs (Inception through December 2018)

Rebate Program Type	Percent of Loans	Loan Amount (Total)
Rebated Program (n=93)	27%	\$1,964,632
<i>Energy Upgrade CA</i>	14%	\$997,817
<i>Advanced Home Upgrade</i>	4%	\$390,748
<i>Rebate through CCA or REN</i>	4%	\$248,675
<i>Rebate through Utility</i>	3%	\$197,823
<i>Rebate through Public Utility</i>	2%	\$129,568
No Rebated Program (n=246)	73%	\$3,819,598

Source: CAEATFA tracking data; interpreted from "Contractor or Borrower Seeks a Rebate/Incentive" and "Rebate/Incentive Program Name" fields.

Appendix B. Detailed Cost-Effectiveness Analysis Methods and Inputs

Cost-effectiveness was conducted using a FPM that is an interpretation of the California SPM. The FPM accounts for the C/B ratio associated with financing programs that are not incurred in traditional rebate programs.

Financing Program Model

The evaluation team applied the costs and assessed the benefits achieved by the REEL pilot to address the CPUC's evaluation objectives and also took a future-oriented approach to assess specific performance levels (that is, attributable savings) that would be needed for a theoretical REEL program to prove cost-effective under the TRC, SCT, or PAC using a finance-specific interpretation of California's SPM.

Prior to the launch of REEL, Dunskey presented the "Cost-Effectiveness of Energy Efficiency Financing Programs" whitepaper¹²⁵ to the CPUC during the Financing and Non-Resource Program Evaluation work conducted by Opinion Dynamics and Dunskey from 2013 to 2018. The whitepaper provides an interpretation of the California SPM based on a comprehensive view of finance-related costs and benefits relevant to each of the cost-effectiveness tests therein.

Table 84 provides a list of key inputs used for the TRC and PAC.

Table 84. Financing Program Model and Key Inputs

Input	Description	TRC	PAC
Administration	Non-financing expenditures, including overhead, program management, program support, evaluation, enabling strategies (communications, marketing and outreach, done by IOUs), costs and fees for service (data management, contractor management). These exclude setup costs.	✓	✓
LLR	Costs associated with the LLR, including fees for service (bank trustee and master servicer), direct losses, lost opportunity cost of capital (spread between LLR fund's anticipated rate of return and that capital's assumed value if not used for an LLR) (assumed equal to the IOU weighted average cost of capital).	✓	✓
Participant Cost	The incremental cost of RFP-driven measures.	✓	
Avoided Costs	Utility-avoided costs related to generation and distribution of energy from conventional power plants and natural gas lines. Values are based on the 2017 Avoided Cost Model produced by Energy + Environmental Economics, Inc. (E3) for use in demand- side cost-effectiveness proceedings at the CPUC.	✓	✓
Leveraging Effect of LLR	For an LLR that is maintained at 10% of the overall loan pool for the RFPs, thus a 10:1 leveraging ratio is applied for private loan capital to program capital. Similar leverage ratios can be calculated for other LLR coverage rates.	✓	✓
NEBs	The environmental, economic, and health-related externalities.	✓	
Reduced Borrowing Cost	Consumers benefit from lower interest rates and/or longer loan terms.	✓	

¹²⁵ Dunskey. 2016. Cost-Effectiveness of Energy Efficiency Financing Programs - Methodology & Strategic Issues.

Input	Description	TRC	PAC
Market Transformation	Assumes that the program/pilots will generate some degree of market effects as a percent of EEEM benefits, leading to continued incremental activity after its initial two-year life.	✓	

Note: Prior to launching the RFPs, the IOUs will have incurred material setup costs, including costs relating to administration, overhead, and marketing and outreach to lenders and others. The evaluation team treated these as sunk costs for the purposes of this analysis.

As shown in the table above, the FPM includes the following considerations.

- **The LLR:** A fundamental difference between innovative financing programs/pilots and conventional rebate programs relates to time. Specifically, while rebate costs are incurred as measures are adopted, costs associated with the LLR are primarily incurred after loans are made, typically over a period of many years, and at unknown amounts at the outset. For example, a rebate is issued following the purchase and installation of an eligible measure, whereas the LLR may have to cover a portion of a participating lender's losses if, when, and to the extent such losses occur over the life of the loan.

Furthermore, the LLR is expected to be used as leverage to increase the total loan book volume for both LMI borrowers and all other borrowers. Holding the funds in an LLR creates leveraging opportunity across the project lifetime (benefit), but also results in lost opportunity cost of capital — the spread between the LLR fund's anticipated rate of return and that capital's assumed value if not used for an LLR (cost).

- **Reduced Borrowing Costs:** Mitigating eligible loans for lenders (through an LLR that backstops 90% of the total outstanding value of loans). These consumers gain benefits from lower interest rates and/or longer loan terms.
- **NEBs:** The CPUC does not historically account for NEBs. Since 2011, the avoided-cost model includes an avoided GHG cost, so while not strictly financial, other than this one non-energy impact, the EE cost-effectiveness tests do not contain any non-energy impacts.¹²⁶ The REEL program differs from rebate programs in two significant ways:
 - REEL allows up to 30% of the financed project to include non-EEEMs to support comprehensive projects.
 - REEL offers an LLR that covers the entire value of the projects financed regardless of the portion invested in EEEMs versus non-EEEM investments.

Neglecting NEBs would effectively allow the TRC¹²⁷ to make an arguably weak assumption: that consumers would voluntarily assume debt for zero benefit. Indeed, past studies show that NEBs comprise a significant portion of the benefits in residential programs, outweighing the energy benefits and costs. For example, in the evaluation of three RFPs,¹²⁸ it was observed that the APR reduction made up the largest portion of benefits to participants, and without considering these benefits, the programs would not have passed cost-effectiveness tests. Moreover, studies commonly find NEB values exceed avoided-energy costs for residential weatherization and HVAC programs. A

¹²⁶ Societal Cost Test Workshop, Societal Cost Test Introduction (SCT): Background and Staff Research. September 22, 2016.

¹²⁷ NEBs apply only to the TRC, since they provide no value to the PA.

¹²⁸ ODC and Dunskey. 2017. Regional Finance Program Attribution and Cost-Effectiveness Study: Final Report.

2014 PG&E study¹²⁹ of EUC found NEBs far outweigh bill savings (the evaluation team interpreted it at 129% of avoided-energy costs).

Even the REEL participant survey conducted for this analysis showed that, while the primary interest in EE programs is for the bill savings (29%), others were motivated by improving comfort (24%) and environmental benefits (12%). See Chapter 8.

- **Market Transformation:** The REEL pilot is partly driven by a desire to transform the EE market by demonstrating to lenders that specialized efficiency loans provide a preferential risk/return profile. The evaluation team's analysis attempts to capture the value that the REEL pilot/future program will generate through market effects, leading to continued incremental efficiency lending after the initial program/pilot period. An early process evaluation of REEL¹³⁰ recommended development of a public database to help transform the market by making loan and project performance available. This would benefit participating REEL lenders and inform other lenders interested in joining the pilot or a future program. While several lenders interviewed said that REEL loans are performing well, information is not shared widely; therefore, market effects are estimated to be modest.

Algorithms for Financing Program Model

While the California SPM provides a framework for evaluating cost-effectiveness, it was designed specifically to evaluate rebate or incentive programs; it does not consider the unique distinctions of EE financing. The FPM is an interpretation of the TRC and PAC SPM framework that reconsiders existing inputs and includes new inputs.

Below are the high-level algorithms for each model and details of the adapted benefits and costs by component for the TRC and PAC.

Table 85. TRC/SCT High-Level Algorithm

Standard Practice Manual	Financing Program Model
$B_{TRC} = \sum_{t=1}^N \frac{UAC_t + TC_t}{(1+d)^{t-1}} + \sum_{t=1}^N \frac{UAC_{at} + PAC_{at}}{(1+d)^{t-1}}$ $C_{TRC} = \sum_{t=1}^N \frac{PRC_t + PCN_t + UIC_t}{(1+d)^{t-1}}$	$B_{TRC} = EB_{EEEM} + NEB_{EEEM} + CCS + MTB$ $C_{TRC} = C_{PAC} + LLRC + PCN + UIC$
<p>Where:</p> <p>B_{TRC} = Benefits of the program</p> <p>C_{TRC} = Costs of the program</p> <p>UAC_t = Utility-avoided supply costs in year <i>t</i></p> <p>TC_t = Tax credits in year <i>t</i></p> <p>UAC_{at} = Utility-avoided supply costs for the alternate fuel in year <i>t</i></p> <p>PAC_{at} = PA program costs for alternate fuel in year <i>t</i></p> <p>PRC_t = PA program costs in year <i>t</i></p> <p>PCN_t = Net participant costs in year <i>t</i></p> <p>UIC_t = Utility increased supply costs in year <i>t</i></p> <p>d = discount rate</p>	<p>Where:</p> <p>B_{TRC} = Benefits of the program</p> <p>C_{TRC} = Costs of the program</p> <p>EB_{EEEM} = Energy benefits from EEEMs</p> <p>NEB_{EEEM} = NEBs from EEEMs</p> <p>CCS = Capital cost savings</p> <p>MTB = Benefits from market transformation</p> <p>C_{PAC} = PA program costs</p> <p>LLRC = LLR costs</p> <p>PCN = Net participant costs</p> <p>UIC = Utility increased supply costs</p>

¹²⁹ Opinion Dynamics and Research Into Action. 2014. PG&E Whole House Program: Marketing and Targeting Analysis.

¹³⁰ Evergreen Economics. 2017.

Adapted TRC/SCT Benefits (By Component)

1) EB_{EEEM} : Energy Benefits from Eligible Energy Efficiency Measures

$$EB_{EEEM} = \sum_{t=1}^N \frac{CAES_t \times AC_t}{(1+d)^{t-1}}$$

Where:

$CAES_t$	Cumulative Annual Gross Energy savings in year t
AC_t	Avoided costs in year t
d	Discount rate

2) NEB_{EEEM} : Non-Energy Benefits from Eligible Energy Efficiency Measures

$$NEB_{EEEM} = VNEB_{EEEM} \times EB_{EEEM}$$

Where:

$VNEB_{EEEM}$	Value of NEBs for EEEMs as a percent of avoided costs
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3) CCS: Capital Cost Savings

$$CCS = APR_{BENEFIT} \times \left[\frac{r}{1 - (1+r)^{-n}} - \frac{r'}{1 - (1+r')^{-n}} \right] \times \sum_{t=1}^N \sum_{i=1}^{LD} \frac{I_t}{(1+d)^{t+i-2}}$$

Where:

$$r = APR_{BASELINE}$$

$$r' = APR_{BASELINE} - APR_{TRICKLE}$$

$APR_{BASELINE}$	APR Baseline: Assumed weighted average APR for benefiting participants
$APR_{TRICKLE}$	APR Trickle is the reduction in participant APR attributable to LLR security
n	Number of periods
I_t	Investment in year t
$APR_{BENEFIT}$	Percent of participants who benefit from reduced APR

4) MTB: Market Transformation Benefits

$$MTB = ME \times IAES_{LY} \times \sum_{t=1}^N \frac{MTBC_t \times AC_t}{(1+d)^{t-1}}$$

Where:

$IAES_{LY}$	Incremental annual energy savings from the last year of the program
ME	Market effects: the continued activity beyond pilots as a percent of $IAES_{LY}$
$MTBC_t$	Market transformation benefits curve value in year t

Adapted TRC/SCT Costs (By Component)

1) LLRC: Loan Loss Reserve Costs

$$LLRC = LLRL + LOCC + LLRMC$$

Where:

LLRL	Loan loss reserve losses
LOCC	Lost opportunity cost of capital
LLRMC	Lost opportunity reserve management costs

2) Loan Loss Reserve Losses

$$LLRL = \sum_{t=1}^{PD} \sum_{i=1}^{LD} CL_i \times \frac{LLR_t}{(1+d)^{t+i-2}}$$

Where:

LLR _t	Loan loss reserve fund in year <i>t</i>
CL _i	Covered losses expressed as a percentage of LLR in year <i>i</i> of the loan
LD	Loan duration

3) Lost Opportunity Cost of Capital

$$LOCC = (d - r_{LLR}) \times \sum_{t=1}^{PD} \sum_{i=1}^{LD} \frac{LLR_t}{(1+d)^{t+i-2}}$$

Where:

r _{LLR}	Annual interest rate on LLR funds
LD	Average duration of loans

4) Loan Loss Reserve Management Costs

$$LLRMC = \sum_{t=1}^N \frac{LLRF_t + LLRO_t}{(1+d)^{t-1}}$$

Where:

LLRF _t	Loan loss reserve fund fees in year <i>t</i>
LLRO _t	Loan loss reserve fund other costs in year <i>t</i>

5) PCN: Net Participant Costs

$$PCN = \sum_{t=1}^N \frac{(LLR_t \times L_{ALL}) + PC_{NB,t}}{(1+d)^{t-1}} \times SA \times PC_{EEEM}$$

Where:

$PC_{NB,t}$ Amount of non-borrowed participant contributions in year t
 PC_{EEEM} Incremental cost as a percent of total EEEM cost

Table 86. PAC High-Level Algorithm

Standard Practice Manual	Financing Program Model
$B_{PAC} = \sum_{t=1}^N \frac{UAC_t}{(1+d)^{t-1}} + \sum_{t=1}^N \frac{UAC_{at}}{(1+d)^{t-1}}$ $C_{PAC} = \sum_{t=1}^N \frac{PRC_t + INC_t + UIC_t}{(1+d)^{t-1}}$	$B_{PAC} = EB_{EEEM} + MTB$ $C_{PAC} = PRC + LLRC + UIC$
<p>Where:</p> <p>B_{PAC} = Benefits of the program C_{PAC} = Costs of the program UAC_t = Utility-avoided supply costs in year t UAC_{at} = Utility-avoided supply costs for the alternate fuel in year t PRC_t = PA program costs in year t INC_t = Incentives paid to the participant by the sponsoring utility in year t UIC_t = Utility increased supply costs in year t</p>	<p>Where:</p> <p>B_{PAC} = Benefits of the program C_{PAC} = Costs of the program</p>

Note: All individual cost and benefit components described previously under TRC/SCT algorithm.

Discount Rates

Table 87 details the discount rates used in the model for each test and scenario with a brief description and reference behind the input.

Table 87. Discount Rates

	Low	Medium	High
PAC/TRC	7.5% – Weighted Average Cost of Capital After Taxes for Utilities ^a	5.3% - Average of Low and High Scenarios	3.0% – Suggested rate from CPUC hearing ^b
SCT	3.9% – 2019 20-Year California General Obligation Bond Yield ^c	3.3% – 2019 5-Year California General Obligation Bond Yield	1.4% – Stern Review: The Economics of Climate Change ^d

^a “The Basics of Cost-Effectiveness Analysis.” 2015. <http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5189>.

^b <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M184/K627/184627134.PDF>.

^c https://neighborly-issuance-documents.s3.amazonaws.com/production/4d0c3ff3-a570-4ee3-a3b1-f22e313a249c_os_1507132635.pdf.

^d http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf.

Cost-Effectiveness Model Inputs

Table 88. Summary of Cost-Effectiveness Model Inputs

Input	Description	Low Scenario	Mid Scenario	High Scenario
Covered Losses	Year-1 LLR-Covered Losses (declines thereafter)	0.95%	0.47%	0.24%
Discount Rate (PAC, TRC)	Applicable demand response rate for PAC, TRC (current \$)	7.5%	5.26%	3.0%
Discount Rate (SCT)	Applicable demand response rate for SCT (current \$)	3.9%	3.3%	1.4%
Net Savings Influence	Share of net savings driven by financing	100.0%	100.0%	100.0%
Non-EEEM NEBs	Value of NEBs for non-EEEMs spending (X cost)	0.0 X	1.0 X	2.0 X
EEEM NEBs	Value of NEBs for EEEMs (% avoided costs)	0%	25%	50%
EEEMs: Market Effects	Continued activity beyond programs	5%	10%	15%
EEEMs	% of LLR going to EEEMs	100%	100%	100%
Non-EEEMs	% of non-EEEM \$ producing equiv. EE savings	0%	0%	0%
EEEM Cost	Incremental cost as % of total EEEM cost	40%	40%	40%
EUL	Average effective useful life of savings (years)	16 yrs	16 yrs	16 yrs
MT Persistence	Years after pilot end that some (designated %) market effects persist	10	10	10
Electric Savings Share	% of savings	70%	70%	70%
Gas Savings Share	% of savings	30%	30%	30%
APR Baseline	Assumed weighted average APR for benefiting participants	11.7%	11.7%	11.7%
APR % Benefit	Average percent of benefits from APR	4.6%	4.6%	4.6%
Electric Avoided Costs	All-in average avoided costs (2016\$/kWh)	\$0.08	\$0.09	\$0.10
Gas Avoided Costs	All-in average avoided costs (2016\$/MMBtu)	\$7.63	\$7.63	\$7.63
Avoided Costs	Average 2016 Avoided Cost (2016\$/mmbtu-equiv. for Electricity + NG)	\$20.80	\$20.80	\$20.80
Inflation	Assumed inflation rate	2%	2%	2%
LLR Duration	In years	15 yrs	15 yrs	15 yrs
LLR Interest	Annual interest on LLR funds (real \$)	-1.96%	-1.96%	-1.96%

Appendix C. Acronyms, Abbreviations, and Finance Terms

Table 89. Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
AB	Assembly Bill
ACEEE	American Council for an Energy-Efficient Economy
AHUP	Advanced Home Upgrade Program
AMI	Area Median Income
APR	Annual Percentage Rate
ARRA	American Recovery and Reinvestment Act
BAU	Business as Usual
BayREN	Bay Area Regional Energy Network
C/B	Cost-Benefit
CA	California
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CARE	California Alternate Rates for Energy
CAS	Combustion Appliance Safety
CCA	Climate Change Assessment
CDFI	Community Development Financial Institution
CEDARS	California Energy and Data Reporting System
CHEEF	California Hub for Energy Efficiency Financing
CISR	Customer Information Standardized Request
CO	Colorado
CPUC	California Public Utilities Commission
CT	Connecticut
DEER	Database for Energy Efficiency Resources
DIY	Do-It-Yourself
DSM	Demand-Side Management
DTI	Debt-to-Income
E3	Energy + Environmental Economics, Inc.
EE	Energy Efficiency
EEEM	Eligible Energy Efficiency Measure
EEFP	Energy Efficiency Finance Program
EFLIC	Energy Financing Line-Item Charge
EFS	Energy Finance Solutions
EM&V	Evaluation, Measurement, and Verification
ESAP	Energy Savings Assistance Program
EUC	Energy Upgrade California

Acronym/ Abbreviation	Definition
EUL	Effective Useful Life
EV	Electric Vehicle
FFIEC	Federal Financial Institutions Examination Council
FICO	Fair, Isaac and Company
FPM	Financing Program Model
FR	Free-Ridership
GHG	Greenhouse Gas
GSFA	Golden State Finance Authority
GW	Gigawatt
HUP	Home Upgrade Program
IOU	Investor-Owned Utility
kW	Kilowatt
kWh	Kilowatt-Hour
LFER	Linear Fixed Effects Regression
LLR	Loan Loss Reserve
LMI	Low- and Moderate-Income
MI	Michigan
MMBtu	One Million British Thermal Units
MSA	Metropolitan Statistical Area
MWh	Megawatt-Hour
NEB	Non-Energy Benefit
NEM	Net Energy Metering
NMEC	Normalized Metered Energy Consumption
NTGR	Net-to-Gross Ratio
NYSERDA	New York State Energy Research and Development Authority
OFB	On-Bill Financing
OBR	On-Bill Repayment
OR	Oregon
PA	Program Administrator
PAC	Program Administrator Cost Test
PACE	Property Assessed Clean Energy
PCT	Participant Cost Test
PG&E	Pacific Gas & Electric
POU	Publicly Owned Utility
PV	Photovoltaic
RE	Renewable Energy
REEL	Residential Energy Efficiency Loan

Acronym/ Abbreviation	Definition
REN	Regional Energy Network
RENU	Residential Energy Upgrade
RFP	Regional Finance Pilot
RIC	Retail Installment Contract
RPS	Renewable Portfolio Standard
SB	State Bill
SCE	Southern California Edison
SCG	Southern California Gas Company
SCT	Societal Cost Test
SDG&E	San Diego Gas & Electric
SoCalREN	Southern California Regional Energy Network
SPM	Standard Practice Manual
TRC	Total Resource Cost Test
UCC	Unified Commercial Code

Table 90. Finance Terms

Term	Definition
Annual percentage rate	Also commonly known as the “interest rate” of a loan
Charge-offs	A declaration by the lender that the debt is unlikely to be collected; part of the loan default process
Credit enhancement	An intervention, policy, or strategy (in the case of REEL, the LLR) that encourages lenders to reduce the APR for loans by supporting repayment in the case of customer default or delayed repayment.
Debt-to-income ratio	A ratio of outstanding debt to income
FICO credit score	A standard rating of creditworthiness
Loan default	Failure to repay a loan
Loan loss reserve	A credit enhancement strategy that reserves a certain amount of money to cover potential losses (for example, defaulted loans)
Loan term	The duration (typically in months) of a loan
Loan origination	The process by which a borrower applies for a loan and is approved by the lender
Loan principal	The original loan amount before interest is applied
Master servicer	Contracted service provider responsible for managing loan enrollment from lenders and the flow of ratepayer funds and data between the IOUs and lender for OBR if added to REEL
Retail installment contract	In the context of EE financing, refers to ability to originate loans directly through a home upgrade contractor
Bank trustee	Contracted service provider responsible for managing the loan loss reserve
Underwriting	The process by which the lender assesses the risk of a loan and provides approval

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