On-Bill Financing Alternative Pathway – Increasing Market Penetration through Scalable EE Financing

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ABSTRACT

Pacific Gas and Electric Company's (PG&E) On-Bill Financing (OBF) program provides qualified, non-residential PG&E customers with a means to finance energy efficiency (EE) retrofit projects under select PG&E EE programs. OBF-Alternative Pathway (OBF-AP) was launched as a High Opportunity Projects and Programs (HOPPS) in 2018 to allow customers to finance qualified EE projects without the requirement to participate in a rebate or incentive program – reducing barriers of customer participation in EE programs and reducing costs for program implementation. Since its launch, OBF-AP has lent over $223M in support of over 1,800 non-residential EE projects. OBF-AP claims energy savings primarily using population-level Normalized Metered Energy Consumption (Pop-NMEC), and supplements with Site-level NMEC and Custom Pathway methods depending on project details and scope.

In this paper, authors share their perspective on the design and impact of the OBF-AP program as a scalable EE financing program. The paper, which is based on a review of a diverse set of projects completed between 2018 and 2023, presents the program design that enables over 400 EE projects annually; lessons learned from the use of Pop-NMEC, site-level NMEC, and Custom savings methodologies; and process improvements implemented by PG&E based on feedback from industry partners, customers, and the California Public Utilities Commission (CPUC). An analytical review of projects and their savings pathways along with associated pros and cons supplement the paper to support project stakeholders in their decision-making process. Finally, the paper outlines recommendations to enhance the quality of project packages, expedite the technical review process, reduce turn-around time, and reduce the gap between submitted and approved energy savings.

Introduction

Over the last 30 years, market analysts and policy makers have been investigating the most impactful barriers of implementing energy efficiency programs, despite their apparent benefits. Through a review of available research outcomes and published works, experts have identified five interrelated categories:

a) Classical market failures, such as imperfect information, split incentives, and transaction costs
b) Institutional, such as a lack of supportive government policy or coordination, conflicting guidelines, or standards
c) Technical, such as low rates of innovation or inadequate technology
d) Motivational, such as bounded rationality or conflicting values

e) Financial barriers, such as hidden costs, access to capital, lack of appropriate financial products, consumer heterogeneity, volatile or artificially low energy prices, and uncertainties.

Of these, financial barriers pose a significant hurdle to mobilizing capital for EE projects and particularly hinder the development of viable financial instruments specialized for EE projects (Hill 2019).

Over the past several decades, several innovative EE financing program designs have emerged with the intent of reducing the upfront costs for EE improvements and assisting owners in the residential and commercial building sectors in achieving maximum energy savings. For instance, Property Assessed Clean Energy Financing (PACE Financing), which is currently enabled in 37 states and the District of Columbia, was designed in 2010 to help cities reach climate goals and property owners pay for the upfront costs of green initiatives. Commercial PACE (C-PACE) and Residential PACE (R-PACE) programs account for $489 million and $366 million, respectively, of energy efficiency lending, around 13% of the total.[1] Utility financing programs (on- and off-bill) account for $424 million of the annual energy efficiency lending, or just over 6% of the total programs administered nationally (Henner 2020).

To increase the market penetration of energy efficiency projects, PG&E offers EE financing through the OBF program. In this study authors provide detailed information about the design and implementation of an effective OBF program and share lessons learned over the years. Implemented process improvements derived from stakeholders' feedback complement the study to support design and implementation of similar programs across the US and beyond. Finally, this paper is augmented by an analytical review of projects and their savings pathways along with their associated pros and cons.

OBF-AP Program Design

OBF generally refers to a financial agreement between a customer and a utility company to encourage energy efficiency improvement. OBF allows the customer to repay the loan on the monthly utility bill. Advantages to OBF include the ability to leverage a utility's unique relationship with energy customers to provide convenient access to funding for energy efficiency investments and allows the customers to pay back part or all of the cost of their EE improvement with the money saved on their monthly utility bill (Bell, Nadel and Hayes 2011). Currently, more than 110 utilities (public and investor-owned) and rural electric cooperatives offer OBF programs throughout the United States. Environmental and Energy Study Institute has an interactive map that can be explored to learn more about each of these programs.[2]

In 2007, the California Public Utilities Commission (CPUC) issued Decision 07-10-032,[3] which directed California investor-owned utilities (IOUs) to "propose on-bill financing programs for institutional customers for the 2009-2011 program cycle and to continue to investigate programs for other sectors". In response, PG&E launched its first OBF program in 2011, which provides 0% interest financing for projects that receive an incentive through one of PG&E's non-

[1] https://www.energy.gov/scep/slsc/property-assessed-clean-energy-programs
[2] Additional information can be found at: https://www.eesi.org/obf/map.
[3] See Decision 07-10-032: https://docs.cpuc.ca.gov/published/Final_decision/74107.htm

residential EE programs. Loans issued by OBF grew from $551,008 in 2011, to $24M in 2017, demonstrating the market demand for EE project financing.[4] Following the approval of Assembly Bill 802 in 2015, and the CPUC's subsequent "Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs or Projects", PG&E filed[5] and received approval for OBF Alternative Pathway (OBF-AP), which expanded the existing finance offerings to support all qualifying energy efficiency projects, regardless of participation status in rebate or incentive programs.[6] The program design of OBF-AP includes:

- 0% interest financing for loans ranging from $5,000 to $4M per premise, with loan terms up to ten years
- Monthly payments are included on the customer's energy bill and are calculated based on the estimated energy cost savings resulting from the EE project

When PG&E launched OBF-AP in 2018, it sought to test the theory that OBF alone is an incentive that can support customers' investments in EE to deliver incremental EE savings to traditional rebate and incentive programs. The data collected over the past six years of OBF-AP's history supports that theory. OBF-AP's loans issued have grown from $1.2M in 2018 to $53.4M in 2023, while OBF's loans issued to projects also receiving an incentive decreased from $36.5M in 2018 to $3.9M in 2023, as shown in the Figure 1. This trend was also motivated by policies PG&E put in place to increase the demand for OBF-AP, including implementing a $250,000 loan limit for OBF loans combined with incentives (compared to up to $4M loan limit for OBF-AP), and highlighting a simpler, faster QA process for OBF-AP projects, which is described later in this paper.

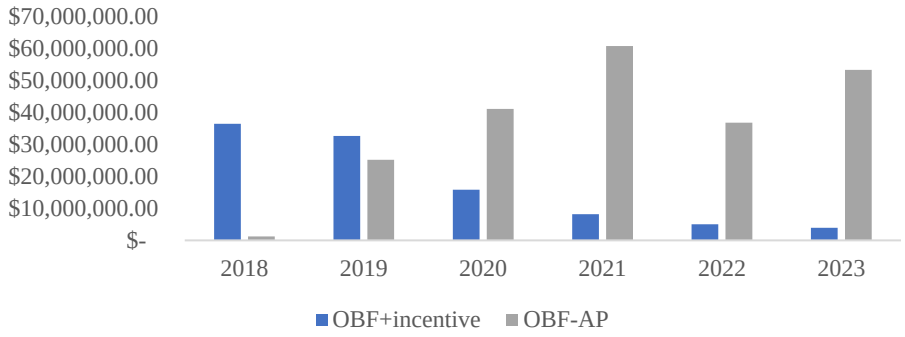

Figure 1: Loans issued to OBF compared to OBF-AP

A recent impact evaluation of program year 2018-2019 California Statewide On-Bill Financing, conducted by Opinion Dynamics under contract with the CPUC, found that for projects that received an incentive and an OBF loan, the customer cited the loan as more

[4] References to loans issued and repayments by year throughout this paper refer to fiscal year, January 1 through December 31. PG&E's energy efficiency annual reports, with data by program year, can be viewed at: https://cedars.sound-data.com/documents/standalone/list/
[5] https://www.pge.com/tariffs/tm2/pdf/GAS_3697-G-A.pdf
[6] OBF-AP Program Implementation Plan can be found at: cedars.sound-data.com/documents/download/2614/main/

influential in their decision to pursue the project (Opinion Dynamics 2023). In addition to increasing customers' access to affordable capital, OBF-AP's success can also be attributed to the scalability of the business model. This section will present four primary aspects of the program design that enable the scalability: robust trade pro network, external quality assurance system, population NMEC methodology, and revolving loan pool. These aspects are elaborated below.

Trade Pro Network

PG&E maintains a Trade Pro Alliance,[7] which is a network of approximately 30 active trade professionals that develop and/or install EE projects. This network serves as a non-contractual relationship where qualified independent contractors develop expertise on OBF-AP program design and policies. This expertise enables them to support customers through the loan application process and develop qualified projects. Members of PG&E's Trade Pro Alliance must meet the following requirements: have a valid California business license, have a valid C10 or C20 contractor's license, pass an annual online OBF training with minimum score of 90%, and complete at least two OBF-AP projects per year. This structure enables any contractor that meets these requirements to incorporate OBF-AP as part of their business model. This system is a significant factor in OBF's scalability, as previous financing offerings were only available to customers working with vendors which were contracted to implement PG&E's rebate and incentive programs.

PG&E's Trade Pro Alliance consists of a variety of trade pros ranging from small independent contractors to large Energy Service Companies (ESCOs). In an effort to make OBF-AP a viable program for smaller trade pros with less engineering resources, PG&E implemented a tiered system for classifying project complexity and developed several tools to streamline project documentation for single-measure, smaller, and less complex projects. The majority of OBF loans are issued for projects developed by Trade Pros,[8] with Trade Pro projects consistently utilizing between 43-59% of PG&E's loan pool over the past six years, as shown in Figure 2.

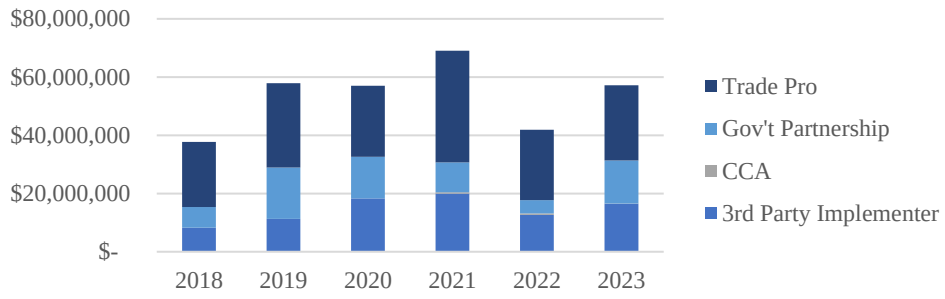

Figure 2: Loan pool usage by market channel

The shift to allowing an open network of trade pros to use OBF-AP enables these companies to independently incorporate the program into their business model and market OBF-

[7] See PG&E's Trade Pro Alliance website: https://www.pge.com/en/about/doing-business-with-pge/trade-professional-alliance.html

[8] See PG&E's Energy Efficiency Annual Report for more information: https://cedars.sound-data.com/documents/standalone/list/

AP to PG&E customers. It represents a mutually beneficial partnership, where Trade Pros are able to offer zero-interest financing to their qualified customers, and PG&E receives quality energy efficiency projects for minimal program implementation costs.[9] The recent statewide OBF impact evaluation noted the key role that project developers play in customer awareness of OBF, and the influence they have on a customer's decision to undertake an EE project. The evaluation found that 57% of survey respondents first heard about the program through a contractor or project developer, and stated they would have been unlikely to apply for an OBF loan if their project developer hadn't mentioned it (Opinion Dynamics 2023).

Quality Assurance System

PG&E's OBF-AP program supports approximately 400 projects annually. In order to ensure that the projects meet OBF-AP requirements, PG&E implemented a system of external quality assurance (QA) providers that review project documentation submitted by the project developer during both pre-install and post-install. This QA process leverages a third-party project certification facilitated by the Investor Confidence Project (ICP), which is an underwriting standard sponsored by the Environmental Defense Fund. The ICP-certified QA firm then validates that the project savings estimates for OBF-AP projects have been independently reviewed. The QA reviewers are ICP-certified and are kept up-to-date on OBF-AP policies. In the OBF-AP program, project certification states that the project was installed, the documentation was performed in accordance with the program framework, and the calculations, data, and project documentation are complete and accurate.

This QA system benefits customers by providing confidence in the quality of their EE investment and enables financing for some measures that may not otherwise be eligible for a rebate or incentive program. Customers benefit from incremental energy savings that are validated by the oversight of external QA reviewers. Lastly, Trade Pros benefit from the ability to sell a more holistic project to customers as well as the opportunity to select which QA reviewer to work with from a large network of ICP-certified engineering firms.

For smaller projects, (considered Tier 1A in PG&E's tiering system), the QA process is automated using industry benchmarks to ensure that transaction costs do not preclude the participation of smaller customers. PG&E provides a standard workbook for the project developer to complete, which uses California Commercial End-Use Survey (CEUS) data to validate estimated energy savings.

Population-level NMEC

In order to verify energy savings of projects financed by OBF-AP, OBF-AP leverages pop-NMEC measurement and verification (M&V) methodology. Pop-NMEC projects are aggregated in cohorts and project performance is measured across the population, as opposed to Site-level NMEC or Custom pathway where M&V must be performed for each individual project. Pop-NMEC M&V method is less onerous for project developers and improves

[9] This is supported by the high Program Administrator Cost (PAC) ratio of the OBF-AP program. The PAC test is a useful metric for comparing the benefits of the EE portfolio to the costs of running the portfolio since it excludes participant costs. View OBF-AP's PAC by program year at: https://cedars.sound-data.com/programs/PGE210911/details/2023/?include_c_n_s=true

customers' EE investment experience, ultimately increasing market penetration by providing an opportunity to capture EE investments that may not have otherwise been pursued.

To launch OBF-AP as a Pop-NMEC program, PG&E included an up-to-date program-level M&V plan in the Implementation Plan filings to CPUC.[10] In this program, measurement methods and calculation software are determined before the program starts (and not subsequently changed) and apply to all sites in a uniform fashion. In addition, Population-level NMEC program designs must meet or exceed the predictability threshold explained in the NMEC Rulebook (CPUC 2020).

Opinion Dynamics' recent OBF impact evaluation cited the Pop-NMEC method as a key component to the success of OBF-AP: "OBF-AP fills gaps in the EE marketplace. The relative ease of application and relatively streamlined approval process compared to the custom rebate pathway, combined with the increased flexibility of measures that can be funded through the program compared to the deemed rebate, allows project developers to sell a holistic project to a customer while providing them a way to pay for the project on a reasonable timeline." (Opinion Dynamics 2023).

OBF-AP's annual Pop-NMEC cohort is submitted as a savings claim based on estimated energy savings in the year of project completion, and a savings claim true-up is filed the following year based on the normalized metered results of the 12-month performance period. Further details on implementing a Pop-NMEC program are described later in this paper.

Revolving Loan Pool

OBF program leverages a ratepayer-funded revolving loan pool, which allows the funding to be leveraged multiple times, increasing the effectiveness. After PG&E issues an OBF loan to a customer, the customer proceeds to make monthly payments until the loan is paid in full. These returned funds are then re-issued to fund another EE project, as demonstrated by Figure 3. This allows OBF to perpetually fund new projects and differs from traditional incentives in that ratepayer funds are recycled to yield incremental EE savings multiple times.

PG&E safeguards these ratepayer funds by requiring customers to pass a credit screening to be eligible to apply for an OBF loan. The customer must demonstrate creditworthiness as determined by a review of the previous 12 months of PG&E bill payment history. After the loan has been issued, repayments appear as a line item on the customer's monthly energy bill, and failure to make monthly bill payments may result in interruption of energy service. This protocol has proven to be effective at ensuring OBF loans are repaid timely, as OBF has a current default rate of less than 1% of loans issued.[11]

[10] View the OBF-AP Implementation Plan and M&V Plan at: https://cedars.sound-data.com/programs/PGE210911/details/2023/?include_c_n_s=true

[11] PG&E's most recent Energy Efficiency Annual Report (program year 2022 at the time of this paper) with publicly-reported default rates can be viewed at: https://cedars.sound-data.com/documents/standalone/list/

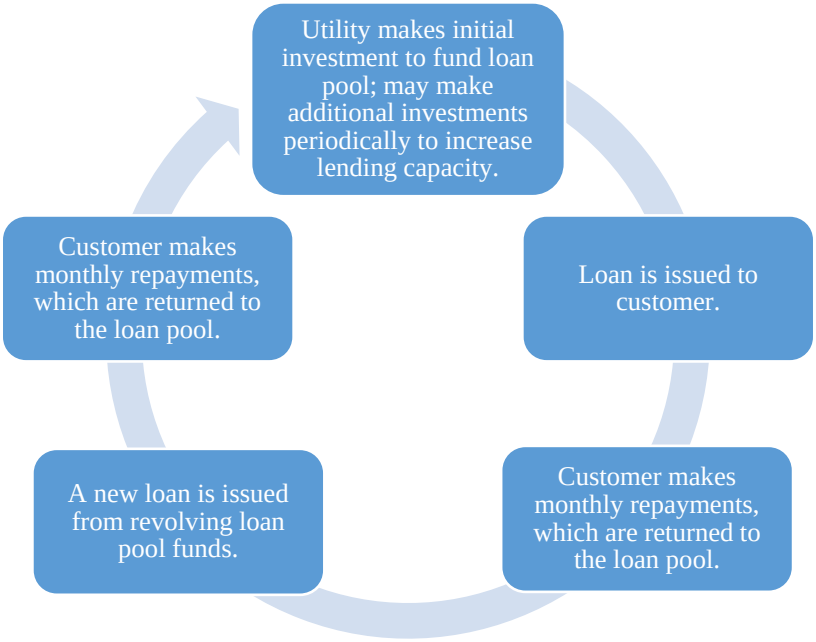

Figure 3: Revolving loan pool cycle

Evolutions and Improvements

Offering financing programs is essential to promote the energy efficiency upgrades and installation of energy conservation measures. Studies show that offering specific, nuanced education efforts, preferably in small group settings, to program stakeholders such as property owners, developers, consultants, and contractors, can positively contribute to the success of the program (Leventis and Deason 2023). In 2011, Hayes et al. conducted research on the existing OBF programs and summarized the results and lessons learned from energy efficiency finance programs that have moved beyond initial start-up phase (Hayes, et al. 2011). To maximize energy savings, achieve deep retrofits, and boost the program cost-effectiveness, they made multiple recommendations including:

- Packaging loan programs with utility incentives and rebates
- Offering tier program benefits to incentivize greater energy savings
- Training participating contractors to ensure the credibility of the program and the achievement of energy savings

Along with other best practices and lessons from similar programs, PG&E's OBF team has adopted these recommendations over the years and each of these has become a crucial piece of the program and contributed to its success.

Combining Loans and Utility Incentives

OBF is available for all projects that are claiming a PG&E incentive with the requirement that the maximum OBF loan amount for these projects is capped at $250,000. Projects that claim an incentive must follow the measure eligibility criteria and procedures in those programs and

the OBF loan process. The ability to combine an OBF loan and EE incentive provides additional support for smaller EE projects and broadens the program outreach to smaller customers who often experience increased capital constraints. Once installation of all equipment is complete, customer or contractor submits all necessary rebate and/or application materials to the appropriate rebate and/or incentive program prior to submitting the post-installation OBF application materials. The OBF team will determine the final loan terms based on the total cost minus paid incentives to ensure the loan is within a ten-year payback and equal to or less than $250,000. Buy-downs may not exceed 30% of the total costs. As discussed earlier in this paper, PG&E has observed a gradual decrease in projects seeking to combine a PG&E incentive and an OBF loan.

Tiered Program Approach

OBF can support EE projects that vary in size and complexity. The tier system provides a guideline to help project developers understand the information, associated cost, and expected level of detail and effort typically required to be accepted for OBF. The tiers are as follows:

- **Tier 1 projects.** These typically consist of small, simple measures, such as lighting retrofits, that do not fundamentally change building design. Typically, there is no more than one measure type implemented and it uses energy calculation methods that don't require an energy model. Energy efficiency measures (EEMs) are limited to single system measures or "one-for-one" replacements. Tier 1 projects are required to undergo QA review as described earlier in this paper.
- **Tier 1A.** Launched in 2021 to encourage small- and medium-size business customers (and contractors that serve them) to complete EE projects. These projects are typically single measure one-for-one replacements that involve little to no redesign and have little to no interactive effects. They do not require a full QA review, but instead utilize a PG&E-developed workbook and industry benchmarks to validate estimated energy savings. These projects are randomly selected for inspection to ensure Trade Pro adherence to program policies and guidelines. This streamlined process eliminates QA costs and makes OBF-AP accessible for smaller customers and smaller EE projects.
- **Tier 2 projects** include measures that cover multiple systems and system types or may involve limited redesign and multiple complex measures for one building system with limited interactive effect. Typically, there are three or more measures implemented. EEMs may be "one-for-one" replacement for multiple system and system types or may involve some redesign and multiple complex measures for one building system. Tier 2 projects require a full QA review of the project before loan approval is granted and at post-install stage.

Trainings

Trainings have been a key part of the program delivery process throughout the evolution cycles of the program. To begin with, all new and current project developers are required to complete the OBF online training with a 90% passing grade. In addition, OBF team hosts monthly “office hour” calls and sends out periodic program updates to keep the community up to

date about the recent changes in the policy, technical requirements, or simply share best practices to assure the quality of project submissions. Moreover, the team holds online/in-person training sessions annually to share insights from all program stakeholders, including program implementation team, PG&E Policy team, Quality Control and Communication (QC&C) team and more.

OBF-AP Prescreening Process

In February 2021, PG&E's QC&C team established a project prescreening process. The main objectives of this process were:

- To assure the projects claim the savings using the best path between Pop-NMEC, Site-level NMEC, and Custom
- To avoid having an ineligible project in a Pop-NMEC OBF-AP cohort
- To increase the visibility on the total resource cost (TRC),[12] and starting in 2024, Total System Benefit (TSB), when approving loan cap increase for larger projects,
- Avoiding projects with large baseline energy usage that can potentially have negative impact on the entire cohort.

TSB captures the monetary value of the full range of benefits of an EE intervention to the electric and gas systems over its full lifecycle. TSB was adopted for California IOU portfolio goal metric starting in 2024, replacing kWh, kW, and Therm savings goals, by CPUC decision D.21-05-031.[13] This Decision orders that beginning in 2024, EE goals will be set in a single metric, TSB.

Since the start of the prescreening process, PG&E's QC&C team, in collaboration with the OBF team, has been working closely with CPUC staff on an Early Opinion (EO)[14] about adding this process to OBF-AP projects with larger than $250,000 loan amount. The first version of this EO was submitted on 06/09/2022 and after multiple rounds of review and response, the OBF Prescreening Process was approved on 05/25/2023. The OBF Prescreening Process and its approval through EO by CPUC have enabled PG&E to broaden its intake and accept projects that would not be a good fit to OBF Pop-NMEC cohort of projects by instead leveraging either Custom or Site-level NMEC path. This has increased the number of projects OBF can support while simultaneously increasing savings claim accuracy for the PG&E portfolio.

At a high level, the OBF prescreening consists of:

1. Eligibility check: Project/measure eligibility check for NMEC/OBF-AP,
2. Cost-effectiveness check: Running CPUC's Cost Effectiveness Tool (CET)[15] to calculate NoAdmin TRC cost and TSB

[12] Total Resource Cost is a measure of the societal benefits of a product (or cost-effectiveness for the utility). The equation is a ratio of the benefits divided by the cost.
[13] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M385/K864/385864616.PDF
[14] Early Opinion reviews allow the PAs to request clarification from CPUC staff of custom project related CPUC policies or rules before submitting a project.
[15] https://cedars.sound-data.com/cet_ui/cet-user-guide

3. Predictability check: Fitting a regression model on 12-month pre-install energy usage data using nmecr. Nmecr is a R-based model that has been extensively used in PG&E's NMEC projects and it is capable of developing Time-of-Week (TOW), Time-Of-Week and Temperature (TOWT), Simple Linear Regression (SLR), 3P Cooling, 3P Heating, 4P Change, 5P Change, Heating Degree Days (HDD), Cooling Degree Days (CDD), and HDD-CDD models (Kialashaki and Erlenbach 2022).
4. Homogeneity check: The size of baseline usage of each individual project should not exceed 4% of the program's counterfactual usage.
5. Filling in a checklist that includes measure eligibility screening, NoAdmin TRC, site energy usage as a percentage of OBF portfolio counter factual usage, results of predictability analysis on the baseline data.

The Figure 4 shows the flowchart of the baseline predictability analysis.

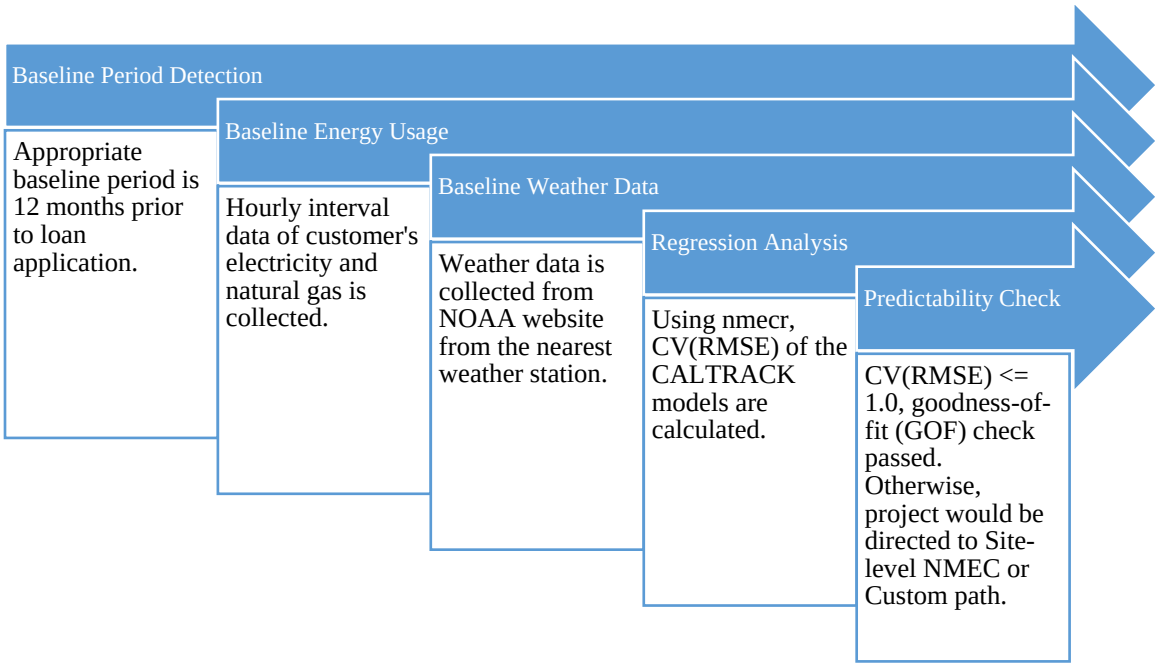

Figure 4: Predictability analysis flowchart for prescreening.

While the OBF-AP's main program delivery method is Pop-NMEC, the results of the prescreening process may yield a savings claim other than Pop-NMEC (explained in the Figure 5). These projects which are not a fit for Pop-NMEC, are directed to Site-level NMEC or Custom path. The graph below illustrates the decision-making process to select the most appropriate path to calculate the energy savings.

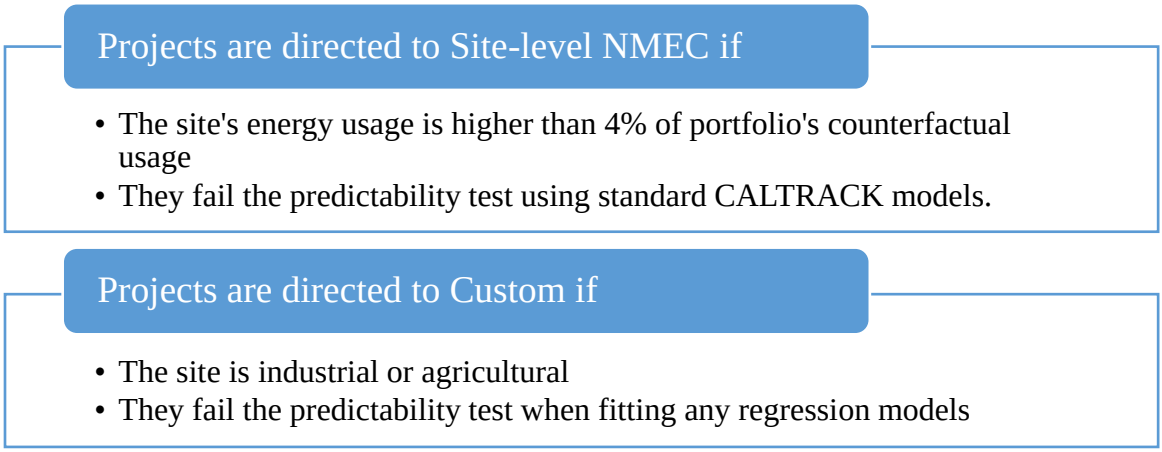

Figure 5: Decision-making process to direct projects to the appropriate path

For more information about the CALTRACK methods, please visit the CALTRACK website.[16] The Figure 6 outlines the differences between Site-level NMEC vs Custom path.

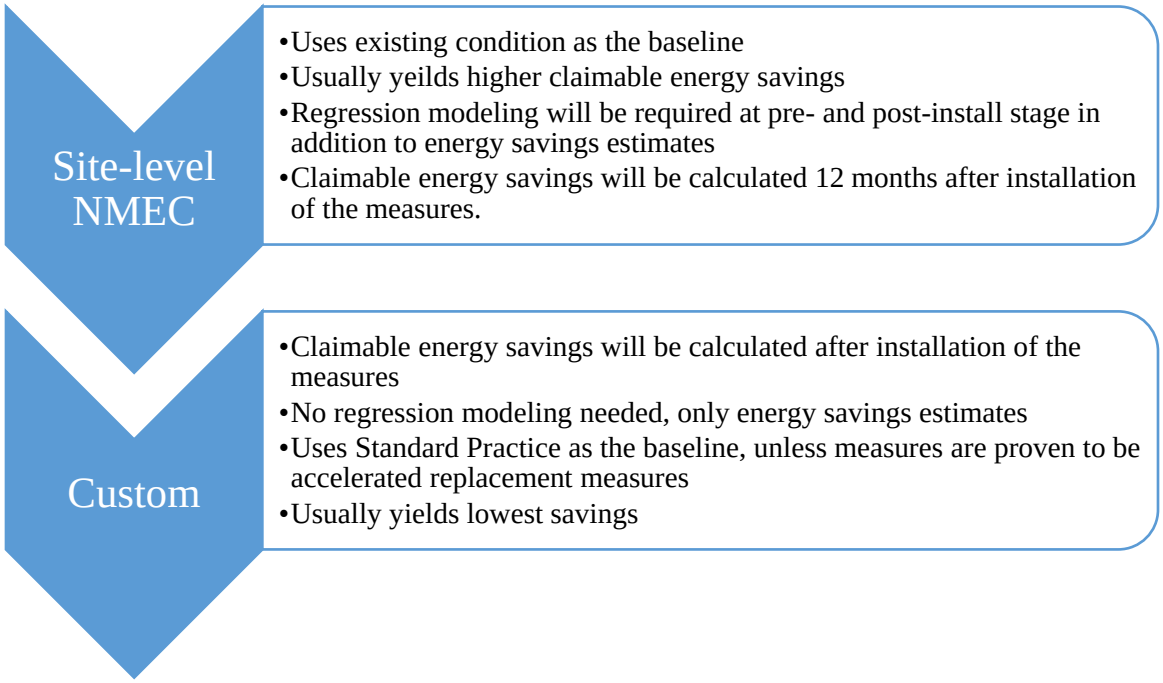

Figure 6: Differences between Site-levelNMEC and Custom savings methodology

[16] https://docs.caltrack.org/en/latest/methods.html

Analytical Review: Lessons Learned

PG&E orients all work around three primary goals related to People, Planet, and Prosperity.[17] This includes the effort to maximize results of the EE ratepayer dollars in order to promote a healthy environment and carbon-neutral energy system for all Californians. As such, QC&C Meter-based team and OBF team have focused on providing a safe and smooth process for customers to invest in EE projects and reliably observe the energy savings on their meters. Based on review of implemented OBF projects in PG&E territory since 2020, the following process improvements were made to assure progress towards achieving PG&E's goals:

Onboarding an M&V Consultant

Since the establishment of the prescreening process in 2021, QC&C team has reviewed more than 120 projects. The graph below shows the outcome of this screening.

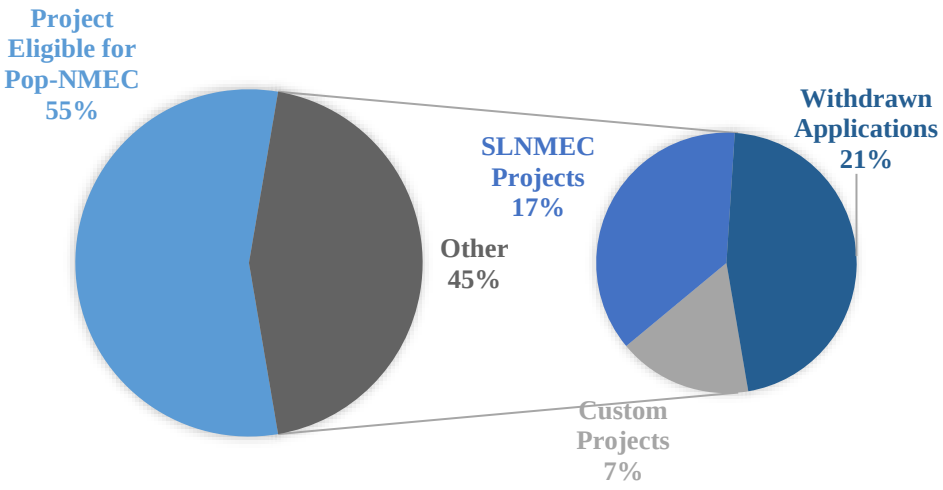

Figure 7: Analysis of the impact of OBF prescreening on projects path.

As Figure 7 shows, 45% of the projects that went through the prescreening were found to be ineligible for Pop-NMEC path. Those projects were directed to Site-level NMEC or Custom path, depending on the project sector, and availability and predictability of baseline data usage. Our investigations show that of the projects that were screened out of Pop-NMEC, 47% withdrew their project, and never submitted a new application under Site-level NMEC or Custom pathways as recommended by the original prescreen.

Knowing that these were larger projects (with potential OBF loan of $250,000 or greater), opting out of the OBF-AP program has had a considerable impact on the programs' savings and customer engagement. After careful review and root cause analysis of opted-out projects, QC&C team decided to leverage program funds to hire an M&V provider/consultant to

[17] For more information on PG&E's mission, see PG&E's stands at: https://jobs.pge.com/about-us#:~:text=Pacific%20Gas%20and%20Electric%20Company%20(PG%26E)%2C%20a%20subsidiary%20of,companies%20in%20the%20United%20States.

help the program participants successfully navigate the more challenging project channels and increase the likelihood of a successful project by assisting with the project development and criteria needed to participate in the Site-level NMEC or Custom pathway.

The scope for the M&V consultant includes:

- **Project screening**: after receiving necessary information about the scope of the project and 12 months of baseline energy usage data, the consultant will deliver an M&V plan, baseline regression models, and modeling details including independent variables.
- **Performance period**: during the 12-month performance period, the M&V consultant will provide ongoing non-routine event detection during implementation and reporting period with implementer notifications. To operationalize this stage, PG&E team will provide customer's energy usage data on a regular cadence and implementer's contact information.
- **Final savings estimation**: upon completion of the 12-month performance period, the M&V consultant creates the final NMEC deliverables for each site that includes regression models, model outputs, and an updated site-level M&V plan.

This process improvement has begun in 2024, and the PG&E Meter-based team anticipates having the process improvement metrics by the end of 2026.

Post QC Review

In addition to the ICP-certified QA firm that reviews projects, the PG&E QC&C team also selects OBF-AP projects for an additional review after project completion and loan payment. This selection process is probability-based random sampling and is intended to provide feedback to the ICP-certified QA firms and ensure the projects are:

- Adhering to OBF Program requirements
- Protecting customer (bill neutrality)
- Verifying accurate savings estimates to reduce impact to PG&E portfolio
- Making continuous OBF program improvements by identifying deficiencies in the QA and implementing additional training and/or providing program updates to the participants

For this effort, PG&E's QC&C team selected a sample of projects from each QA firm. For each selected project, the following checks were done:

- **Eligibility checks**: does the project meet the requirements to participate in the program? Does the project meet the requirements for the selected savings claim path?
- **Savings estimates review**: a detailed review of energy savings calculations and engineering assumptions.

The QC found that in more than 47% of the reviewed projects, the estimated electricity usage of the existing lighting system[18] exceeded the California CEUS data. This could be due to:

- Overestimating the operating hours of the lights, knowing that in 47% of the projects, the QA provider was unable to verify the claimed operating hours.
- Using inaccurate wattage of the existing lights. It is important to note that only 23.5% of the projects had evidence to show the wattage of existing lights.

The outcomes of this random QC lead the team to increase scrutiny in review process and increase the rigor and frequency of Trade Pro and QA provider trainings.

Conclusion

This paper aims to lay the groundwork for standing up a successful, scalable EE financing program. In this paper, authors provided insight to the creation and evolution of PG&E's OBF-AP program since 2018, along with most up-to-date information on current program designs, implementation, and quality control features in PG&E territory. Authors also provided a description about the savings claim pathways leveraged in the program in PG&E along with pros and cons of each path. With several years of managing a successful financing program and providing quality control for Meter-based and Custom projects, this paper took a deep dive into prescreening as a means of avoiding material eligibility and compliance risk in larger projects of the program portfolio. The prescreening has enabled the program administrator to successfully direct projects to the appropriate pathway based on the customer type, size of the baseline, and predictability of the site's energy usage. The authors provided practical recommendations to address the issues observed in prescreening and random QC of projects in the Pop-NMEC cohort. This paper equips the EE programs stakeholders, such as program managers, project developers, and technical reviewers with essential tools they need to move towards helping the customers with their EE projects using EE financing. Finally, authors bring light to current challenges in OBF projects and what could be done to overcome those challenges.

It is important to note that the recommendation list is not an exhaustive list and is limited to the findings of projects subject to this paper's review. Although the discussions provided in this paper focus on PG&E's OBF-AP program, it can offer valuable insight to decision makers and managers of EE programs in other states and countries.

Acknowledgements

Administering a program of this scale requires a robust team effort. Several teams within PG&E play important roles in the success of the program, including:

[18] This is provided as an example of an EE measure included in an OBF project. All measures are reviewed in the selected project.

- **Meter-based and Custom Platform Quality Control and Communications**, which perform project pre-screening, support Site-level NMEC and Custom projects, coordinate M&V for the program, and facilitate CMPA posting as required.
- **OBF Application Managers**, who process loan applications and issuance.
- **OBF Program Managers**, who facilitate eligibility screening and project workflow, implement program policies, administer trainings for project developers, guide internal and external stakeholders in the program details, report OBF-AP energy savings and loan pool utilization data, and monitor reserved funds and revolving loan pool balance.
- **Trade Pro Managers**, who administer PG&E's Trade Pro Alliance, serve as trade pro account representatives, and ensure Trade Pro Alliance requirements are met.
- **Customer Relationship Managers**, internal Account Management team, who educates customers on the program, support them through the initial credit screening process and serve as the customer's primary point of contact at PG&E.
- **EE Reporting and Policy**, which supports OBF's regulatory reporting and policy landscape.

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