

Evaluation of the On-Bill Financing - Alternative Pathway, PY2018-2019

FINAL REPORT

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Executive Summary

The PG&E On-Bill Financing (OBF) program offers no-interest financing for energy efficiency improvements, repaid on the utility bill. In 2018, PG&E launched OBF-Alternative Pathway (OBF-AP), which gave participants an option to participate in OBF without applying for PG&E rebates. PG&E commissioned this study to assess the net-to-gross-ratio (NTG) for OBF-AP projects completed in program years 2018-2019, and to obtain feedback from early participants on their experience.

OBF Program Overview

OBF is offered by the four large California investor-owned utilities (IOUs) to cover nonresidential customers' upfront energy efficiency project costs. A minimum of \$5,000 is loaned at zero percent (0%) interest with the cost recovery through a customer's utility bill.¹ Initially OBF loans were offered as a supporting program for PG&E rebate and incentive programs. Customers would obtain an incentive and the OBF loan would be available for the remaining cost of the project. PG&E launched OBF-AP in 2018 to allow customers to access OBF financing without participating in rebate and incentive programs, granting them greater flexibility in accessing OBF for their project and reducing barriers to participation. OBF-AP also offers higher loan amounts, up to \$4 million instead of the previous cap of \$250,000.² The original design, that combined loans up to \$250,000 with rebates, continued to be available to customers as the "OBF with Rebates" pathway.

Customers seeking OBF for their project must work with an industry professional (PG&E representatives, project developers, and contractors) to begin the application process. This ensures a trained professional will be involved to manage the assessment of projected savings from each project, which serves as the basis for determining loan terms and conditions. The project developer or contractor models energy savings from a project and submits those calculations to a third-party engineering firm that participates in the Investor Confidence Project (ICP) network for a quality assurance review. Once the review is complete, PG&E issues a loan agreement to the customer, with loan terms structured so that the customer's combined average energy charge and loan payment following project completion is equal to or less than the average energy charge prior to installation. The loan period is set to be no greater than the expected useful life of the equipment installed. Loan checks are issued following installation of the project and a post-installation review of the energy savings.

Customer eligibility for OBF financing is based on a payment history screening, instead of traditional credit requirements or collateral as would be expected from a more conventional lender. Customers must show a strong history of paying their PG&E bill to be eligible for the program. Beginning in 2019, customers were also required to stipulate that they had an explicit need for the OBF funds, through a clause included in the loan agreement. OBF-AP was approved as a separate program from OBF with

¹ Decision 09-09-047 adopted statewide terms for OBF loans to be offered by PG&E and the other investor-owned utilities (IOUs).

² PG&E Advice Letter 5517-E, April 3, 2019. https://www.pge.com/tariffs/assets/pdf/adviceletter/ELEC_5517-E.pdf

Rebates, but PG&E marketed the program as an alternative participation option within the existing OBF program. As the new offering demonstrated positive market response, PG&E revised their marketing to promote OBF-AP as the primary pathway (referring to it as simply OBF), while the original option to participate after receiving a rebate became the “OBF with Rebates” pathway.

Findings

Cadmus developed a Financing NTG protocol attuned to the unique impact of OBF-AP on participant decision-making. In drafting the Financing NTG protocol, Cadmus reviewed existing NTG protocols commonly used in the industry and solicited feedback from the Energy Division staff and their evaluators. Using the final Financing NTG protocol, Cadmus developed and implemented in-depth interviews and surveys with 26 respondents, 23 of which provided valid and complete data that informed the NTG analysis. Cadmus targeted the largest participants for in-depth interviews, and reached out to the remainder with an online survey. The in-depth interviews included many of the same questions included in the survey, but also explored the decision-making process for large capital investments, and the influence of the OBF program, in more detail to inform the process evaluation. Table 1 illustrates the survey and interview completes by project type.

Table 1. Survey and Interview Completes

Project Type	Population	In-depth Interview Respondents	Survey Respondents	Total Respondents	Responses Valid for NTG Analysis
Lighting Only	139	1	20	21	18
Non-Lighting	24	2	3	5	5
Overall	163	3	23	26	23

Table 2 presents NTG results by project type. This result is higher than the NTG reported for the original OBF program in the PY2015-2016 evaluation (0.65), and nearly equivalent to the default NTG for normalized metered energy consumption (NMEC) projects (0.95).³ The 23 projects included in the analysis represent 29% of the program ex ante gross savings (MMBtu).

Table 2. On-Bill Financing Net-to-Gross Ratio for PY2018-2019

Project Type	Population	NTG Sample Size	Sample Weight (MMBtu)	Freeridership	PY2018-2019 NTG	Precision (90% Confidence)
Lighting Only	139	18	31,436	1%	0.99	N/A
Non-Lighting	24	5	3,250	48%	0.52	N/A
Overall	163	23	34,686	6%	0.94	±6%

Participant surveys and interviews also provided insights to the participant experience and satisfaction with OBF-AP. Most respondents learned about OBF-AP from a contractor, followed by their PG&E account manager. In addition, most participants (20 of 26) had already started planning their project

³ California Public Utility Commission. RESOLUTION E-4952, October 11, 2018.
<http://www.deeresources.com/files/DEER2020/download/Resolution%20E-4952.PDF>

before learning about OBF-AP, and 15 participants had included the project, or some version of it, in their capital budgets. However, the majority of participants (17 of 26, including 8 of the 15 that had budgeted for their project) also reported they were not confident their organization would have been willing or able to use an alternative funding source if OBF-AP were not available.

Most respondents had a positive experience applying for and receiving their loan, indicating the process, when facilitated by a trade professional, is operating smoothly and not overly burdensome to participants. The majority of respondents reported the application was easy to complete, asked for a reasonable amount of documentation and took a reasonable amount of time to process. Several responses indicated confusion on the part of participants as to whether they received a rebate in addition to financing (five reported they did, although PG&E confirms they did not), or whether rebates were an option for the projects they financed. Some of this confusion may be explained by the fact that OBF-AP participants often had engaged with PG&E on other projects for which they did receive rebates, or by long project development timelines, during which the rebate eligibility for some measures changed. For the most part, respondents reported very few barriers to participating in the OBF-AP program.

Participants did report a number of non-energy benefits from the project they installed, most commonly reduced maintenance, improved comfort and productivity, and increased competitiveness. These benefits were more commonly reported by lighting participants than non-lighting participants. One participant used OBF-AP to help meet local government climate change goals.

Key Conclusions and Recommendations

NTG Analysis

Conclusion: Although the PY2018-2019 measured NTG was very similar to the default NTG for NMEC programs, the wide range of project size and respondent types may cause the NTG to vary year over year. The PY2018-2019 OBF-AP NTG result of 0.94 is nearly equal to the 0.95 NTG deemed for NMEC programs. This result is based on a sample representing 29% of ex ante gross savings and achieves better than 90/10 confidence precision. Although the two values are not directly comparable due to the differences in the program design, the OBF-AP NTG is also 0.29 higher than the evaluated PY2015-2016 NTG ratio for the PG&E OBF with Rebates program. The higher NTG for the OBF-AP program is largely due to the higher NTG scores for lighting projects in PY2018-2019. However, the Financing NTG Protocol allows for scores from 0.0 to 1.0, and individual NTG scores covered this full range. In future years, the savings-weighted NTG may vary significantly based on results from a few large projects.

Recommendation: PG&E should apply this study's NTG value to calculate the net savings claim for OBF PY2018-2019. The program should continue to monitor the variability of NTG, especially for the largest projects.

Conclusion: Although non-lighting projects have a lower NTG, they are important to overall program savings and have not prevented the program from achieving a high NTG. Our analysis found lighting only projects have a substantially higher NTG than non-lighting projects (99% compared to 52%).

Although the difference is greater in PY2018-2019 than in the PY2015-2016 evaluation, the lighting only NTG has consistently been higher than the NTG for non-lighting projects. Survey responses showed that non-lighting projects are more likely to be driven by a need to replace failing equipment, which may contribute to the low NTG. However, non-lighting projects are important contributors to program savings, even accounting for the lower NTG. Non-lighting projects contributed over 50% of program *ex ante* MMBtu savings and 100% of the therm savings despite representing only 24 of 163 (14%) of projects. Non-lighting projects are also more common among government agency participants, which is an important target segment for this program. Because large capital improvement projects can take years to plan and implement, and the loan cap for the program was increased less than two years ago, non-lighting projects may make up a greater percentage of program savings in the coming years.

Recommendation: PG&E should continue to support non-lighting projects, as they are an important source of savings and support a diversity of customer needs. The PG&E Program Manager should consider whether there are potential delivery or marketing strategies that could encourage GA participants to implement capital improvements before equipment fails. Information about the cash flow benefit of an extended-term, 0% loan compared to a shorter-term, market rate loan may be persuasive.

Conclusion: Project acceleration is an important component of how financing incentives generate savings. Six of 12 partial freerider respondents specifically indicated that they would have delayed some or all of their project in the absence of OBF. Accelerated project timing was especially common among government agency (GA) participants (4 out of 8 indicated some level of acceleration), who tended to have larger projects and contributed 48% of the OBF-AP *ex ante* MMBtu.

Recommendation: For future OBF evaluations, continue to use the Financing NTG protocol that accounts for the program acceleration of project timing.

Conclusion: Nonresidential self-report NTG protocols commonly used in California and Illinois are overly complex and calculations do not have sufficient justification. Since any self-report NTG protocol will have limitations, it is important to use a protocol that is easily understandable by stakeholders, defensible at each step and easy to consistently apply year over year. Complexity in NTG calculations should offer significant and measurable benefits relative to the tradeoff of greater difficulty interpreting the result and potential for calculation error, in addition to greater evaluation resource needs.

Recommendation: PG&E and CPUC should carefully review NTG protocols used in other nonresidential evaluations to determine if the issues raised in this study are applicable.

Conclusion: Applying different self-report NTG protocols to the same data appear to lead to very different results.

Recommendation: Since Cadmus had to use proxy data in our analysis, it would be of further interest for a formal study to examine the result of different NTG protocols applied to the same customer, ideally with a larger sample size and incorporating all the features in the protocols reviewed.

Process Evaluation

Conclusion: Participants may require non-energy benefits as well as energy savings in order to accept the incremental cost of high-efficiency equipment. This study found that many participants valued the non-energy benefits from their completed projects at least equally to the energy savings. Interviewee 1 indicated that the non-energy benefits were an important factor for completing the project, even though they were not explicitly factored into the financial analysis. These results indicate that participants may expect or require non-energy benefits from their energy efficiency projects and that even if participants are not quantifying these benefits, they may have an implicit value. Since non-energy benefits are not included in the Total Resource Cost test required to demonstrate program cost-effectiveness, it may be inappropriate to include the portion of measure cost that the participants accepted in order to receive the non-energy benefits.

Recommendation: PG&E should continue to research the role of non-energy benefits in participant decision-making and whether some portion of the incremental cost of high-efficiency equipment is attributable to these non-energy benefits.

Introduction and Research Tasks

Pacific Gas & Electric (PG&E) filed the On-Bill Financing Alternative Pathway (OBF-AP) program in an advice letter on March 25, 2016, as one of its High Opportunity Programs and Projects.⁴ Through OBF-AP, PG&E provides financing with no additional rebates or incentives to its commercial and government customers⁵ to support energy efficiency projects that meet bill neutrality requirements.⁶ OBF-AP customers receive 0% financing with repayments made through the utility bill. Loan amounts are based on the savings determined through the Investor Confidence Project's *Targeted Commercial Protocols*⁷ and can range from \$5,000 to \$4 million.

Although approved as a separate program, PG&E implemented OBF-AP as an alternative participation pathway within their existing OBF program. The original OBF program, active since 2011, offered financing as an add-on to rebates available through other PG&E programs. Projects had to qualify for a PG&E rebate or incentive program to also qualify for financing. Energy savings from rebated projects financed through OBF were attributed to the rebate or incentive program. Based on findings from evaluations and feedback from PG&E account managers and trade allies, PG&E theorized that the 0% financing on its own would be sufficient incentive to convince customers to install energy efficiency projects, and so developed OBF-AP.

This program, offered without rebates, would directly generate claimed savings. Because OBF-AP does not require participation in an existing incentive program, participants can use the program to finance efficiency measures outside those currently offered by PG&E's portfolio. The increased project flexibility was deemed appropriate since staff expected OBF-AP to support more "stranded potential" projects (projects that would otherwise not happen at all) than other portfolio programs. Incentives, on the other hand, are designed to make more efficient projects competitive with less efficient projects (increasing the savings from projects that would happen anyway). The original OBF pathway, now referred to as OBF with Rebates, remains available, but PG&E staff expected OBF-AP to become the more popular pathway.

Because OBF-AP generates savings directly (instead of supporting savings generation by other rebate programs), PG&E proposed an evaluation, measurement, and verification plan in its OBF-AP advice letter

⁴ California Public Utilities Commission. July 12, 2016. *Disposition Approving Advice Letter 3697-G/4812-E, 3697-G-A/4812-E-A, PG&E's On Bill Financing Alternative Pathway Program, as a High Opportunity Program*. https://www.pge.com/notes/rates/tariffs/tm2/pdf/GAS_3697-G.pdf

⁵ Customers must have a good bill payment history and have been a PG&E customer for at least 24 months.

⁶ Projects that meet bill neutrality are expected to result in monthly bill savings that equal or exceed the monthly installment.

⁷ The Environmental Defense Fund's Investor Confidence Project protocols assemble industry-accepted best practices and standards into a consistent and transparent process for project developers to follow. The project includes a set of protocols specific to commercial projects: <http://www.edf.org/sites/default/files/icpfactsheet07132015.pdf>

discussing how it would measure net savings. Since OBF-AP is the first PG&E financing program that will claim savings, PG&E proposed dual methods of determining the net first-year savings. The first approach, conducted by PG&E staff, would use a quasi-experimental design, with a comparison group, and leverage normalized metered energy consumption (NMEC) data for billing analysis across both groups. The second approach would develop a net-to-gross ratio (NTG) based on self-report survey data that would be multiplied by the gross savings determined through the regression model used for the first approach. The NTG would be calculated with an analysis methodology customized to the OBF-AP incentives and delivery mechanism. The second approach would also be combined with a process evaluation.

This study represents the second approach described above. It provides the self-report NTG, and a process evaluation of the OBF-AP program. Cadmus' measurement of NTG factored in freeridership and explored the existence of off-site spillover.⁸ Cadmus developed a financing-specific protocol based on a review of existing methods and consideration of the unique OBF-AP program design. Cadmus also used data from the participant survey to assess key aspects of the program design.

The California Public Utilities Commission Energy Division oversees impact evaluations for the large investor-owned utility demand-side management programs. However, in the Energy Division's Contract Group B Workplan⁹ regarding the evaluation plans for PG&E's OBF program, the Energy Division evaluator said their role will be "to provide oversight of what PG&E is doing to evaluate its own program and verify their analyses to support savings claims and attribution" (p. 123). PG&E and Cadmus shared the research plan and draft Financing NTG protocol with the Energy Division's Group B evaluators and considered their comments in developing the final protocol. PG&E coordinated with the California Public Utilities Commission Energy Division and their evaluation team over the duration of this study to maintain transparency, avoid redundancies, and reduce customer burden.

Research Objectives

Through this study, Cadmus addressed three core research objectives:

- Identify the best methodology for measuring NTG for a financing-only program and estimate the OBF-AP program NTG for program years (PY) 2018-2019
- Determine the motivators of program participation, including the influence of key OBF-AP features (no rebates, a fast application process, 0% interest, and payments offset by savings) and non-energy benefits that result from OBF-AP projects

⁸ PG&E is conducting the NMEC analysis to determine gross savings internally, and will apply the NTG provided by Cadmus to determine net savings.

⁹ Opinion Dynamics. November 30, 2018. *California Public Utilities Commission Energy Efficiency Program Evaluation of the Group B Sectors: Year 1*.
https://pda.energydataweb.com/api/view/2109/CPUC%20Contract%20Group%20B_Research%20Sector%20Workplan%20Year1_2018_1205_FINAL.pdf

- Identify potential barriers to participation and opportunities to improve program performance and the participant experience

Study Tasks

Cadmus reviewed PG&E's program data, reviewed several self-report protocols, developed an OBF-AP specific NTG protocol, conducted a participant survey and multiple in-depth interviews, and analyzed customer responses.

Program Data Review

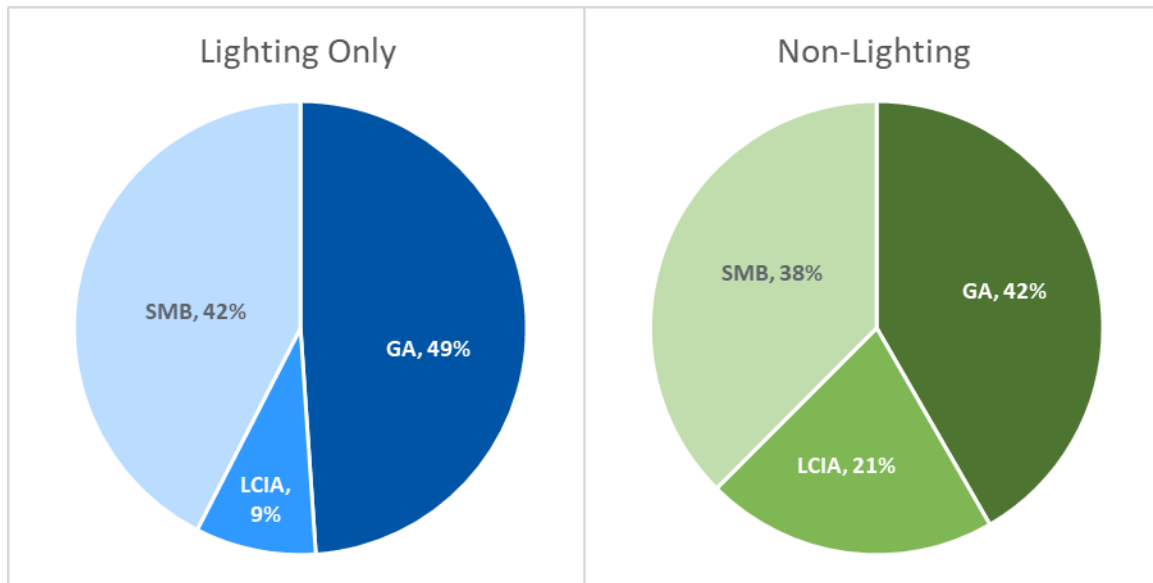
Cadmus received data extracts from PG&E in September 2019 and February 2020, containing 168 loans covering 163 total projects. The program data categorized projects as either lighting only or non-lighting (where the latter may or may not also include lighting measures). The majority of the completed projects were lighting only (139 of 163). Cadmus converted the kWh and therm *ex ante* savings into MMBtu. Projects ranged in total savings from 11 MMBtu to 28,154 MMBtu, with a median of 117 MMBtu. Table 3 summarizes program participation by project type.

Table 3. Participation and *ExAnte* Savings by Project Type

Project Type	No. of Projects	Total MMBtu
Lighting Only	139	57,851
Non-Lighting	24	59,922
Program	163	117,773

In addition to categorizing the project type, the program tracking data categorized participants as government agencies (GA), large commercial/industrial/agricultural businesses (LCIA), or small/medium businesses (SMB). Figure 1 shows the distribution of projects by customer type and project type. Although the program had significantly more lighting only projects than non-lighting projects, the distribution by customer type was similar for both project types.

Figure 1. Distribution of Projects by Customer Type



Cadmus reviewed the program data for clarity and completeness, and to create sample frames for the participant interviews and participant surveys.¹⁰

Participant Surveys and Interviews

Cadmus conducted both surveys and interviews to collect data for the NTG measurement and process evaluation. In-depth interviews with customers with larger projects or multiple projects were designed to collect qualitative information and explore topics in greater depth than could be captured in surveys.

Instruments

Cadmus developed a survey instrument and an interview guide to collect information for the freeridership analysis, as well as feedback on the program experience. The participant survey is available as *Appendix C*, and the participant interview guide is included as *Appendix D*.

The freeridership section, which was identical in both instruments, consisted of a detailed set of scored questions and non-scored questions. The questions were designed to encourage thoughtful responses by breaking down abstract concepts into digestible pieces, cross-checking responses, and asking for clarification or correction as needed where answers were inconsistent. For example, the protocol requires asking respondents if they would have modified measure quantity, efficiency, or installation timing in a no-program scenario. Because efficiency is more abstract and more difficult to assess in a

¹⁰ The sample frame is the contact list used for recruiting respondents for the surveys and interviews, which also includes the project information that each individual will be asked about. To avoid a participant being asked to respond to both the survey and interview, Cadmus assigned all participants to either the interview sample frame or survey sample frame.

counterfactual scenario than quantity or timing, the survey simplifies the concept by relating it to price, asking respondents if they would choose “less expensive equipment that is likely less efficient.”

The participant interview guide included the full set of freeridership questions, as well as open-ended questions that addressed the same process-related subjects addressed in the survey. To minimize potential bias from using two different techniques (surveys and interviews) to gather self-report data, Cadmus began each interview with the freeridership questions, presented exactly as administered to survey respondents. Cadmus then transitioned into a more open-ended discussion, which provided additional depth and detail to inform the process evaluation.

Sampling

Across 163 projects, there were 99 unique contact names, 96 of which had a phone number. The interview and survey instruments asked each respondent about a specific project. To create the sample frames for interviews and survey, Cadmus first randomly selected one project for each unique participant contact in the tracking data. The projects selected for each contact represented 80% of the program MMBtu.

Due to the small number of unique contacts available for outreach, Cadmus attempted a census of all available contacts for either surveys or interviews. We developed a small sample frame of the larger projects for in-depth interviews, then created a survey sample frame from the remaining records. Data in this section are presented by project type to provide a more comprehensive overview, but these project types were not strata within the sample frame.

To create the interview sample frame, Cadmus selected 10 participants who had completed larger projects or who had completed many projects. For interviewees with multiple projects, Cadmus randomly selected one project as the subject of the interview. The final interview sample frame represented a mix of project and customer types, as shown in Table 4. The interview sample frame represented over half of the reported energy savings.

Table 4. Interview Sample Frame

Project Type	Number of Participants				Savings	
	GA	LCIA	SMB	Total	MMBtu	Percentage of Program
Lighting Only	3	0	1	4	28,893	25%
Non-Lighting	4	1	1	6	32,215	27%
Total	7	1	2	10	61,108	52%

Cadmus created the survey sample frame from the remaining unique contacts. Table 5 shows characteristics of the survey sample frame.

Table 5. Survey Sample Frame

Project Type	Number of Participants				Savings	
	GA	LCIA	SMB	Total	MMBtu	Percentage of Program
Lighting Only	22	4	45	71	20,354	17%
Non-Lighting	3	4	8	15	12,574	11%
Total	25	8	53	86	32,928	28%

Data Collection

Cadmus received program data for 69 OBF-AP projects in September 2019 and conducted a set of interviews and surveys in November 2019 based on these data. We received a second set of 94 new OBF-AP projects in January 2020 and conducted a second set of interviews and surveys in March 2020. Between two sets of interviews and surveys, Cadmus completed three in-depth interviews and 23 surveys. We included responses from both survey and interview respondents in the quantitative analysis. Table 6 shows characteristics of the final sample relative to the participant population.

Table 6. Final Participant Survey and Interview Sample

Project Type	Number of Participants				Energy Savings	
	GA	LCIA	SMB	Total	MMBtu	Percentage of Program
Lighting Only	7	0	14	21	31,677	27%
Non-Lighting	2	0	3	5	3,250	3%
Total	9	0	17	26	34,455	30%

Self-Report NTG Protocol Review

To inform development of the Financing NTG protocol, Cadmus reviewed three existing self-report approaches to estimating freeridership:

- Nonresidential self-report NTG methodology developed by the California Nonresidential Net-to-Gross Working Group (Working Group method)¹¹
- PY2015-2016 California Statewide On-Bill Finance Impact Evaluation (OBF with Rebates method)¹²
- The *Illinois Technical Resource Manual* Volume 4, version 7.0 (Illinois TRM method)¹³

¹¹ California Nonresidential Net-to-Gross Working Group. February 20, 2015. *Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers*. Prepared for California Public Utilities Commission, Energy Division. (Not available online.)

¹² Opinion Dynamics. December 31, 2017. *PY2015 California Statewide On-Bill Finance Impact Evaluation*. CALMAC Study ID CPU0181. Prepared for California Public Utilities Commission, Energy Division. [http://www.calmac.org/publications/PY2015 On-Bill Finance Impact Evaluation FINAL.pdf](http://www.calmac.org/publications/PY2015%20On-Bill%20Finance%20Impact%20Evaluation%20FINAL.pdf)

¹³ Illinois Statewide Technical Reference Manual, Version 7.0, Volume 4. September 28, 2018. "Cross-Cutting Measures and Attachments." [https://s3.amazonaws.com/ilsag/IL-TRM Effective 010119 v7.0 Vol 1-4 Compiled 092818 Final.pdf](https://s3.amazonaws.com/ilsag/IL-TRM_Effective_010119_v7.0_Vol_1-4_Compiled_092818_Final.pdf)

The Working Group method is used by the Energy Division and other evaluators for most nonresidential evaluations in California. The OBF with Rebates method, closely based on the Working Group method, was applied in the PY2015-2016 evaluation of the OBF with Rebates program. The Illinois TRM method was developed by another working group of subject matter experts, several of whom also participated in drafting the California Working Group method. Cadmus selected the Illinois TRM method to review as a more recent peer document to the Working Group method. All three methods are variations of the same approach.

Cadmus reviewed each approach to determine which of these methods, or which aspects of each method, were best suited to the unique OBF-AP program design. OBF-AP impacts customer decision making differently than a traditional rebate program because it removes most or all of the upfront cost of a large capital improvement project and then recovers that amount over time, rather than reducing the total project cost but leaving the customer to manage the remainder. Cadmus presented early findings from this literature review to PG&E in a memo (summarized in *Appendix A*). After reviewing the memo and early findings from the study, PG&E asked Cadmus to analyze the NTG resulting from applying the different methods, as well as a fourth method. The fourth method is a revised version of the Working Group approach, used in the evaluation of the 2018 Small/Medium Commercial Sector ESPI Impact evaluation (Revised Working Group method)¹⁴

Cadmus used data from scored and non-scored portions of our survey as proxy inputs for the other methods, then conducted a qualitative comparison of NTG. A summary of these findings is presented in the main text of this report; detailed findings from the comparative analysis are included in *Appendix B*.

Financing NTG Protocol

This section discusses the Financing NTG protocol developed for this evaluation. The findings from the review of alternative protocols that informed this protocol are discussed in the study results.

Guiding Principles

The Financing NTG protocol is a set of freeridership questions and scoring algorithms that measure the substantial impact of financing on the scope and timing of a project, due to removing the upfront cost barrier. It is designed to recognize all ways in which the OBF-AP program might impact project scope or timing, to be compatible with the NMEC gross savings analysis, and to apply a simple measurement concept and scoring methodology that can be readily understood by all stakeholders. The Financing NTG Protocol also meets the Participant Net Impact Protocol criteria outlined in the California Evaluation,

¹⁴ Itron. February 28, 2020 (DRAFT). *2018 Small/Medium Commercial Sector ESPI Impact Evaluation*. Prepared for the California Public Utilities Commission.

Measurement, and Verification Protocols (CA EMV Protocol). These criteria are summarized below for convenience:¹⁵

- Calculates the probability that participant would have adopted the technology in the absence of program
- Determines, if the measure would have been adopted without the program, the proportion of actual savings that were achieved given the program's ability to:
 - Increase the quantity installed,
 - Increase the efficiency level installed, and
 - Promote earlier installation.

Measurement Approach

To obtain the program level NTG, Cadmus calculated the *ex ante* savings-weighted average of the project-level NTGs. Since PG&E intends to quantify gross savings using a meter-based approach, Cadmus measured the project-level NTG without on-site spillover (which would presumably already be counted in meter-based savings), therefore:

$$NTG = 1 - Freeridership$$

The project-level freeridership calculation includes four characteristics of a counterfactual project, multiplied together:

$$Freeridership = W * Q * E * T$$

Where:

- W = A participant's willingness to use a different method of funding to pay for the project, measured as either 0 or 1
- Q = The quantity of measures installed that the participant would have installed without the program financing
- E = The proportion of Q that would have been as efficient as the actual equipment installed
- T = The proportion of Q that would have been installed within 12 months of the actual install date

In other words, freeridership is contingent on a participants' willingness to pay for all or some of the project using another source of funds, and whether that counterfactual project would have generated

¹⁵ TecMarket Works. April, 2006. California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals. Prepared for the California Public Utilities Commission. Available online: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEnergyEfficiencyEvaluationProtocols.doc

the same amount of energy savings on the same timeline as the actual project. To minimize the burden on participants, the willingness (W) question serves as a screen to determine whether to ask additional NTG questions. A participant who says they were not willing or able to use an alternate payment method is not considered a freerider and no more questions are asked. Participants who were willing or able are asked, if they had used an alternate payment method, how that would change the scope (Q and E) or timeline (T) of their project.

Cadmus developed a scoring rubric to translate survey responses into the quantitative variables listed in the equation above (W, Q, E, and T). Table 7 shows the variables with the corresponding survey question and scoring. (See [Appendix C](#) for the full set of questions, including unscored questions.)

Table 7. Financing NTG Protocol Framework

Variable	Description	Survey Question	Response Options	Freeridership Scoring
W	Willingness	How confident are you that your organization would have been willing or able to use a different payment method to fund the project?	a. Very confident b. Somewhat confident c. Not too confident d. Not at all confident	(a, b, or c) = 1 d = 0
If a participant indicates willingness to use an alternate payment method (W =1), the survey presents intermediate questions to ask if the project scope or timeline would have changed if using different funding. The responses determine which of the following counterfactual questions for Q, E, and T to present to the respondent.				
Q	Quantity	You said you would have reduced the quantity of equipment or improvements installed. What percentage of the improvements in your project would you still have installed?	[Percentage: 0% to 100%]	Equal to response
E	Efficiency	You said you would have selected less expensive equipment that would likely have been less energy efficient. Please indicate if all, most, a little, or none of the equipment would have been less energy efficient than what was actually installed.	a. All less efficient b. Most less efficient c. A little less efficient d. None less efficient	a = 0% b = 33% c = 67% d = 100%
T	Timing	Of the equipment you would have installed or improvements you would have made, what percentage would you have installed within one year of the actual project you completed?	[Percentage: 0% to 100%]	Equal to response

For each question, Cadmus used the simplest possible response architecture. The objectives were to limit the need for explanation in the question and limit the need for the respondent to process and understand the structure of the response options in addition to the question itself. We considered that more complex question structures would undermine the respondent's ability to answer accurately, which is already difficult given the hypothetical nature of the question. Adding more complexity could therefore give the appearance of providing more precise information but might in fact degrade the quality of the data (by increasing the likelihood of measurement error).

We limited the scales to either a percentage (0% to 100%), or, where a percentage did not fit well conceptually, a four-point scale. The percentage scale is intuitive and well known to respondents, and there is no need to describe the end-points. The four-point scale is designed to not include a mid-point

that could potentially be falsely interpreted as a neutral option. Scoring for the four-point scale used to measure efficiency (E) is based on four response options distributed evenly across the percentage scale, from 0% to 100%.

For the question about timing, Cadmus selected a one-year timeframe because the study is examining first-year net savings, and because it is a simple question to ask respondents. Timelines beyond a year are, in our opinion, too uncertain and become vulnerable to exogenous factors.

Error! Not a valid bookmark self-reference. presents response examples that illustrate how Cadmus applied the methodology and determined the resulting freeridership score. As these examples demonstrate, the Financing NTG protocol allows an estimate of 0% NTG, 100% NTG, or any value in between.

Table 8. Financing NTG Protocol Scoring Examples

Scenario	W	Q	E	T	FR	NTG
Customer would have paid cash for the project and would not have changed any aspect of the scope or timeline.	1	100%	100%	100%	100%	0%
Customer would have used a business line of credit instead of OBF-AP, would have installed 80% of the measures, and the measures would have been the same models and installed on the same timeline.	1	80%	100%	100%	80%	20%
Customer would have used cash to pay for the retrofit and would have installed the same quantity and level of efficiency, but over five years instead of one year.	1	100%	100%	20%	20%	80%
Customer was not able to pay using a different method.	0				0%	100%

Results and Discussion

Cadmus designed and implemented an NTG measurement protocol for the PY2018-2019 OBF-AP program, and assessed factors that impact the NTG. We also analyze participant feedback on the program design and application process.

Protocol Review Findings

To develop the Financing NTG protocol, Cadmus reviewed literature describing three existing NTG methods: the Working Group method, the OBF with Rebates method, and the Illinois TRM method. (During the reporting phase, we also analysed a fourth method, the Revised Working Group method, which is not discussed in this section.)

Like the Financing NTG method, the other self-report NTG methods we reviewed only consider freeridership in estimating NTG. However, these three methods are each a variation of a type of approach that is significantly different from the protocol Cadmus developed. These methods each incorporate several features that Cadmus did not include in the Financing NTG protocol. Table 9 lists the most important of these features, and shows which ones are included in each of the reviewed protocols. The next section summarizes the rationale for not including these features in the Financing NTG protocol. A more detailed discussion of Cadmus' findings from the literature review, including descriptions of each method we reviewed, is included in *Appendix A*.

Table 9. Summary of Reviewed NTG Protocol Features

Feature	Working Group	OBF with Rebates	Illinois TRM	Revised Working Group
Includes counterfactual and influence factors in scoring	2 influence, 1 counterfactual	2 influence, 1 counterfactual	2 influence, 1 counterfactual	1 influence, 2 counterfactual
Multiple scores averaged for final score	x ^a	x	x	x
Does not give program credit for project acceleration	x	x		x
Downward adjustment to NTG if project planned before learning about program	x	x		x
Potential for double counting – partial freeridership adjustment multiplied by the core score	x			

^a The Working Group method averages a counterfactual and two influence scores in what is called the “core” score.

Counterfactual Scenarios and Influence Factors

Self-report NTG methods ask questions along two primary lines of inquiry. The first line of inquiry investigates a hypothetical scenario (commonly referred to as a “counterfactual”) in which the respondent did not have access to the program and asks how the project outcome would differ. Counterfactual scenarios can be broken down into three ways a project might be altered: the *quantity* of

equipment or materials installed, the *level of efficiency* of the materials or equipment installed, and/or the *timing* of the installation.

The second line of inquiry investigates what factors influenced the participant’s decision and to what extent. This line of questioning usually tries to identify the major decision factors, and identify them as either program related, or non-program related. Program related factors can include the program financial incentive, information provided by the program, recommendations from program partners, etc. Non-program factors include the condition of replaced equipment, the organization’s equipment replacement schedule, non-program financial incentives (e.g., manufacturer promotion), among others. Information about energy savings might be a program factor, if it was new information, while the actual energy savings from the project could be a non-program factor, if the organization was aware of the opportunity for savings prior to participating. Questions try to determine the level of influence of program-related factors relative to other factors that would have been present even without the program.

Cadmus used only the counterfactual line of inquiry in the Financing NTG protocol, because in our view it is inappropriate to include information about factor influences in the quantitative analysis. While virtually all participants will have many reasons for completing a project, often none of these reasons is sufficient by itself. For example, aging equipment, a desire to reduce energy costs, and having access to the program financing may all be equally important factors in a participant’s decision to make an energy efficiency improvement. But even if a customer is influenced by the first two factors, they may be unable or unwilling to fund the project if the third factor, the program financing, were not available. Measuring the influence of different factors therefore is not a measurement of freeridership.

As a result of this logic gap, how influence questions should be scored is not intuitive. The reviewed protocols propose widely different scoring algorithms for similar questions, resulting in significant divergence in the final freeridership score. Two variants of the program and non-program influence scoring are shown in Table 10.

Table 10. Influence by Component NTG Scoring

CA Working Group and Variants	Illinois TRM
$\frac{Max(Program)}{Max(Program) + Max(Non - Program)}$	$\frac{Max(Program)}{Max(Scale)}$

The California based protocols include at least one influence score that uses the highest influence rating assigned to a program factor as the numerator and the sum of the highest program and nonprogram factors as the denominator. Using this approach, any participant that had any motivation for completing their project other than program incentives and information would be a partial freerider. For complex capital improvement projects, that will include almost all participants, and result in artificially low freeridership scores. In contrast, the Illinois TRM uses the maximum scale as the denominator, so if any program component received a maximum influence score then it could overstate attribution. (For a more in-depth review of scoring methods, see Appendix B.)

Cadmus does agree that asking about the influence factors can help a respondent have a more holistic view of their decision-making and may make them better prepared to answer questions about a counterfactual scenario. To take advantage of this benefit, Cadmus included several questions about influences prior to asking the freeridership questions in the participant survey, but these were not scored.

Averaging Multiple Scores

There are several known issues with self-report surveys as a means to measure attribution. For example, counterfactual questions ask how participants would have behaved in a scenario that did not actually occur. It is also difficult for people to accurately remember and assess the relative influence of various factors on a previous decision, especially if the decision was made by several people, or consisted of multiple decision points, spread over time. As a result, all self-report measurement approaches have some uncertainty and potential bias.

To “stabilize” the freeridership measurement of an individual respondent, the four methods Cadmus reviewed all recommend asking about freeridership in three different ways, calculating separate scores from this data, and then averaging the separate scores together. Biases inherent in one measurement will hopefully be mitigated by the other measurements.

However, it is only beneficial to average different values if the values are all measuring the same thing. As described above, the influence of program factors is not a good measure of freeridership. Three of the methods incorporate two influence measurements into their final score, compared to a single counterfactual score, and thus not only include a faulty measurement but overweight it.

Cadmus’ scoring incorporates the responses to several questions, but these are all multiplied to calculate a single score – a single measurement of freeridership – for each respondent. Incorporating additional scores to average with this score may be beneficial, but the basis for those scores must be an observation of freeridership, which program influence is not.

Project Acceleration

“Project acceleration” refers to a project installation that happens sooner than it would have otherwise, due to the program. Increasing efficiency as equipment fails and it replaced with newer technology is normal economic process; the design of most efficiency programs is to increase the *rate* of efficiency improvement. Therefore, accelerated project timing is a key program outcome. The acceleration of savings – enabling the project to occur sooner than it would otherwise occur – is one of the primary ways a large-scale financing program achieves savings, since otherwise the process to obtain funding can be long and complex. More importantly for this study, assessing the program’s impact on project timing is a requirement under the CA EMV Protocol.

Three of the four methods Cadmus reviewed do not explicitly score program impact on project timing. In other words, if a respondent said they would have installed the exact same project, the respondent’s counterfactual score (one of the three scores averaged to calculate the final NTG) is 0. The methods do not ask follow-up questions about *when* the project would have been completed. The Financing NTG

protocol does incorporate project acceleration, so that if 75% of that exact same project would have been installed more than 12 months after the actual project was completed, the project is scored a 0.75 NTG. Accounting for project acceleration tends to increase overall NTG, since it offers an additional way to attribute savings.

Awareness Adjustment

Consistent with the idea of assessing influence factors, the California methods reviewed apply a discount in the calculation of NTG score if the respondent indicates the project was planned before the organization learned about the program. Cadmus did not incorporate this discount factor, because, in particular for a financing program, participant projects may be planned, but unable to move forward due to lack of capital. This idea relates to the idea of project acceleration and reflects Cadmus' contention that one of the primary ways financing programs drive savings is by enabling major projects that the organization could not otherwise afford in the present moment. Consider a government agency with significant deferred maintenance. They may have identified a project need, and even fully scoped the project, only to find out they couldn't get the project approved in the budget due to other competing needs. To say this agency is a freerider because they planned the project before they learned about OBF-AP is not valid.

In summary, the benefits of Cadmus' Financing NTG protocol are that it treats influence factors as explanatory observations, uses a single score for each respondent instead of an average of three complicated scores, explicitly factors in project acceleration, and does not discount NTG based on when the respondent learned about the program.

OBF-AP Net-to-Gross Ratio

To determine the program-level NTG, Cadmus reviewed responses from each survey and interview respondent. We discarded three responses that were inconclusive. We then calculated the average freeridership, weighting responses by total MMBtu savings.

The savings-weighted NTG is 0.94 based on responses from 23 participants with projects representing 29% of the population MMBtu savings. This result is nearly equivalent to the default NTG normalized metered energy consumption (NMEC) projects (0.95).¹⁶ Table 11 shows the NTG results by project type, with the lighting only NTG being higher than the non-lighting NTG. The high lighting-only NTG is largely due to one very large street lighting project (representing 83% of the reported MMBtu savings in the survey sample) that had an NTG of 1.00.

¹⁶ California Public Utility Commission. RESOLUTION E-4952, October 11, 2018.
<http://www.deeresources.com/files/DEER2020/download/Resolution%20E-4952.PDF>

Table 11. On-Bill Financing Net-to-Gross Ratio for PY2018-2019

Project Type	Population	NTG Sample Size	Weight (MMBtu)	Freeridership	PY2018-2019 NTG	Precision (90% Confidence)
Lighting Only	139	18	30,635	1%	0.99	N/A
Non-Lighting	24	5	3,250	48%	0.52	N/A
Overall	163	23	33,885	6%	0.94	±6%

As shown in Table 12, the higher lighting only NTG is consistent with the previous cycle's OBF with Rebates evaluation, and the non-lighting NTG (0.52) is very similar to the previous evaluation values. However, the lighting only NTG is much higher than the previous evaluation values.

Table 12. On-Bill Financing Net-to-Gross Ratio Compared to OBF with Rebates Net-to-Gross Ratio

Project Type	PY2018-2019 OBF-AP NTG	PY2015-2016 OBF with Rebates NTG ^a (Statewide)	PY2015-2016 OBF with Rebates NTG ^a (PG&E)
Lighting Only	0.99	0.69	0.80
Non-Lighting	0.52	0.56	0.49
Overall	0.94	0.64	0.65

^a These NTGs are based on a subset of rebate projects that also received OBF financing.

The extreme weight of the large lighting only project raised the question of whether it is an outlier that should be discarded from the sample. This project is the largest in the program population, followed by another lighting only project with 88% of the savings of the largest project. These two are substantially larger than the next largest project - a non-lighting project - that has 30% of the savings of the largest project. However, this program offers loans that range from \$5,000 to \$4 million (see the *Participant Characteristics* section for more details). Although there are no historic project data to demonstrate this, Cadmus expects the program to have a small number of very large projects each year, relative to the average project, and these projects will always contribute a significant percentage of the program savings.

Freeridership Trends by Project and Customer Type

Cadmus analyzed freeridership trends by project type (lighting only or non-lighting) and customer type (GA or SMB; there were no LCIA respondents in the sample). Table 13 shows the composition of the project type groups by customer type, and vice versa.

Table 13. Distribution of Projects by Type and Customer in NTG Sample

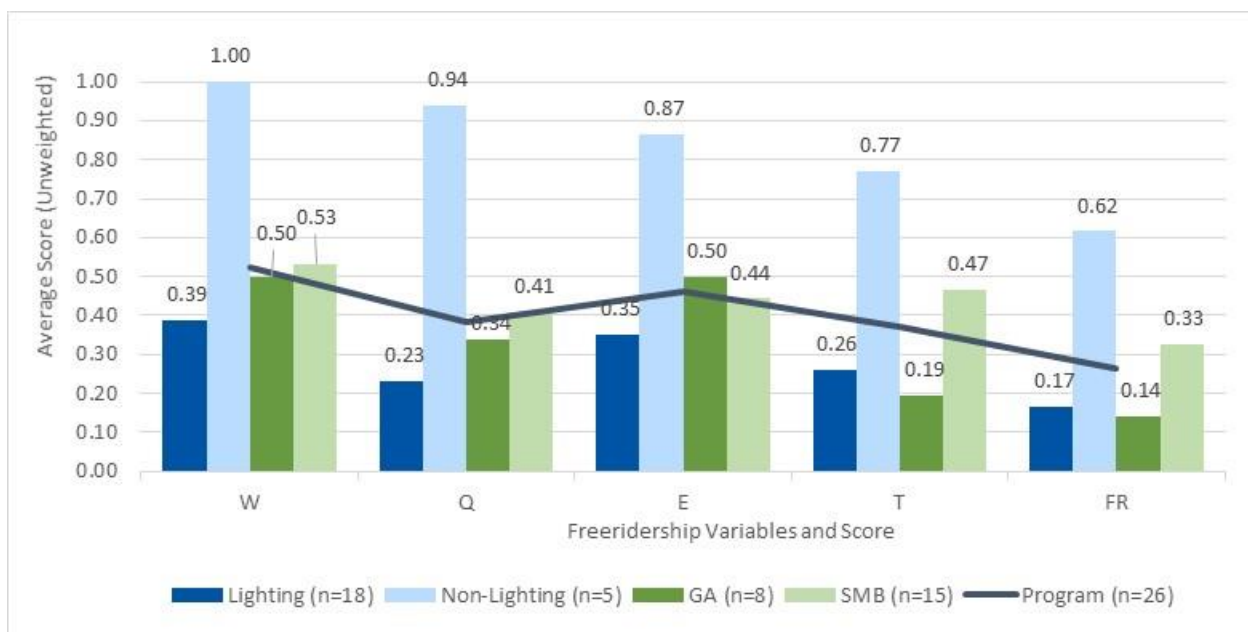
Project Type	GA	LCIA	SMB	Total
Lighting only	6	0	12	18
Non-lighting	2	0	3	5
Total	8	0	15	23

Figure 2 shows the average unweighted scores for each variable and the overall freeridership for each of the four groups (two project type groups, and two customer type groups). Given the small survey sample, these disaggregated results are anecdotal. However, the analysis reveals some notable trends:

- Participants are more confident their organizations would use an alternative source of funding when the project is more urgent. Non-lighting participants were the most likely to indicate willingness to pay for at least part of the project with a different method in absence of the program (**W**). Relatively more non-lighting participants (60%, n=5) said their projects could not have been delayed for one year or more, compared to 23% (n=21) of lighting only participants (not shown in figure). In both groups, the urgency to complete the project was most often to correct mechanical problems.
- Non-lighting participants were also less likely than lighting-only participants to reduce the quantity of measures installed (**Q**). This may reflect the fact that non-lighting projects are more likely to consist of a single piece of equipment that is not easily scaled up or down.
- After non-lighting participants, SMB customers were the least likely to delay some or all their project more than 12 months in the absence of the program (**T**), while GA customers were the most likely to delay. The program's impact on project timing was the greatest difference between GA and SMB customers, and the biggest driver of the difference in average freeridership between the two groups.

A discussion of the efficiency variable (E) is found after the figure.

Figure 2. Average Variable Scores and Freeridership by Project Type and Customer Type



Source: Cadmus analysis.

Since 11 respondents indicated zero willingness or ability to use alternate funding, and Cadmus asked them no further freeridership questions,¹⁷ Cadmus only surveyed 12 respondents directly about the variables **Q**, **E** and **T**. Table 14 shows, for each variable, the number of respondents who indicated that without the program, they would have done something less – effectively indicating that the program had some impact on that aspect of their project. For all customer and project types, measure efficiency (**E**) is the variable that is least likely to be modified in the absence of the program (non-lighting participants were equally unlikely to modify **Q** or **E**). This finding may be related to the high number of lighting projects in the sample. Non-lighting participants were more likely to be responding to a need to replace failing equipment (2 of 5 respondents, compared to 3 of 21 lighting only respondents). These respondents may also be more likely to be willing to substitute a lower efficiency item in order to be able to complete a project.

Table 14. Number of Partial Freerider Respondent Scores Different From 1.0 for Quantity, Efficiency or Timing Variables

Project Type	Q	E	T
Lighting (n=7)	5	1	4
Non-Lighting (n=5)	1	1	2
GA (n=4)	2	-	4
SMB (n=8)	4	2	2
Program (n=12)	6	2	6

NTG Comparison to Alternative Methods

Cadmus used proxy data from the participant surveys and interviews to apply the four methods from the protocol review. Table 15 shows the savings-weighted and unweighted program NTGs calculated from each method.

Table 15. Comparison of On-Bill Financing Program Net-to-Gross Ratios by Method

Scoring Method	Program NTG (n=23)	
	Weighted	Unweighted
Financing NTG	0.94	0.74
Working Group	0.57	0.45
OBF with Rebates	0.63	0.54
Illinois TRM	0.89	0.80
Revised Working Group	0.72	0.57

These scores confirm several of Cadmus' observations when creating the protocol. As expected, influence scores tended to depress program NTG values. The IL TRM method was the exception to this rule. The structure of the IL TRM method's first influence score (see Table 10) resulted in a 1.00 NTG score for all respondents. All other influence scores resulted in unweighted averages ranging from 0.42

¹⁷ The analysis in Figure 2 assigns these 11 respondents a score of 0 for Q, E, and T, which is implied by 0% willingness to use alternate funding for any portion of the project at any time.

to 0.66, while counterfactual scores ranged from 0.62 to 0.74. The Revised Working Group method, which differed from the Working Group method and the OBF with Rebates method mainly by having two counterfactual scores instead of two influence scores was the highest of the three California scores. The two highest NTGs overall, the Financing NTG and the Illinois TRM, are boosted by giving the program credit for project acceleration, and by not discounting respondents' scores if they planned their project before learning of OBF. A more detailed analysis of the comparative NTG scores is included in *Appendix B*.

Potential Spillover and Non-Attributable Improvements

PG&E plans to use a meter-based approach to estimate OBF-AP gross savings. Savings from measures installed at the same location after the OBF-AP project is completed would be incorporated into the NMEC site-level savings result, so on-site spillover measures do not need to be assessed separately. However, there are two situations that may warrant further research.

1. **Non-attributable savings** occur when measures are installed on-site following the OBF-AP project but are not attributable to the program. Non-attributable savings could occur when a participant has an equipment failure, or a regular maintenance or equipment replacement schedule, that requires them to upgrade a building system in the OBF-AP post-retrofit period. This would fall under non-routine adjustments to the NMEC analysis.
2. **Off-site spillover savings** occur when a participant implements energy efficiency improvements, without external incentives, in other locations within PG&E territory due to their OBF-AP experience.

Using the participant survey, Cadmus collected information about conservation projects respondents had implemented after the OBF-AP project to assess whether more research is warranted to quantify non-attributable or off-site spillover savings. Six survey respondents said they had installed additional efficiency measures after completing their PG&E financed projects. Four of those participants had installed projects in other locations and indicated that OBF-AP influenced their decision. Table 16 shows the freeridership scores for these possible spillover respondents, the types of projects installed, and the number of locations impacted.

Table 16. Types and Quantity of Potential Off-Site Spillover Projects by Respondent

Respondent ID	Respondent Freeridership Score	Types of Projects Completed	Number of Locations Upgraded
Survey 2	23%	Solar PV; LED lighting; some HVAC	30
Survey 4	25%	LED lighting	12
Survey 5	0%	LED lighting	3
Survey 7	0%	Some LED lighting; some solar PV	2

To more rigorously establish whether these projects represent spillover, an evaluator would also need to determine whether participants received any kind of utility incentive or support for the project, whether the project was located in PG&E territory, and to what degree the project was motivated by participation in OBF-AP. However, the potential savings may justify the additional effort, especially since these four respondents represented 47 potential spillover locations.

Two respondents installed additional measures in the same facility where they installed the OBF-AP project, and both said the additional measures were not influenced by OBF-AP. Table 17 shows the freeridership scores of these respondents and the types of measures installed. These non-attributable savings have no effect on the net savings because these projects were classified as 100% freeriders with an NTG of 0%.

Table 17. Types and Quantity of Potential Non-Attributable Savings by Respondent

Respondent ID	Respondent Freeridership Score	Type of Projects Completed
Survey 1	100%	Solar PV
Survey 9	100%	LED lighting

Interaction with Other Programs and Policies

It is well known in the evaluation profession that assessing attribution accurately has been challenging. In 2010, Doug Mahone and Nick Hall drafted a paper, *Pursuit of Aggressive Energy Savings Targets: Aligning Program Design and Evaluation*, exploring the potential pitfalls in energy efficiency program evaluation as programs become more prevalent and more central to driving market trends.¹⁸ Mahone and Hall explore the problems created by traditional evaluation—which is implemented at a program level—for program administrators operating whole portfolios of programs that may overlap. By excluding any savings not fully attributable to a single program, program-level evaluations are doomed to miss savings at the portfolio level. In this situation, program managers are incentivized to disregard total achievable savings in order to maximize total *attributable* savings.

One respondent in particular illustrates the complexity this presents for evaluation. Interviewee 2 represented a quasi-GA that manages over 100 pumping stations. The organization uses a continuous maintenance plan to retrofit about one-tenth of its stations every year, with upgrades that have an expected useful life of about 10 years. Their budget for this maintenance plan has historically relied on PG&E rebates to cover a significant portion of the cost. According to the interviewee, those rebates were not available in 2019, so they turned to OBF-AP. Without the OBF-AP loan, the organization would only have been able to fund half their repair cycle and would have faced a growing backlog of retrofits year over year.

From the evaluator’s perspective, it is difficult to separate the PG&E portfolio’s impact on this respondent’s existing retrofit schedule, from the OBF-AP program’s impact on the single project completed with the OBF-AP loan. Applying the Financing NTG protocol, Cadmus scored this respondent as a 50% freerider because they expected they would have completed the same number of retrofits eventually, at the same level of efficiency, but only would have completed half of the expected number within one year. We did not factor in that the following year, the organization would have faced a lack of funding for the remaining half of the 2019 retrofits, in addition to a lack of funding for the ten retrofits

¹⁸ Mahone, Doug and Nick Hall. 2010. Pursuit of Aggressive Energy Savings Targets: Aligning Program Design and Evaluation. Submitted to the 2010 ACEEE Summer Study. Available online: <https://www.aceee.org/files/proceedings/2010/data/papers/2069.pdf>

scheduled for 2020. We also did not incorporate the fact that they listed “other PG&E programs” as a potential source of replacement funds. Common sense indicates that more than 50% of the savings from this project are attributable to PG&E’s portfolio. But by using a program-specific analysis, Cadmus cannot give them credit for a greater proportion of the savings.

The NTG methods included in the literature review apply questions about the relative influence of different program and non-program factors to attempt to triangulate the appropriate level of freeridership. However, the long-term nature of PG&E’s programs complicates this approach as well. For example, this respondent rated the “need to address deferred maintenance” – which would typically be considered a non-program factor – as a 3.5 out of 5 in terms of the importance to the decision to do the project. But the most likely reason the respondent did not have a pressing need to address deferred maintenance is that the organization has been consistently retrofitting their equipment through PG&E’s programs.

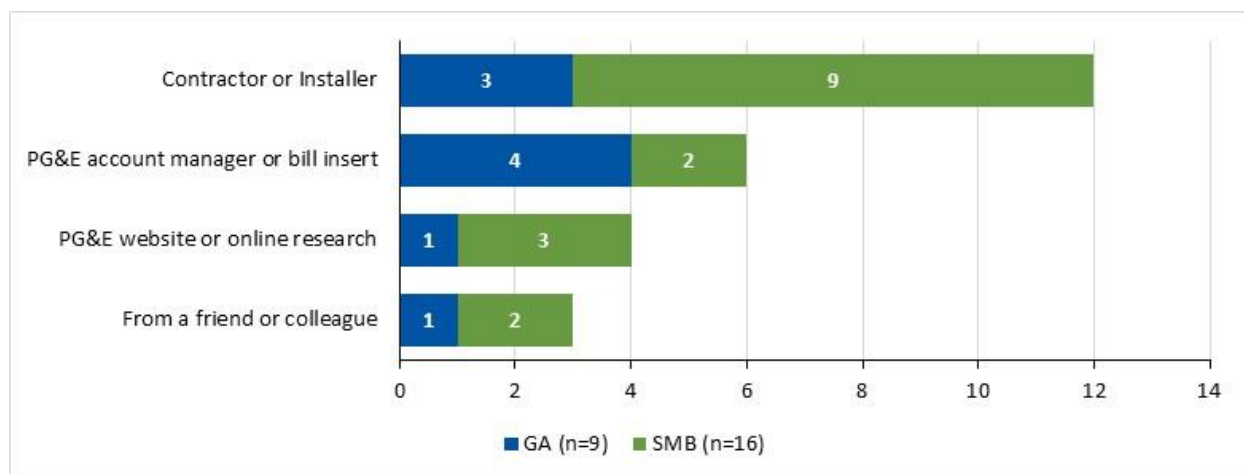
Process Evaluation

This section provides details of survey and interview respondents’ source of OBF-AP awareness, decision process, and experience, along with a few demographic details. It also outlines the barriers to and non-energy benefits of participation. Note that the survey and interview respondents’ answers are combined in the results below unless otherwise stated.

Awareness and Delivery Channels

As shown in Figure 3, the majority of respondents learned about the program through their contractor or installer. More GA respondents learned about the program through a PG&E account manager, probably because these customers tend to be larger and more likely to work directly with a PG&E account manager. Respondents also indicated a high degree of familiarity with other PG&E programs, with 19 of 23 respondents saying they were aware of PG&E rebates prior to their OBF-AP program participation. All three interviewees reported having previously participated in a PG&E rebate program, and one had also previously participated in PG&E OBF.

Figure 3. How Participants Learned of On-Bill Financing



Source: Participant Survey Question C1 and Participant Interview responses (n=26).

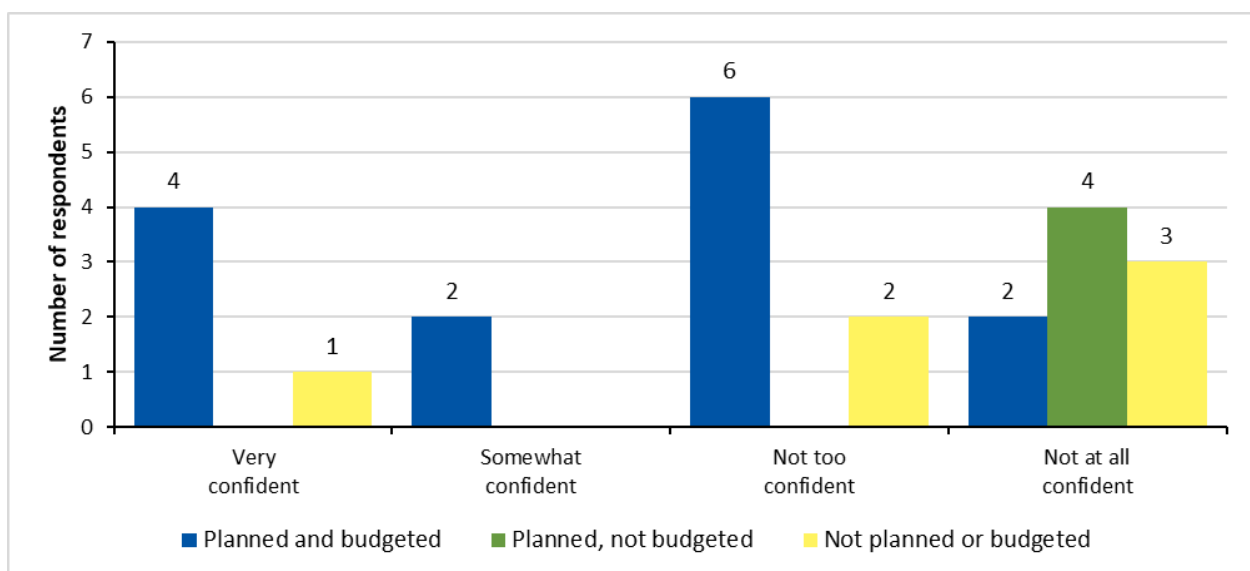
When they mentioned learning of OBF-AP through a contractor or installer, some participants may have been referring to their project developer. Developers are able to refer customers to the program and guide them through the process or, in some cases, a PG&E account manager refers a customer to a developer (or PG&E staff may take on the developer role themselves). According to program data, one developer was especially active in the program, developing 70 projects (all lighting only). PG&E staff were the next most commonly mentioned developers, responsible for 20 loans for lighting only and non-lighting measures. In total, 31 project developers participated, 12 of whom supported non-lighting projects.

Decision-Making Process

For most participants, the decision to install a project began before the organization learned about OBF-AP. The majority of respondents (20 of 26) had planned for their project before they learned about financing available through the OBF-AP program; of those 20, 15 said their organization had included the project in their capital budget prior to learning about OBF-AP. The 20 respondents who had planned the project prior to learning about OBF-AP had a freeridership rate of 28%, compared to 21% for the six respondents who had not pre-planned the project. Both groups included participants with 0% freeridership and with 100% freeridership.

As part of the freeridership protocol, the survey asked respondents how confident they were that their organization would have used a different funding source to complete at least part of the project if OBF-AP were not available. Figure 4 shows the responses, grouped by project status before the organization learned about OBF-AP. Not surprisingly, most respondents who rated themselves as *very confident* or *somewhat confident* also said their OBF-AP project was planned and budgeted before they learned about OBF-AP. However, the majority of respondents whose project was planned and in budget (8 of 14) were *not too confident* or *not at all confident* that their organization would have found another way to fund the project.

Figure 4. Confidence in Use of Alternate Funding

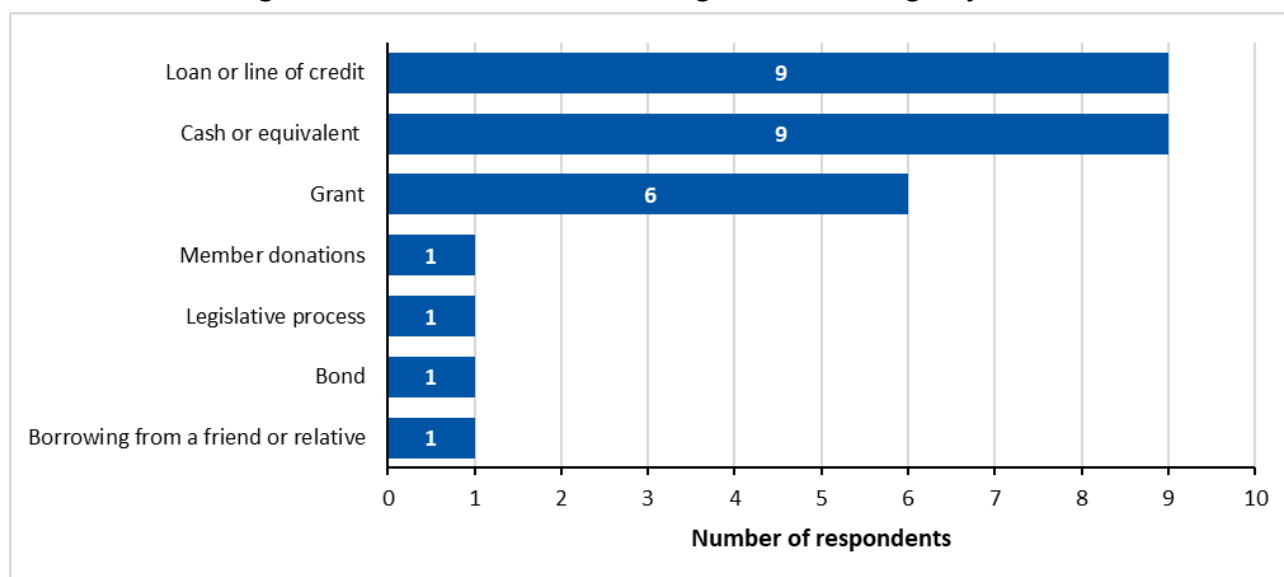


Source: Participant Survey Questions C2, C3 and D4 and Participant Interview responses (n=24).

In April 2019, PG&E added the following clause to the loan agreement: “*The customer confirms that the OBF loan funds are required for the project to be completed, and that without the loan funds, the project would not otherwise be able to be proceed and be completed with the same scope or within the same timeframe.*”¹⁹ Sixteen of the 26 respondents started their project installation after April 1, 2019, indicating they most likely signed an agreement that included this clause. Eight of these respondents indicated their project was planned and in the budget prior to learning about the program, but only 2 of these respondents were *very or somewhat confident* their organization would have used alternate funding to complete the project.

Excluding those who were *not at all confident* that their organization would use an alternate funding source, Cadmus asked respondents what type of funds they would have used if OBF-AP were not available. Figure 5 shows that respondents were most likely to have used either a different loan/line of credit, or cash. However, there was little overlap across the two options. Of the nine who indicated they would have used cash, only three also indicated they might have used different financing. In addition, of the six who indicated they might have used other financing, but not paid cash, two reported they expected to have difficulty obtaining financing.

Figure 5. Alternate Sources of Funding On-Bill Financing Projects



Source: Participant Survey Question D7 and Participant Interview responses. Multiple responses allowed (n=16).

The more detailed findings from the interviews provided helpful context to interpret the survey results and highlighted the major role of program in accelerating savings from large capital investments. Interviewees 1 and 2 both said their project was in response to relatively urgent, near-term needs. Interviewee 1 said the city agency he represented designed their project as part of a plan to meet city climate change goals. The city planned to replace old equipment with more efficient units, and to

¹⁹ PG&E. Advice Letter 5517-E, April 3, 2019. https://www.pge.com/tariffs/assets/pdf/adviceletter/ELEC_5517-E.pdf

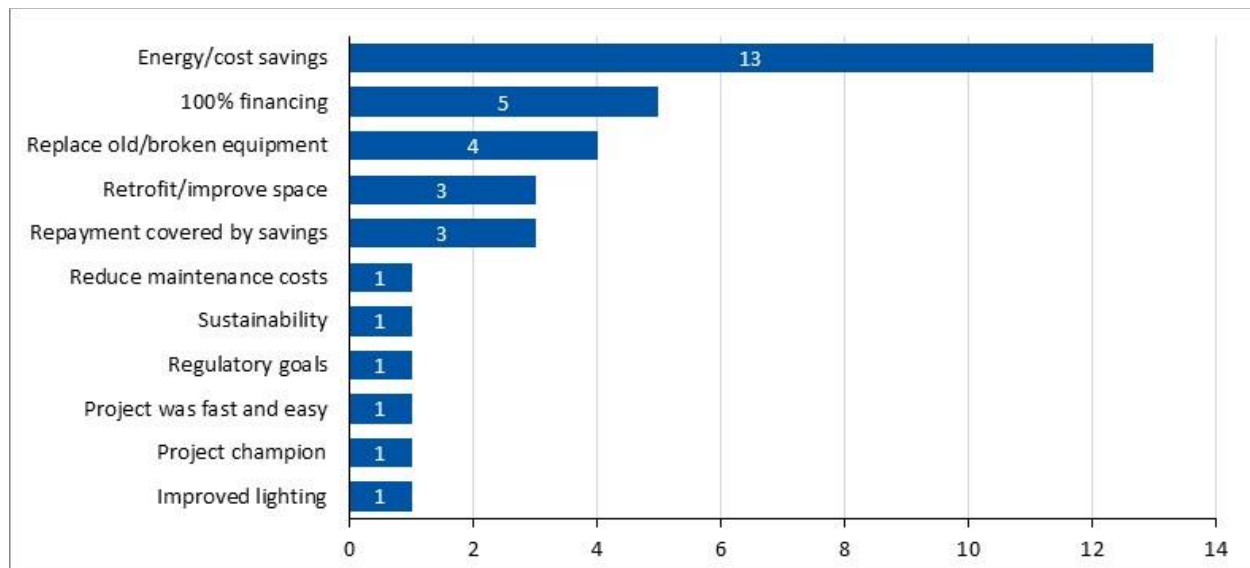
complete additional building improvements at the same time. Due to cash flow constraints and the city leadership's aversion to financing, the project was expected to take five years to complete. Because program financing was offered at 0%, the city council approved the loan and was able to complete the entire project in just one year.

As discussed earlier in this report, Interviewee 2's organization included its continuous retrofit cycle included in the organization's long-term capital budget, assuming that PG&E incentives would continue to be available. Although the interviewee could identify two possible alternative sources of funding, neither was guaranteed and both required significant time and effort to pursue.

In contrast, Interviewee 3 said the lighting only project their municipal agency completed was not in the capital budget forecast prior to learning about OBF-AP. The idea for the project originated through consultation with the PG&E account manager, and was approved by city leadership due to the significant cost savings and the availability of incentives from PG&E. The organization initially planned to use rebates but changed to using OBF-AP later in the process, after the lights the city planned to install were no longer eligible for rebates.

Both the survey and interview respondents shared, in an open-ended format, the most important factors influencing their project scope and timing. Figure 6 shows the full list of factors. The majority of these factors are direct outcomes of the project itself, regardless of how it was funded, such as the most common factor: achieving energy or utility cost savings. Respondents mentioned several program features as well, including the ability to finance the full project cost, having payments at or below expected savings, and accessing financing through a fast and easy process.

Figure 6. Factors Influencing Scope and Timing



Source: Participant Survey Question D20 and Participant Interview Question B1. Multiple responses allowed (n=25).

Participant Experience

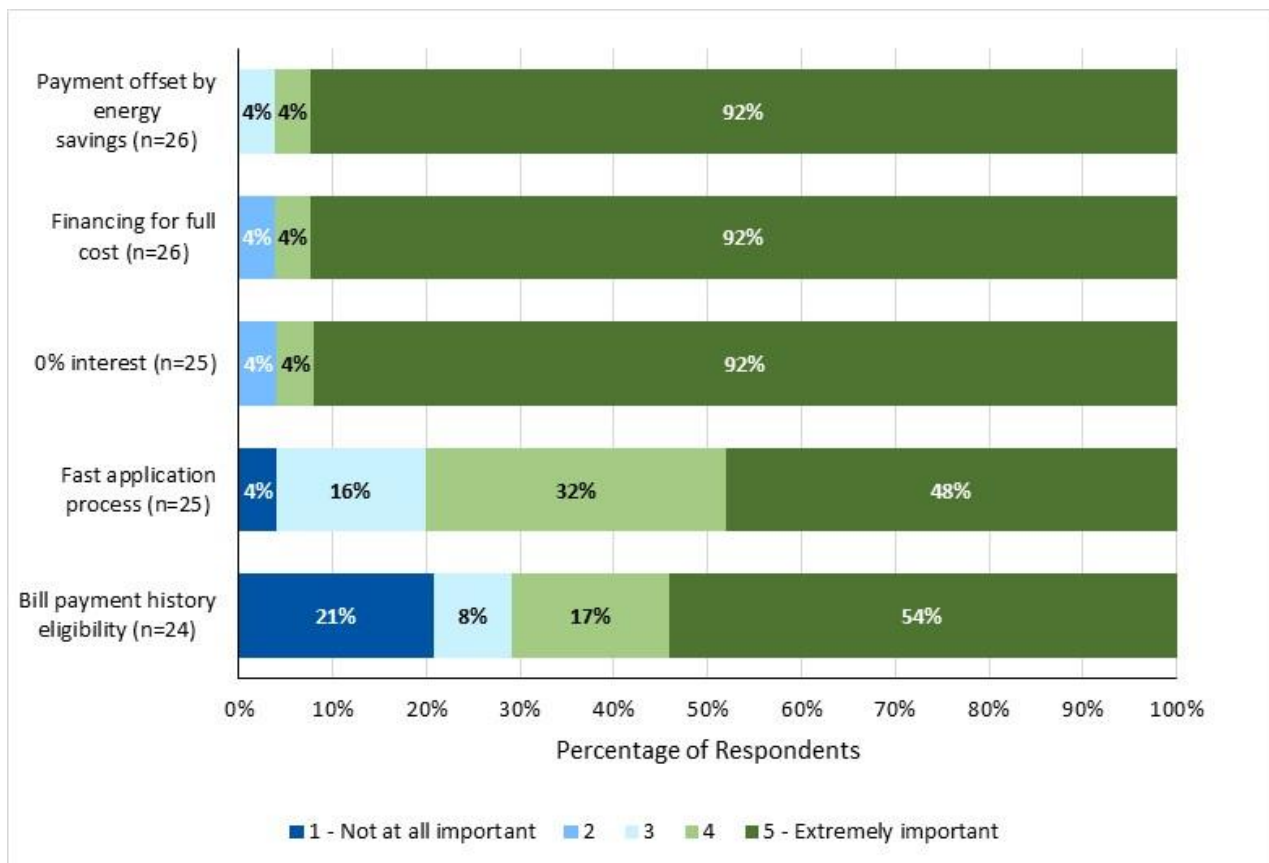
PG&E designed the OBF-AP program to offer a financing product that removed several obstacles presented by standard commercial lending products, and that eliminated some of the barriers presented by the original OBF program, OBF with Rebates. OBF-AP offers three features:

- Provides a fast and easy application process that does not require a credit check or collateral. OBF-AP participants do not combine the loan with available incentives (in order to avoid the long review period necessary for some program applications).
- Provides lending of up to \$4,000,000 at 0% interest for up to 10 years. By avoiding interest charges and spreading the payments out over a longer period than most private-sector loans, the program payments can be structured so they are equal to or less than the average monthly bill savings.
- Provides repayment through the customer utility bill, which minimizes the hassles of making a separate payment.

Survey and interview participants answered questions about their experiences with the OBF-AP loan application process, their decision to pursue a faster application process instead of rebate dollars, and how the payment structure impacted their decision to implement the project. The surveys and interviews also collected information about suggested improvements to the current program.

Figure 7 shows how participants rated the importance of various OBF-AP program features. Participants were about equally likely to rank three financial characteristics as *extremely important*, with over 90% of respondents rating the payment offset by savings, the full-cost financing, and the 0% interest as *extremely important* features. About 50% of respondents rated the fast application process and the eligibility based on bill payment history as *extremely important*.

Figure 7. Importance Ratings for Key On-Bill Financing Features



Source: Participant Survey Question D18 and Participant Interview responses.

Additional detail on key aspects of the program design is presented in the following sections.

Application Process

Nine of the 11 respondents who answered the question received application support from their contractor, a PG&E account manager, or other PG&E staff. All nine of these respondents rated themselves as *very satisfied* with the support they received. Survey respondents also answered whether they agreed or disagreed with several statements about the application process, including whether it was easy to complete, required a reasonable amount of documentation, and took a reasonable amount of time to process (Table 18).

Table 18. Participant Responses to On-Bill Financing Application Features (n=8)

Application Feature	Agree	Disagree
Easy to complete	8	0
Required a reasonable amount of documentation	7	1
Took a reasonable amount of time to process	5	3

Two respondents who disagreed that the application process time was reasonable provided additional comments, which addressed the process as whole. One said PG&E was unresponsive to questions from their contractor and needed to provide more support. The other said the new requirement to assess

site-specific savings for lighting only projects made the process slower, relative to referencing a qualified products list (this statement was referring to a change in requirements for lighting only projects, which is not specific to OBF-AP).²⁰ These respondents had started installing their projects in August 2016 and October 2018 respectively.

Other respondents provided both positive and negative feedback about the application process. One respondent said it was easier than rebate applications (started installation in June 2018), and another said the process was “very easy and simple” (started installation in April 2019). However, a third respondent, who started installing their project in August 2019, said the application process was initially very difficult without contractor support, but that “eventually” PG&E referred them to “a third party” who helped complete the application. A fourth participant, who started installing in September 2017, requested simply that PG&E simplify the online application process.

The interview respondents provided more detail on their application experience. Interviewee 1, who started the application process late in 2018, said their project was one of the first to use the OBF-AP program. Initially both the respondent and the project developer had trouble finding a contact at PG&E who had correct information about the program requirements, saying, “We kept getting handed off to different people...we were bounced around for three or four months.” The interviewee said they ultimately “found the right person” and the process went much faster and more smoothly. Interviewee 2, who started their application process later in 2019, said the OBF-AP process was considerably easier and faster than the rebate application process had been, and was faster than applying for a commercial loan.

Interviewee 3 said the process to develop the project took years due to internal obstacles. This project was ultimately achieved due to the persistence of the city’s sustainability officer, who acted as the project champion despite indifference from other divisions of the city government. The city’s sources of funding are largely earmarked for specific purposes. Even though the total monthly payment to PG&E remained the same, the city could not use funds intended for utility expenses to pay the loan repayment amount. In order to move the project forward, the city had to shift financial resources, a process that required detailed planning and several approvals. Once the city was ready to apply for incentives, the application process was simple.

Rebates

The survey asked questions to capture participants’ reasons for foregoing the rebates in order to participate in the more streamlined version of OBF-AP. Survey respondents offered several reasons for not applying for OBF-AP project rebates, as shown in Table 19. However, many of these responses indicated confusion regarding the availability of rebates in conjunction with OBF-AP. One GA participant was told by their project developer that PG&E no longer allowed rebates to be combined with OBF at all.

²⁰ PG&E program staff indicate that the requirement to use a professional project developer is intended to provide greater confidence that savings will materialize. PG&E found self-report site specific savings used alongside incentives for OBF were unreliable.

Most notably, although the survey asked respondents only about OBF-AP projects that did not include rebates, five respondents said they *did* receive rebates for the project specified.²¹ All of the respondents that indicated they had received a rebate started installing their project prior to April 2019, except one participant for whom no dates were included in the tracking data.

Table 19. Participant Reasons for Not Applying for Rebates

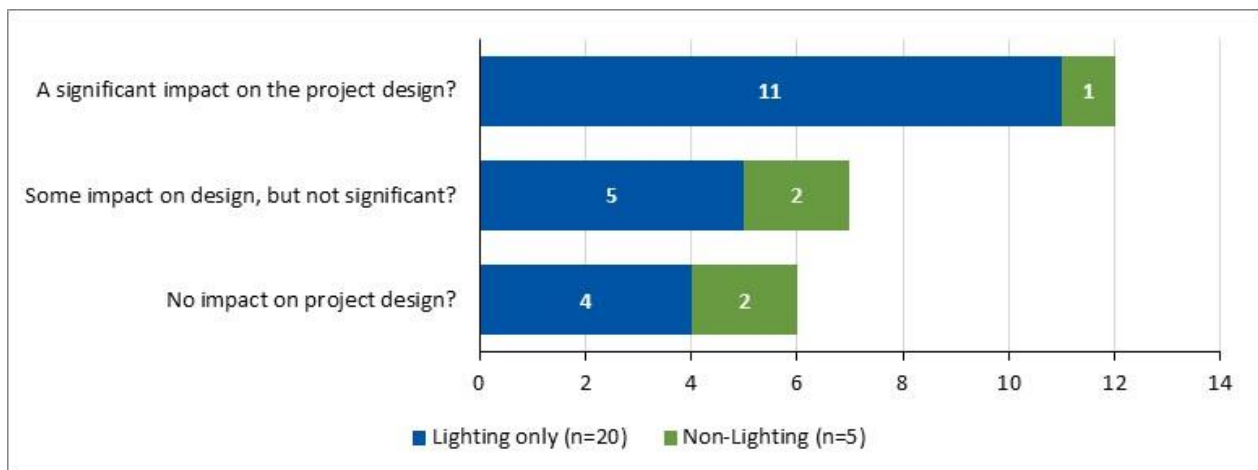
Reason	GA	SMB	Total
Thought the project did receive rebates	3	2	5
Project was not eligible for rebates (lighting only)	2	1	3
Did not understand rebate requirements or application process	0	2	2
Thought rebates were not available or were discontinued (non-lighting)	1	0	1
Rebate was too small to bother with	1	0	1
Wanted to receive funding more quickly	0	1	1
Did not know rebates could be combined with financing	1	0	1
Total	8	6	14

Offsetting Payments with Energy Savings

One of the key features of OBF-AP is that the monthly repayment amount is structured to be equal to or less than the monthly savings, on average. This feature allows the participant to take on a monthly loan repayment with no change in their net cash flow, but it also serves to limit projects to measures that offer greater savings relative to cost. As shown in Figure 8, most lighting only participants said the payment feature had a significant impact on the scope of their project. Non-lighting customers, on the other hand, were about equally likely to say the feature had some impact, but not major, or to say the feature had no impact at all.

²¹ PG&E confirmed that these projects did not receive rebates. It is possible that these respondents were confusing the specified project with a different project, had initially applied for OBF with rebates, and forgot or didn't know they ultimately didn't receive rebates, or mistakenly thought some other discount offered in the contract was a PG&E rebate.

Figure 8. Importance of Payment Offset by Savings



Source: Participant Survey Question D19 and Participant Interview responses.

Early Payoff

Only one of 26 respondents said they intended to repay their OBF-AP loan early, explaining that early repayment was their policy for any financing. Four respondents were not sure if they would repay early or not, and the remainder did not plan to repay the loan early. Both Interviewees 1 and 2 said they would not repay the loan early because it was “free money” and in the organization’s financial interest not to repay early.

Barriers to Participation

In general, participants reported few challenges related to participating in the OBF-AP program. When asked how to improve the program, respondents had these suggestions:

- Provide more support for customers and trade allies
- Simplify the online application
- Make the process faster
- Make more lighting measures eligible

Interviewee 1 said one minor drawback to the program compared to a rebate program is that the city will not enjoy a reduced utility bill for 10 years, when the loan is paid off. The city manages funds available for capital improvements separately from funds directed to operating expenses, so the ability to conserve cash thanks to financing does not necessarily offset the need to make loan payments through the utility bill. To try to capture the savings benefit earlier, the city negotiated with tenants in the building being improved to pay a share of the repayment amount proportional to their share of the usage. Although the tenants initially agreed, after the project was underway, they changed their mind.

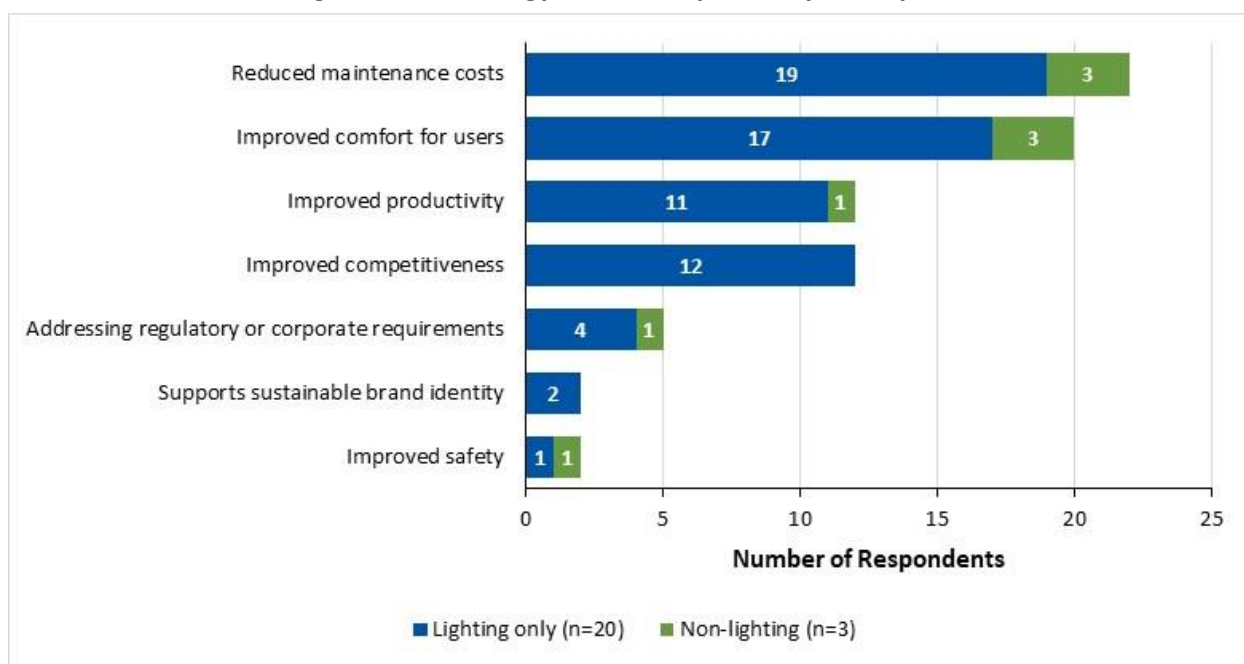
Interviewee 3 reported that the process to develop the project and obtain approval from city authorities took over four years. This delay was the result of competing city priorities and fiscal rules that did not allow the city to use funds allocated to utility costs to repay a financing charge. According to the interviewee, the ultimate success of the project was due to the commitment of the city staff member

who acted as the project champion and to the availability of the program financing that convinced city leadership to act.

Non-Energy Benefits

The survey captured information about the non-energy benefits participants experienced and what value they placed on those benefits. Nearly all survey respondents (23 of 26) reported some non-energy benefits from their OBF-AP project. Figure 9 shows the frequency of the benefits mentioned by respondents. Participants with both project types most commonly said reduced maintenance costs and improved comfort were benefits they experienced. Lighting only participants reported more variety of non-energy benefits than non-lighting participants.

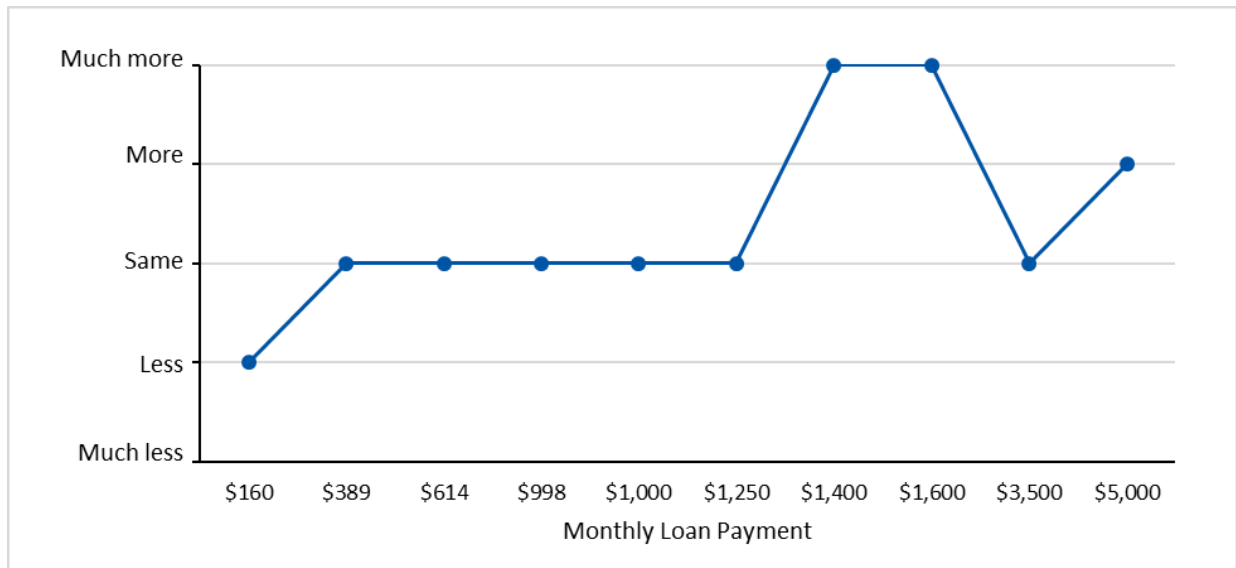
Figure 9. Non-Energy Benefits Reported by Participants



Source: Participant Survey Question G1 and Participant Interview responses. Multiple responses allowed.

To explore the relative value of the non-energy benefits, survey respondents rated whether the non-energy benefits were worth more, the same amount, or less than the monthly payment (which was structured to be roughly equal to the monthly savings). Although only 10 respondents answered this question (nine lighting only participants and one non-lighting participant), Figure 10 shows that respondents with smaller payment amounts were less likely to value the non-energy benefits above the loan payment amount. Most respondents thought the non-energy benefits were equal in value to the loan payment.

Figure 10. Value of Non-Energy Benefits Relative to Loan Payment by Respondent



Source: Participant Survey Questions G2 and G3 (n=10).

Interviewees 1 and 3 provided more detail on the non-energy benefits they had experienced. (Interviewee 2 did not report any benefits other than the energy savings.) Interviewee 1 said the city had observed improved building function (primarily heating and cooling), which reduced maintenance costs and made occupants (city employees and tenants) more comfortable. These were intentional and expected project outcomes, but these benefits were not incorporated into the financial analysis of the project. According to Interviewee 1, though the city hoped these benefits would occur, they did not want to rely on them. In addition, they did not know how to assign a quantitative value to the maintenance savings or the occupant satisfaction. Another benefit was the positive response from residents and city leaders, who were pleased that the city was able to advance so quickly on its climate action plan. The respondent did not place a monetary value on this benefit but considered it a very positive outcome.

Notably, five survey respondents also reported meeting regulatory goals as a benefit of completing their project, and two indicated in comments that these goals were related to climate change. One of these respondents was not included in the freeridership analysis due to conflicting responses to the freeridership questions. For the other four, regulatory mandates may have contributed to reduced NTGs, since all four indicated their organizations would have found a way to complete some portion of their projects in the absence of the program. Although many climate change mandates are unfunded, and state and local governments routinely fail to meet unfunded mandates, they nevertheless represent a pressure point for governments.

Interviewee 3 reported positive resident feedback about the new streetlights, commenting they were brighter, safer, and more attractive; while these benefits were also anticipated, they were not a major factor in deciding to complete the project.

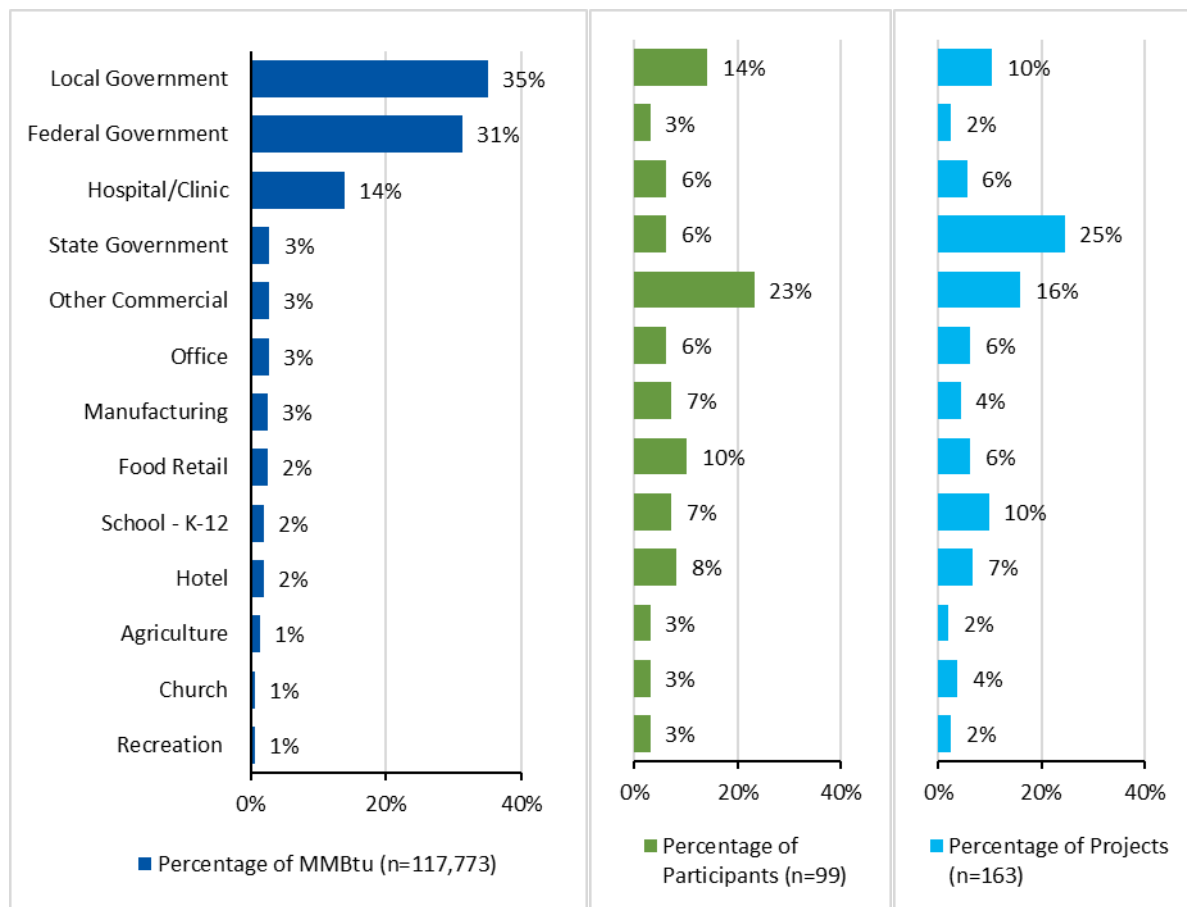
Participant Characteristics

To illustrate the variety of public- and private-sector organizations participating in OBF-AP, Cadmus sorted projects by type of business. Figure 11 shows the distribution of *ex ante* program savings, unique participants, and projects by organization type. Local Government and Federal Government organizations contributed the most savings, but were not the most common type of participant, and did not complete the most projects. Until April 2019, only public sector customers could access funding over \$100,000, so public sector projects are more likely to be larger and have more savings.

The largest number of unique participants were in Other Commercial category, which included specialty retailers, equipment distributors, warehouses, and other businesses (with some that could not be determined). Although they accounted for many participants and significant portion of total projects, these participants contributed only 3% of program savings.

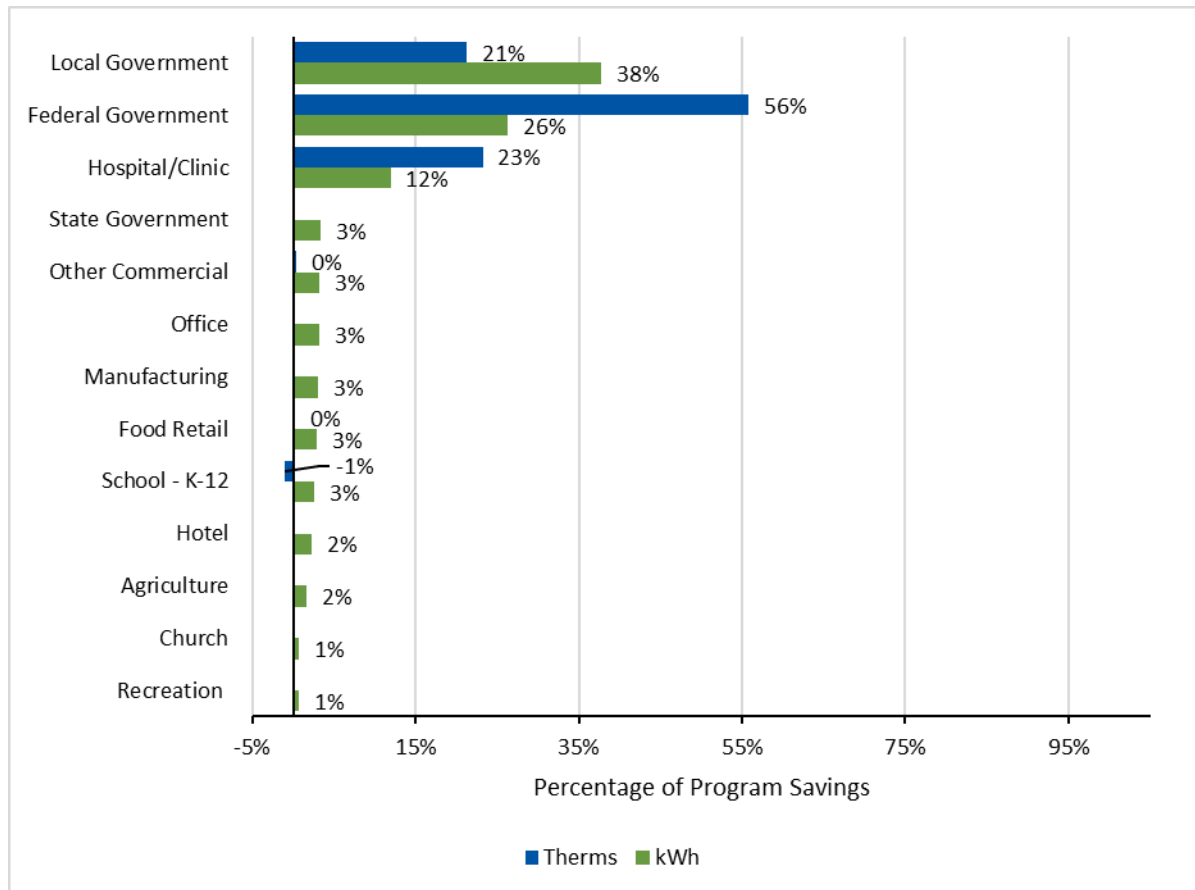
State Government customers completed the largest number of projects, primarily due to a few agencies that completed similarly sized projects at several locations. One agency completed 22 different projects, and three others completed six to 10 each.

Figure 11. Distribution of Savings, Participants and Project by Organization Type

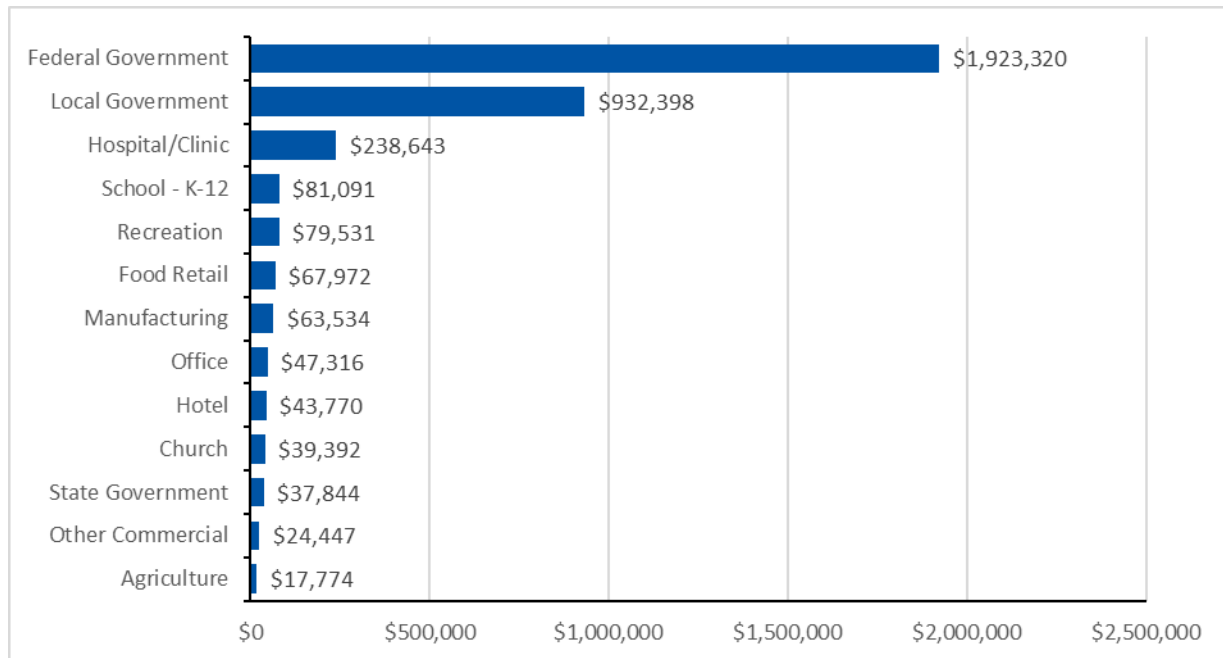


The program included a wide variation in project *ex ante* savings across projects. The four largest projects, issued to a local government, two military organizations, and a hospital, contributed 67,507 MMBtu, or 57%, of the total program MMBtu. Figure 12 shows the percentage of kilowatt-hours and therms contributed by each organization type. Over 99% of all therms savings were contributed by three types of organizations. On the other hand, Schools – K-12 contributed negative therms savings due to interactive effects of lighting retrofits.

Figure 12. Ex Ante Savings Contributions by Fuel and Organization Type

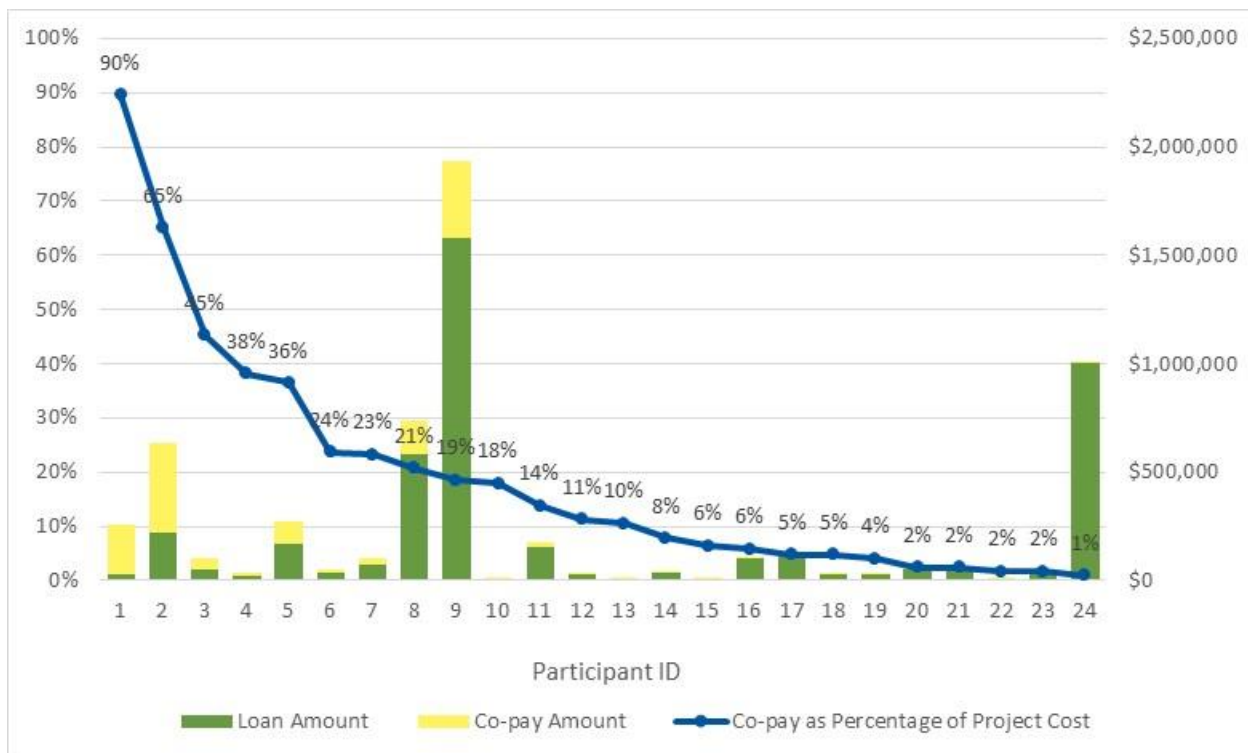


OBF-AP allows loans from \$5,000 to \$4,000,000, and actual program loans covered almost that entire range, from \$5,022 to \$3,623,750. In addition, some recipients took out multiple loans, to fund a single project in stages. The largest such loan was \$10,076,845, issued to a local government. Figure 13 shows average loan amount by organization type. Federal Government (which includes military projects), Local Government, and Hospital/Clinic installed far larger projects on average than all other organization types.

Figure 13. Average Loan Size by Organization Type

Because OBF-AP requires that the loan payment not be greater than the expected monthly savings, participants can offer a co-pay to reduce the total project cost and monthly payment so that it falls below the required threshold. Of the 168 loans (representing 163 projects), 24 included a co-pay ranging from 1% to 90% of the total loan amount. Figure 14 shows the percentage of the project cost paid as co-pay, as well as the loan and co-pay amounts for each of these 24 projects.

Figure 14. Co-Pay as Percentage of Project Cost



OBF-AP Program Data Review

Cadmus found the program data contained the contact information, project type, customer type, kWh savings and therms savings fields needed for this study and were generally complete. The tracking data did not include the application initiation date, instead reporting the installation start and completion dates. The date fields were blank for 26 records, and three projects listed installation completion dates prior to January 2018.

There were also a few instances where the customer type was mislabeled. Cadmus was not able to determine whether customers were correctly identified as large or small businesses, but we did identify GA participants misidentified as LCIA, and some participant businesses labeled as both SMB and LCIA. In addition, we identified four records where the contact phone number was missing or false (i.e., phone number listed as 999-999-9999). Cadmus was able to source contact information for two of these records. We attempted to reach the remaining two by email.

The contact information included in the tracking data was for the authorized signatory on the loan. Through the process of recruiting participants for data collection, we determined that the authorized signatory was usually not the person responsible for implementing the project, especially for government agencies. For both surveys and interviews it was necessary to navigate several contacts before finding the appropriate person to respond.

Conclusions and Recommendations

This section presents conclusions and recommendations related to NTG and then a set related to the process evaluation.

NTG Analysis

Conclusion: Although the PY2018-2019 measured NTG was very similar to the default NTG for NMEC programs, the wide range of project size and respondent types may cause the NTG to vary year over year. The PY2018-2019 OBF-AP NTG result of 0.94 is nearly equal to the 0.95 NTG deemed for NMEC programs. This result is based on a sample representing 29% of ex ante gross savings and achieves better than 90/10 confidence precision. Although the two values are not directly comparable due to the differences in the program design, the OBF-AP NTG is also 0.29 higher than the evaluated PY2015-2016 NTG ratio for the PG&E OBF with Rebates program. The higher NTG for the OBF-AP program is largely due to the higher NTG scores for lighting projects in PY2018-2019. However, the Financing NTG Protocol allows for scores from 0.0 to 1.0, and individual NTG scores covered this full range. In future years, the savings-weighted NTG may vary significantly based on results from a few large projects.

Recommendation: PG&E should apply this study's NTG value to calculate the net savings claim for OBF PY2018-2019. The program should continue to monitor the variability of NTG, especially for the largest projects.

Conclusion: Although non-lighting projects have a lower NTG, they are important to overall program savings and have not prevented the program from achieving a high NTG. Our analysis found lighting only projects have a substantially higher NTG than non-lighting projects (99% compared to 52%). Although the difference is greater in PY2018-2019 than in the PY2015-2016 evaluation, the lighting only NTG has consistently been higher than the NTG for non-lighting projects. Survey responses showed that non-lighting projects are more likely to be driven by a need to replace failing equipment, which may contribute to the low NTG. However, non-lighting projects are important contributors to program savings, even accounting for the lower NTG. Non-lighting projects contributed over 50% of program ex ante MMBtu savings, and 100% of the therm savings despite representing only 24 of 163 (14%) of projects. Non-lighting projects are also more common among government agency participants, which is an important target segment for this program. Because large capital improvement projects can take years to plan and implement, and the loan cap for the program was increased less than two years ago, non-lighting projects may make up a greater percentage of program savings in the coming years.

Recommendation: PG&E should continue to support non-lighting projects, as they are an important source of savings and support a diversity of customer needs. To increase the NTG for non-lighting participants, the PG&E Program Manager should consider whether there are potential delivery or marketing strategies that could encourage GA participants to implement capital improvements before equipment fails. Information about the cash flow benefit of an extended-term, 0% loan compared to a shorter-term, market rate loan may be persuasive.

Conclusion: Whether the participant planned or budgeted for their project prior to learning about OBF-AP is not a good indicator of freeridership. Study results indicate most respondents who had planned and budgeted for their project were not confident their organization would have actually used other means to fund the project, unmodified, without OBF-AP. In addition, some participants who had planned the project before learning about OBF-AP still indicated that their organization would have taken no action without the program, earning them a freeridership score of 0%.

Recommendation: For future OBF-AP evaluations, continue to use an NTG protocol that does not include scored questions about whether the participant learned about OBF-AP before or after planning the project.

Conclusion: Project acceleration is an important component of how financing incentives generate savings. Six of 23 respondents (26%) specifically indicated that they would have delayed some or all of their project in the absence of OBF-AP. Accelerated project timing was especially common among GA participants (4 out of 5 indicated some level of acceleration), who tend to have larger projects, and contributed 48% of the programs gross MMBtu.

Recommendation: For future OBF-AP evaluations, continue to use an NTG protocol that directly accounts for the program acceleration of project timing.

Conclusion: Nonresidential self-report NTG protocols commonly used in California and Illinois are overly complex and calculations do not have sufficient justification. Since any self-report NTG protocol will have limitations, it is important to use a protocol that is easily understandable by stakeholders, defensible at each step, and easy to consistently apply year over year. Complexity in NTG calculations should offer significant and measurable benefits relative to the tradeoff of greater difficulty interpreting the result and potential for calculation error, in addition to greater evaluation resource needs.

Recommendation: PG&E and CPUC should carefully review NTG protocols used in other nonresidential evaluations to determine if the issues raised in this study are applicable.

Conclusion: Applying different self-report NTG protocols to the same data appear to lead to very different results.

Recommendation: Since Cadmus had to use proxy data in our analysis, it would be of further interest for a formal study to examine the result of different NTG protocols applied to the same customer, ideally with a larger sample size and incorporating all the features in the protocols reviewed.

Process Evaluation

Conclusion: Participants may require non-energy benefits as well as energy savings in order to accept the incremental cost of high-efficiency equipment. This study found that many participants valued the non-energy benefits from their completed projects at least equally to the energy savings. Interviewee 1 indicated that the non-energy benefits were an important factor for completing the project, even though they were not explicitly factored into the financial analysis. These results indicate that

participants may expect or require non-energy benefits from their energy efficiency projects, and that even if participants are not quantifying these benefits, they may have an implicit value. Since non-energy benefits are not included in the Total Resource Cost test required to demonstrate program cost-effectiveness, it may be inappropriate to include the portion of incremental cost that the participants accepted in order to receive the non-energy benefits.

Recommendation: PG&E should continue to research the role of non-energy benefits in participant decision-making, and whether some portion of the incremental cost of high-efficiency equipment is attributable to these non-energy benefits.

Conclusion: There is market confusion about how and when rebates can be used with OBF-AP. This appears to be persistent and was mentioned by several respondents. Participants reported confusion arising from different causes, some of which are beyond the control of the OBF program team:

- Contractors advising customers that it is not possible to combine rebates and OBF-AP
- Changes in the products eligible for rebates
- Different messaging that has been associated with the OBF-AP label

Recommendation: Improve messaging on the PG&E website to clarify that participants choose whether to use rebates, and the advantages of each path. Continue conducting training and outreach to trade allies to ensure that contractors also understand that both options are available, where projects are eligible.

Conclusion: The 0% interest feature helps penetrate the group of participants who are financing-averse but could still benefit from using financing. Six survey respondents reported they might have used cash instead of OBF but would not have used alternative financing. Interviewee 1, who was among the six, said city leaders avoid using financing wherever possible regardless of the financial merits of doing so, as a fiscal discipline. The 0% interest feature makes the OBF-AP loan essentially even better than using cash, because the participant's actual cash remains available to invest in other projects. This feature helps OBF attract a broader group of participants than a traditional financing program, with an interest rate above 0%.

Conclusion: Municipal finances are tightly managed, and cities may have limited flexibility for shifting funds to take advantage of the benefits of OBF-AP. Both Interviewees 1 and 3 described challenges related to accounting for the financing paid through the utility bill. For Interviewee 3, the process to work through these challenges took years and was ultimately successful thanks to a persistent staff member that served as a project champion.

Recommendation: Considering the importance of this customer segment to the program, PG&E should take extra measures to identify barriers to participation facing local government and provide additional support where possible to overcome them. Previous local government participants may serve as resources for identifying solutions.

Study Limitations

Self-Report NTG

Like all self-report NTG methods, the protocol used in this study may be impacted by measurement error. The Uniform Methods Project lists the following potential biases that may impact results, but that can't be measured or observed:²²

- A potential bias related to respondents giving socially desirable answers.
- The inability of consumers to know what they would have done in a hypothetical alternative situation, especially in current program designs that use multiple methods to influence behavior.
- The tendency of respondents to rationalize past decisions.
- A potential for arbitrariness in the scoring methods that translate responses into free-rider estimates.
- Consumers may fail to recognize the influence of the program on other parties who influenced their decisions. For example, a program having market effects may have influenced contractor practices, which in turn may have indirectly impacted the participants' (and nonparticipants') decisions.

Furthermore, the OBF-AP program serves a variety of organizations, and funds different types of projects across a very wide range of costs. The maximum loan amount is 800 times the smallest loan amount. As with any statistic, the freeridership estimate presented in this study represents this group of participants but may or may not represent participants in future program years.

Process Evaluation

The process evaluation covered the ramp-up period for this program. Some of the challenges participants experienced with regard to the application and understanding the rebate availability may have already been resolved.

²² Violette, Daniel M. and Pamela Rathbun. Uniform Methods Project Chapter 21: Estimating Net Savings – Common Practices. Prepared on behalf of the National Renewable Energy Laboratory. October 2017.

Appendix A. Findings from Review of Alternate NTG Methods

This section presents Cadmus' findings from our review of three existing NTG methods, and our rationale for the adjustments we made in creating the OBF-AP protocol.

Introduction

The California Evaluation, Measurement and Verification (CA EMV) Protocol indicates the net-to-gross ratio (NTG) may include freeridership and spillover. For this study, the self-report NTG only includes freeridership since any on-site spillover would be captured by the gross savings analysis using NMEC approaches.²³

Cadmus' scope of work for assessing the NTG for OBF-AP participants required that we first develop a freeridership measurement methodology customized to the unique nature of the OBF-AP program that adhered to best practices in self-report research and complied with the CA EMV protocols.²⁴ To do this, Cadmus considered how the OBF-AP program impacts customer decision-making and reviewed literature on existing self-report NTG protocols and best practices in self-report research, including the following:

- Nonresidential Self-report NTG methodology developed by the California Nonresidential Net-to-Gross Working Group (Working Group method)²⁵
- Method used in the PY 2015 California Statewide On-bill Finance Impact Evaluation (OBF with Rebates method)²⁶
- The method recommended in the Illinois Technical Resource Manual Volume 4, version 78 (Illinois TRM method)²⁷

²³ Cadmus' approach investigates qualitatively whether off-site spillover occurred

²⁴ The protocols require net impact analysis to address "probability that the participant would have adopted the technology or behavior in the absence of the program; If adopted in the absence of the program, the probability or proportion (partial freeridership) of expected savings inducted by the program given its ability to: increase the efficiency of what would have been adopted; make the adoption occur earlier than when it would have occurred; and increase the quantity of efficiency equipment that would have been adopted"

²⁵ California Nonresidential Net-to-Gross Working Group. Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers. Prepared for the Energy Division, California Public Utilities Commission. February 20, 2015.

²⁶ Opinion Dynamics. PY2015 California Statewide On-bill Finance Impact Evaluation. CALMAC Study ID CPU0181. Prepared for the Energy Division, California Public Utilities Commission. December 31, 2017. Available online: www.calmac.org

²⁷ Illinois Statewide Technical Reference Manual, Version 7.0, Volume 4: Cross-Cutting Measures and Attachments. September 28, 2018. Available online: https://s3.amazonaws.com/ilsag/IL-TRM_Effective_010119_v7.0_Vol_1-4_Compiled_092818_Final.pdf

- Keating analysis of sources of measurement error²⁸

Cadmus selected the Illinois TRM method in addition to California methods because it was developed through a stakeholder advisory process and was informed by subject matter experts from around the country. Both Cadmus and Opinion Dynamics Corporation (the Energy Division evaluator) contributed to the version of the Illinois TRM cited here.

Overview of Other Methods

Each of the methods Cadmus reviewed are described next. The alternative methods use a similar framework for measuring freeridership and calculating NTG. All three approaches calculate a “core” NTG score by averaging three component scores; two of the component scores are based on the influence of program factors, while the third component score is a probability rating of installing the “exact same project” absent the program (counterfactual or “no-program” score).

Working Group Method

The Nonresidential Net-to-Gross Working Group published a framework approach for measuring NTG of nonresidential programs offered by California utilities in 2015. The report does not explicitly state algorithms, but describes a set of formulas for calculating project NTG that Cadmus interprets as follows:

$$NTG = AVERAGE(Influence1, Influence2, Counterfactual1) \div 10 \times (PF)$$

The protocol states the NTG is calculated with only Influence2 and Counterfactual1 if the respondent indicates a 10 out of 10 likelihood of installing the exact same project. The rationale for this exception is not given.

$$Influence1 = \frac{\max[program\ influence]}{(\max[program\ influence] + \max[nonprogram\ influence \times VMAX])} \times 10$$

$$Influence2 = Program\ Importance \times A$$

$$Counterfactual1 = 10 - Likelihood\ Exact\ Same\ Project\ without\ program$$

Where:

AF = awareness factor (0.5 if the respondent learned about the program after deciding to complete the project, 1 otherwise)

PF = Partial Freeridership adjustment (ratio of counterfactual savings to actual project savings), ranging from 0 to 1

²⁸ Keating, Ken. Freeridership Borscht: Don’t Salt the Soup. Presented at the 2009 Energy Program Evaluation Conference, Portland, Oregon. Available online: <https://www.iepec.org/conf-docs/papers/2009PapersTOC/papers/012.pdf#page=1>

VMAX = obtained from talking to program trade allies, this score assesses the influence of the program on the vendor. It ranges from 0 to 10 where 0 is not at all important and 10 meaning very important, applied to the influence1 score corresponding with vendors.

Influence1 uses respondent's ratings of several factors, including program and nonprogram factors. The highest rating of a program factor becomes the numerator, and the sum of the highest program factor rating and highest nonprogram factor rating is the denominator. Nonprogram factors include vendor recommendations; VMAX is applied to the score the participant assigned to the vendor's influence. The way the math works in this protocol is counter-intuitive. The higher the vendor rates the program influence (with a score of 10), the lower the overall Influence1 score due to the inverse relationship of VMAX.

Influence2 relies on a question that asks the respondent to allocate 10 importance points between two factors: the program as a whole, and nonprogram factors as a whole. The resulting program rating is then modified by an awareness factor that is equal to 0.5 if the respondent decided to implement the project before learning about the program.

Counterfactual1 is the respondent's indication of their likelihood on a 0-10 scale that they would have completed the exact same project without the program.

The three scores are averaged, then multiplied by another adjustment factor, PF. To calculate PF, the survey asks the respondent what quantity and efficiency level the respondent would have installed absent the program for each measure included in the project. PF is equal to the total savings from this alternative project, divided by the actual program savings.

OBf with Rebates Method

This method, used by the evaluators in the PY2015-2016 evaluation of the statewide OBF program, is almost identical to the Working Group method, except the individual scores are calculated as ratios (instead of values from 0 to 10), and it does not include the partial freeridership factor. In this study, the evaluators also did not incorporate a VMAX rating.

Illinois TRM Method

Like the Working Group method, the Illinois TRM method includes three component scores (two influence scores and one counterfactual score). But the algorithms to calculate the scores differ. The scores are calculated as ratios, not on a scale of 0-10. the first influence score doesn't include the nonprogram factor score in the denominator. Instead the score is simply the highest program factor rating divided by 10. In addition, the protocol does not include an awareness factor, and does account for project acceleration.

The primary Illinois TRM algorithms for the nonresidential sector are as follows:

$$NTG = \frac{Influence1 + Influence2 + (Counterfactual1 \times Timing Adjustment1)}{3} \times Timing Adjustment2$$

$$\text{Influence1} = \frac{\max[\text{program influence}]}{10}$$

$$\text{Influence2} = \frac{\text{Program Importance}}{100}$$

$$\text{Counterfactual1} = \frac{10 - \text{Likelihood Exact Same Project}}{10}$$

The Illinois TRM method recommends including a project acceleration factor in one of two ways, to be decided by the evaluator. The first approach is applied to the counterfactual score before the three component scores are averaged. The second approach is applied to the average of the three scores.

$$\text{TimingFactor1} = 1 - \frac{(\text{Months accelerated} - 6)}{42}$$

$$\text{TimingFactor2} = 1 - \left[\frac{(\text{Months accelerated} - 6)}{42} \times \frac{(10 - \text{Likelihood Completed within 1 Year})}{10} \right]$$

The timing factor is dependent on the “number of months expedited.” This value can range from 6 to 48 months. No explanation is given for why this range was selected.

Benefits of the Financing NTG Protocol

Cadmus’ Financing NTG protocol for OBF-AP offers several improvements on these methods, to tailor the protocol to a financing program:

- 1. Consistent with the CA EMV Protocols, Cadmus’ Financing NTG method asks explicitly about program-induced changes to quantity, level of efficiency, and measure adoption timing, instead of relying on a combination of probability questions and factor adjustments.**

The Working Group method and Illinois TRM methods both rely on a narrowly-phrased counterfactual question about the probability of installing the exact same project absent the program, that implicitly captures some information about the program’s impact on quantity and efficiency. The Working Group method also asks a partial freeridership battery that captures this information explicitly, but then combines that information with the probability question in a manner that leads to double-counting in cases when partial freeridership is determined to be nonzero (discussed in more detail later). The Working Group method does not address the program’s influence on project timing. The Illinois TRM method, on the other hand, does not propose the partial freeridership multiplier, and does include other questions that explicitly ask about the program’s impact on project timing. But the Illinois TRM method allows the timing information to be incorporated into the final freeridership score in two ways, one of which gives a much higher weight to the timing score than the other, without providing a clear explanation for the difference.

Cadmus considers these approaches unnecessarily complicated and resulting in final freeridership scores that are difficult to interpret, because they do not separately assess different ways the program can

impact realized energy savings. The OBF-AP program has the potential to affect all three aspects of participant’s project – quantity, efficiency, and timing. All of these are important drivers of savings from energy efficiency programs, in different ways. The purpose of most programs is to accelerate adoption of higher-efficiency technology beyond a naturally-occurring rate of efficiency improvement. Therefore, accelerated project timing is a key program outcome. On the other hand, programs should recognize a code or market standard baseline is not appropriate for all projects because, in at least some cases, participants would have purchased equipment above code even without project intervention.²⁹ Similarly, participants may have installed some lesser quantity of efficient items without the program. Program evaluation should capture and incorporate all of these potential adjustments to project savings (quantity, efficiency, and timing). Given the importance of these factors, Cadmus asked about each explicitly in the OBF-AP survey, and scores each aspect separately. The OBF-AP approach also clearly conforms to the CA EMV protocols, which require that all three factors be addressed in analysis of NTG.

2. Cadmus believes the emphasis for a financing program should be on a detailed counterfactual battery, rather than influence questions.

Cadmus’ understanding, based on the limited discussion available in the documents we reviewed, is that the reason for scoring both influence and counterfactual questions in other protocols is to ensure that freeridership is not developed using a response to only one question. Having multiple scores that are averaged dampens an extreme response and is thought to improve the stability and accuracy of the measurement. Further, although not discussed in the documents we reviewed, Cadmus considered that the two types of questions (influence and counterfactual) allow for some compensating biases – that customers are more likely to say they would have “made the efficient choice” even without the program, while also wanting to acknowledge the program’s helpfulness by giving higher scores for influence.

Cadmus did not incorporate influence questions into the OBF-AP NTG framework because, in our view, including information about relative influence in scoring is inappropriate. While respondents may have many reasons for completing a project, often none of these reasons is sufficient by itself. For example, aging equipment, a desire to reduce energy costs, and having access to the program financing may all be equally important factors in a participant’s decision to make an energy efficiency improvement. But even if a customer is influenced by the first two factors, they may be unable or unwilling to fund the project if the third factor, the program financing, were not available.

The potentially offsetting biases for influence and counterfactual questions are likely minimized for financing programs. With rebates, customers must come up with the remainder of the project costs or potentially even the entire upfront cost if the rebate is paid after installation. As such, influence questions are appropriate for rebates that leverage participant dollars. However, given OBF-AP pays for 100% of upfront costs, it is beyond influential, it is enabling. Full upfront financing, like that offered through OBF-AP, can change purchasing power by orders of magnitude, because the customer only

²⁹ As an example, Cadmus’ previous Codes and Standards impact evaluation for the CPUC revealed that a significant share of TVs sold in California were already compliant before a Title-20 TV standard took effect.

needs to have a tiny fraction of the overall cost on hand at any point in time. Especially for financing programs that charge interest (and therefore add to the total project cost), the purpose of making the financing available is to leverage this increase in purchasing power.

Finally, Cadmus found little consensus among experts as to how influence data should be scored. The methods we reviewed used a range of algorithms to score the same influence data, with no explanation of the underlying logic. For example, the Working Group method calculates one influence score as the maximum importance rating for a program-related factor, divided by the sum of the program maximum importance rating and the non-program maximum importance rating. There is no discussion of why this denominator makes more sense than using two times the maximum value in the rating scale, or some other value. The second influence question is simply that same program maximum importance rating, divided by the maximum value in the rating scale and then multiplied by an adjustment factor of 0.5 if the participant planned their project before learning about the program. Again, there is no explanation for why the adjustment is applied to only one influence score, or why it is set at 0.5.

In our survey, Cadmus includes questions about program and non-program influences as added context for interpreting results. Some of these questions are asked before counterfactual questions so that respondents will be mindful of those influences when responding to scored questions. We also ask questions to assess the relative importance of the key program features after the scored freeridership battery. Analysis of the responses to these questions, discussed in the Decision-Making Process section in the main body of this report, revealed that financing for major capital improvement projects is a significant barrier to project completion, and that while respondents have many reasons for wanting to complete a project, they are often unable or unwilling to take action without the program financing.

3. Cadmus’s approach accommodates an NMEC-based approach to gross savings.

The Working Group protocol indicates the partial freeridership adjustment factor is based on calculation of energy savings under an intermediate baseline relative to the in-situ baseline. However, the OBF-AP program was approved with the savings methodology based on normalized metered energy consumption (NMEC). An NMEC baseline provides gross savings without engineering calculations, and so the engineering analysis required by the Working Group method cannot be applied. Instead, Cadmus’ approach asks respondents to self-report the probable percentage of the project’s quantity, efficiency level, and timing (phrased as completion within one year) completed in a counterfactual scenario. These percentage responses are multiplied together to obtain the freeridership score, which can be applied directly to the gross savings to account for partial freeridership. No additional adjustment is necessary.

4. Cadmus’ scoring approach correctly accounts for conditionally linked phenomena.

In a review of our approach, the CPUC’s Energy Division (ED) and their consultants noted that research on using self-report data for freeridership analysis has found that multiplicative scoring often results in an inappropriately low value, since the product of two values between 0% and 100% is always less than either of the inputs. A second potential problem with multiplicative scores is that they can too easily be set to zero if a single component is 0%. To provide additional detail on their concerns, the ED team provided a paper by Ken Keating called “Freeridership Borscht: Don’t Salt the Soup”.

While we appreciate this feedback and acknowledge the potential for problems, our reading of the Keating paper indicates that, in this case, our approach was warranted.

Multiplicative “Shrinking”. The Keating paper explains that the danger of multiplicative shrinking applies to scoring that summarizes multiple observations **of the same phenomenon** through multiplication. Keating provides an example of 4 responses to different questions that all essentially ask, “how important was the program to your decision?” in a different way. The responses are scored as 0.7, 0.1, 0.5, and 0.8 (with 1.0 representing 100% freeridership). The scores are multiplied together, and the result – 0.028 – is less than any of the individual components, almost all of which implied a high freeridership rate. In Keating’s example, it was inappropriate to multiply the values. Instead, they should have been averaged to calculate the final result.

This concern does not apply to our scoring protocol, since each of the components we include is measuring a different phenomenon, and the phenomena are conditionally linked (each phenomenon is modifying or qualifying the outcome of the previous phenomenon). We ask questions about quantity, efficiency level, and timing that are “nested” so that each successive question narrows the reference case for the following question. For example, if the respondent would have installed 50% of the LEDs without the program, we then ask a question about the level of efficiency of the 50% that would have been installed. Multiplying the scores is the appropriate and accurate way to incorporate that “nesting” into the final score.³⁰

In contrast, it would NOT be appropriate use a multiplicative algorithm if the phenomena being asked about were not conditionally linked. For example, it would be inappropriate to multiply the response to the following two questions, because they are not conditionally linked. Instead, each refers back to the original project.

1. What proportion of the LEDs actually installed would have been installed without the program?
2. What proportion of the lighting project that was actually completed would have been completed in one year?

The response to both questions could be 50%. Multiplying the two values would give a value of 25%, indicating 25% of the LED project would have been completed anyway within one year. However, if all of the 50% of LEDs that would have been installed, would have been installed in the first year, the value of 25% would be incorrect.

Power of Zero. Another concern that Keating discusses is the power of zero. Keating illustrates that in a purely multiplicative score, any variable scored as 0 sets the entire score to zero, essentially ‘erasing’ the

³⁰ As Keating notes: “It would be proper to use a multiplicative algorithm if the phenomenon being measured is best represented by a contingent or conditional probability.... In this sense, conditional means that in order for the phenomenon to be valid, all facets must be true. The answer X is valid only if A AND B AND C are true. In that case, the probabilities of A, B, and C, not only can be multiplied, but they must be multiplied together.”

input from other variables. Our score has four components: A “filter” for absolute zero freeridership (applied as 0% or 100%), and scores for quantity, efficiency, and timing in a counterfactual scenario. As a safeguard, the survey includes a verification question for any response that would lead to a score of 0% for any of these components. We agree that a response that equates to a score of 0% for any of the four components in our algorithm would result in a final freeridership score of 0%. However, we could not identify a scenario where it would be unreasonable for a zero component to set the entire score to zero. For example, consider the two questions that inform the filter component. The first question allows a respondent to indicate zero confidence that their organization would have paid for the project without OBF-AP. If the respondent does indicate zero confidence, a second question verifies that response. The two questions are shown below:

D4. Thinking back to when your [company/organization/agency] was planning this project, imagine the PG&E on-bill financing was not available. How confident are you that your [company/organization/agency] would have used other financing, cash or another means to pay for some or all of the project? Would you say... [READ ALL RESPONSES]

1. Very confident
2. Somewhat confident
3. Not too confident
4. Not at all confident
98. (Don't know)

D6. [IF D4D4=4] To confirm, your [company/organization/agency] would not have invested in any portion of the project in the foreseeable future without the PG&E on-bill financing?

1. (Yes, that's correct) [SKIP TO D18]
2. (No, that's not correct) [SAY "Ok, Lets revisit the previous question." RETURN TO D4]

A respondent that indicates zero confidence in the first question, and then confirms their response in the second question, would be scored a 0% freerider. Since the respondent is indicating the project (and savings) would not have occurred without the program, this is the appropriate score.

5. Cadmus does not base freeridership on the timing of awareness of the program.

A question about whether respondents decided to implement their project before learning about the program is a common element to all three methods we reviewed. The Working Group and OBF with Rebates methods assign a 50% adjustment factor to one of the two influence scores if the answer is affirmative. The Illinois TRM method recommends a confirmation question if the answer is yes and if the respondent reported any program factor had an influence greater than 7 on a 10 point scale.

Intuitively, the participant should not give the program full influence credit if they learned about the program AFTER deciding to implement a project. However, the adjustment factor suggests respondents are unable to accurately provide the relative importance of the program. It may be worth investigating why customers give the program any influence at all if they had truly made the decision to implement

the project before learning about the program. In short, the need to apply the adjustment suggests this measurement is inherently unreliable.

In addition, this type of question is not appropriate for financing because access to capital may be the reason for project delays. Consider a government agency with significant deferred maintenance. They may have identified a project need only to find out they couldn't get the project approved in the budget due to other competing needs. To say this agency is a freerider because they planned the project before they learned about OBF-AP is not valid. This example highlights the point referenced previously, that one of the major benefits of financing is its ability to dramatically increase purchasing power and accelerate project installation.

Instead, to measure the impact of OBF-AP, the appropriate question is whether the respondent would have been willing or able to use a different method of payment to complete the project within the timeframe of consideration (in this case, 12 months) if OBF-AP were not available.

Additional Observations on Alternate Methods

Below, Cadmus presents some additional observations on the California methods and the Illinois TRM method. These concerns do not directly relate to our proposed approach for estimating OBF-AP freeridership, but may provide value to future evaluations.

General Observations

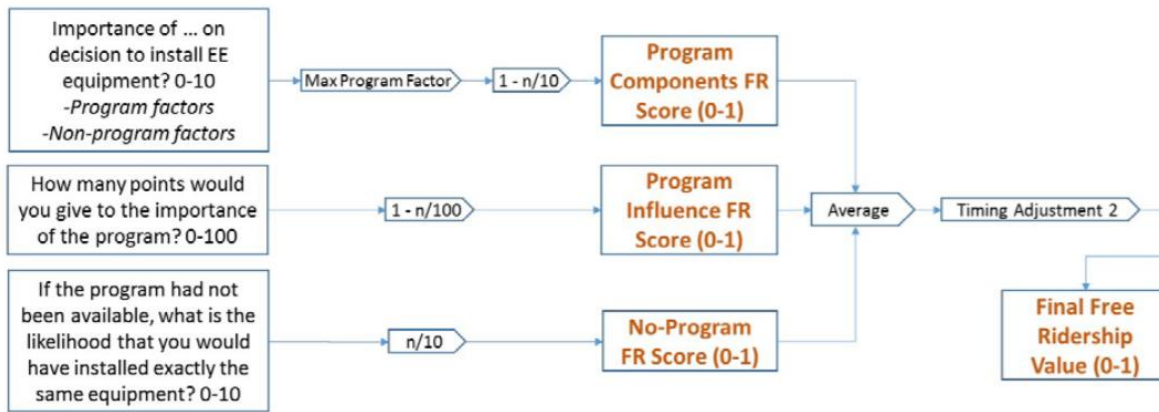
Scoring weight different components unequally

The Working Group method, OBF with Rebates method, and the Illinois TRM method all use an approach that emphasizes influence factors over counterfactual scenarios. Although we did not find an explicit discussion of the structure of the two influence scores used in each method, each method appears to have one score based on unconstrained ratings (rating multiple factors on a uniform scale, with no requirement to relate the factors to each other), and one score based on a relative importance rating, where the sum of the program importance and the non-program importance ratings have to sum to maximum value on the rating scale. Although structured differently, the two scores are addressing the same information – the importance of program factors on decision-making. In each of these approaches, the influence questions have a 2/3 weight in the core score.

The Illinois TRM presents a second weighting issue, related to the program's impact on project timing. In the Illinois TRM method, the timing adjustment is used as a weight itself. It can be incorporated into the 'no-program' basic counterfactual score (modifying only the counterfactual component score and leaving the influence questions with a 2/3 weight). Alternatively (as shown in Figure 15), it can be applied to the entire core score, in which case it has a much greater influence on the final score. The rationale behind the uneven weighting of influence score, or uneven application of the impact on project timing, is not explained in any of the three protocols.

Figure 15. IL TRM Nonresidential FR Score Option 2

$((\text{Program Components FR Score} + \text{Program Influence FR Score} + \text{No-Program FR Score}) / 3) * \text{Timing Adjustment 2}$



An “exact same project” counterfactual is too limited

All three methods use a single probability question about completing the “exact same project” as their core counterfactual assessment. This question could be confusing to respondents and leaves out important counterfactual possibilities.

In the Working Group method, the question reads:

“Now I would like you to think about the action you would have taken with regard to the installation of this equipment if the PROGRAM had not been available. Using a likelihood scale from 0 to 10, where 0 is “Not at all likely” and 10 is “Extremely likely”, if the PROGRAM had not been available, what is the likelihood that you would have installed exactly the same program-qualifying efficiency equipment that you did in this project?”

It is likely many respondents would have difficulty differentiating between this question, which asks about the relative probability of exactly the same project occurring, and a question about the likelihood of completing some portion of the project. Any response to this question that is less than 10 is at least as likely to mean “we probably would have done something less” as it is to mean “there is a less than 100% chance we would have done the exact same project.” This is particularly true of large, multi-measure projects, which can easily be scaled up or down.

Eleven-point scales are inappropriate for phone research

The alternate methods ask customers to use 0-10 scales to rate importance and probability. Cadmus adopted 4 and 5 points scales instead, for several reasons. First, in a phone survey, larger scales can be problematic because the respondent hears an emphasis on the endpoints, which can lead to responses

that are concentrated at the endpoints.³¹ In addition, as noted in a presentation to the Illinois NTG Working Group, scales with more than 7 points can introduce unnecessary statistical “noise” into analysis.³² The presentation also noted that for unipolar scales, a midpoint can be falsely interpreted by respondents as a “neutral” response, when in fact it is not. Cadmus adopted a 5-point scale to assess program and non-program influences, to allow potential comparison with 11-point scales used for other studies (both scales have a clear mid-point, which should facilitate alignment). However, for the questions Cadmus will score to evaluate freeridership, we rely primarily on percent, which is a familiar, intuitive scale where the end points do not need to be described. We also use a 4-point unipolar scale, which has no potentially confusing midpoint, to assess likelihood.

Working Group Method

Scoring introduces potential for double-counting freeridership

The recommended scoring for the Working Group method partial freeridership battery introduces the potential for double-counting of freeridership in the way it is integrated with the core score. The core NTG includes a question about the probability of completing the exact same project absent the program, rated on a scale of 0-10. The response value is included in the core score with no further adjustment. In other words, if the respondent indicates an 8 out of 10 probability of completing the same project without the program, this is interpreted as an observation of 80% freeridership. As discussed previously, Cadmus considers it probable that many respondents misinterpret this question, and in their response are indicating the portion of the project they would have completed without the program assistance.

The partial freeridership adjustment is an explicit calculation of the savings the respondent would have achieved from the portion of the project – or efficiency level of the project – they would have installed without the program. The Working Group method provides two options for incorporating this adjustment – either multiplying it with the core NTG, or incorporating it directly to the project gross savings. However, either approach leads to the same end result – information on the portion of the project that would have been conducted without the program is incorporated twice (once, inadvertently, in the core NTG, and once explicitly through the partial freeridership adjustment.).

The Keating paper expresses this problem another way, as a downward bias resulting from inappropriate multiplication of scores. Whether they are combined in the NTG, or the freeridership adjustment is incorporated into the gross savings (which is itself then multiplied by the NTG) the core NTG and the partial freeridership adjustment are eventually being combined through multiplication. Since the Working Group method core NTG and partial freeridership adjustment are both numbers

³¹ Great Brook conducted an experiment with 10,000 telephone surveys using different scale designs measuring the same attributes. They found a numeric scale with anchors only for the endpoints led to more people selecting the endpoints. Scales with verbal descriptions (extremely satisfied, somewhat satisfied, etc.) led to greater dispersion of responses. Accessed 11/15/2019 <https://greatbrook.com/survey-scale-design-and-performance-measurement-systems/>

³² Opinion Dynamics. “Survey Scales” (presentation). Prepared for the Illinois NTG Working Group. June 5, 2019.

between 0 and 1, the final NTG is equal to or smaller than either value on its own. Given the core NTG and partial freeridership batteries ask overlapping questions about the respondent's decisions in a counterfactual no-program scenario, the more appropriate method to combine them would be averaging.

Working Group method scoring calculations are unclear

The document describing the Working Group method would benefit from equations to demonstrate the calculations it describes. For example, consider Score 1. Score 1 consists of asking the respondent to rate at least seven factors that may have influenced their decision. Six of these are program features, and one (vendors) could be either a program or non-program factor. Presumably additional nonprogram factors could be included although examples of nonprogram factors are not provided. The Score 1 calculation is described as:

"The highest program influence score divided by the sum of the highest program influences (i.e., the responses to the first six decision maker questions) plus the highest non-program influence score, multiplied by 10. and, if the vendor interview has been triggered, the VMAX score multiplied by the score the decision makers assigned to the vendor recommendation." [sic]

This wording is unclear and could be interpreted different ways. Cadmus interprets this to say that the score is meant to be calculated as follows:

$$\text{Score 1} = \frac{\max[\text{program influence}]}{(\max[\text{program influence}] + \max[\text{nonprogram influence} \times \text{VMAX}])} \times 10$$

However, applying this to a specific example, the algorithm doesn't seem to produce the intended results. Imagine a respondent rates the six program influences as 10, 2, 2, 2, 0, 2 and the nonprogram vendor influence as 8, triggering a vendor-program (VMAX) score of 10. This indicates one aspect of the program was very important, and the vendor factor was almost but not quite equally important, and all other aspects of the program were minor. It also says the vendor was strongly influenced by the program with a vendor score of 10. So for this respondent, intuitively, the freeridership should be somewhere between 0% and 50%, and the corresponding NTG between 50% and 100%. But the score would be calculated as follows:

$$\text{Score 1} = [10 / (10 + 8 \times 10)] \times 10 = 10/90 \times 10 = 1.1111$$

The core NTG, as measured by Score 1 alone, and divided by 10 per the Working Group method core score calculation, would then be 11%. Also, in our interpretation, the stronger the vendor score VMAX, the lower Score 1 would be, which seems to be incorrect. If the vendor had said the program was not at all influential, with a score of 0, then Score 1 would result in a value of 10, or NTG of 100%.

Working Group method partial freeridership battery is inconsistent

The Working Group method partial freeridership battery confuses the idea of the program being unavailable with the idea that the measures installed are unavailable.

The first question is:

“Now I would like you to think one last time about what action you would have taken if the program had not been available. Supposing that you had not installed the program qualifying equipment, which of the following alternatives would you have been MOST likely to do?”

The critical issue is what would have occurred if the *program* did not exist. The second sentence in the question implies the *installed measures* were not available, forcing the respondent to indicate they would have done something else without the program.

Summary

In reviewing FR protocols for applicability to OBF-AP, Cadmus identified several issues with the existing Working Group method protocol and its application to nonresidential programs in general. We believe PG&E has the basis to request a revisit of the Working Group method protocols to clarify and correct the issues described herein.

Appendix B. Comparison of Self-Report NTG Methods

To compare the results of different self-report methods, Cadmus applied the scoring algorithms from four other NTG methods to the OBF-AP survey data. Since Cadmus did not include the exact questions used by these other methods in our survey, we used proxy data in our calculations. As a result, this analysis cannot provide the degree of difference in the NTG that results from using different methods, and the explicit values presented in this analysis should be used with extreme caution. In addition, we cannot assess the impact of different question language, choice architecture, or other elements of survey design on the NTG outcome. However, the analysis does demonstrate likely directional differences in the results from different protocols, and highlights how each protocol's different treatment of the same information results in different NTG outcomes.

Background on Methods

The four other methods in this analysis include the three methods from the protocol review (see the *Self-Report NTG Protocol Review* section in the main text for more detail) and the updated nonresidential NTG approach described in the draft version of the 2018 Small/Medium Commercial Sector ESPI Impact evaluation (Revised Working Group method).³³ While the Financing NTG protocol calculates a single score for each respondent, the four comparison methods all calculate three separate scores for each individual that are then averaged. Two of the methods allow for an additional multiplier to adjust the final averaged score. Each alternative method's component scores and multipliers are shown in Table 20.

Table 20. Summary of Score Components by Method

Method	Counterfactual Scores	Influence Scores	Total Component Scores	Additional Multiplier on Final Score
Financing OBF	1	0	1	No
Working Group	1	2	3	Yes (Counterfactual quantity and efficiency)
OBF with Rebates	1	2	3	No
Illinois TRM	1	2	3	Optional (Project acceleration) ^a
Revised Working Group	2	1	3	No

^a The version of the Illinois TRM method modeled in this study did not apply the optional final score multiplier; instead, project acceleration was incorporated into the counterfactual score.

Comparative Net-to-Gross Ratio Analysis

Table 21 shows the weighted and unweighted program NTGs calculated from each method. The highest weighted value (0.94) was 164% of the lowest weighted value, while the highest unweighted value

³³ Itron. February 28, 2020 (DRAFT). *2018 Small/Medium Commercial Sector ESPI Impact Evaluation*. Prepared for the California Public Utilities Commission. PG&E asked Cadmus to include the Revised Working Group method after we had completed the protocol review.

(0.80) was 178% of the lowest unweighted value. Weighted NTG was consistently higher than unweighted NTG across all methods.

Table 21. Comparison of On-Bill Financing Program Net-to-Gross Ratios by Method

Method	Program NTG	
	Weighted	Unweighted
Financing NTG	0.94	0.74
Working Group	0.57	0.45
OBF with Rebates	0.63	0.54
Illinois TRM	0.89	0.80
Revised Working Group	0.72	0.57

Analysis by Component

Looking at only counterfactual scores, the spread in the unweighted average NTG is lower. Table 22 shows the Financing NTG (a counterfactual score) and the counterfactual component scores from the other four methods. Although the other four methods all use a single question about the probability of completing the exact same project as a counterfactual score, we used the responses to the Financing NTG protocol to model counterfactual scores for this study. Since the Working Group, OBF with Rebates and Revised Working Group methods do not account for project acceleration, Cadmus used only the W, Q, and E values from our analysis to model counterfactual scores for these methods. For the Illinois TRM method, which does incorporate project acceleration into their score, Cadmus included the W, Q, E and T values to model the counterfactual for that method.

The Financing NTG and Illinois TRM methods have the highest counterfactual scores because these two methods credit the program for accelerated savings (from projects being implemented sooner than they otherwise would). In addition, the Working Group method resulted in the lowest overall unweighted NTG (0.45) due to the partial freeridership adjustment factor applied to 11 of 23 respondents. This multiplier, applied to the average of the three core component scores, discounts the averaged score for savings that the respondent would have achieved without the program. However, because this discount is already implicit in the counterfactual score, this amounts to double-counting freeridership. The unweighted NTG for the OBF with Rebates method, which is very similar to the Working Group method except that it does not include the partial freeridership adjustment, was 0.09 higher.

Table 22. Counterfactual Scores by Method (Unweighted)

Financing NTG	Working Group*	OBF with Rebates	Illinois TRM	Revised Working Group Score 1	Revised Working Group Score 2
0.74	0.65	0.65	0.74	0.62	0.65

*The Working Group method also applies a partial freeridership adjustment factor, not shown in this table, which is also measure of counterfactual savings.

The primary driver of the difference in NTGs is the use of influence scores. Across the four comparison methods, the influence scores use two basic approaches that Cadmus refers to as the unconstrained influence score, and the relative influence score. The unconstrained influence score is based on questions that ask the respondent to rate various program and nonprogram factors on a consistent scale, without requiring the respondent to compare across factors. In these questions its possible for every factor to receive the maximum rating. The relative influence questions ask the respondent to assign a number of points (either 10 or 100) to the program’s influence as a whole, and to non-program influences as a whole, so that the two ratings sum to the total number of points. This question forces the respondent to indicate the importance of the program relative to non-program influences. The Working Group, OBF with Rebates and Illinois TRM methods all include one of each type of influence score. The Revised Working Group method only uses the relative influence approach.³⁴ Table 23 shows the algorithm used for each type of influence score, by method.

Table 23. Influence Score Algorithms by Method

Method	Unconstrained Influence	Relative Influence
Financing NTG	N/A	N/A
Working Group	Max program rating/ (Max program rating + Max non-program rating)	Share of 10 assigned to program/10 (x 50% if learned about program AFTER)
OBF with Rebates	Max program rating/ (Max program rating + Max non-program rating)	Share of 10 assigned to program/10 (x 50% if learned about program AFTER)
Illinois TRM	Max program rating/10	Share of 100 assigned to program/100
Revised Working Group	NA	Share of 10 assigned to program/10 (x 50% if learned about program AFTER)

To model the influence scores, Cadmus used the results to questions D18, D20 and C2 from the participant survey. Question D18 asks about the importance, on a 1-5 scale, of several program factors as well as the need to address deferred maintenance (a non-program factor). Cadmus used these responses to calculate the unconstrained influence scores. Question D20 asks the respondent to indicate in their own words the single most important driver of their decision to complete their project. Where this factor was program related, Cadmus assigned the respondent a 0.75 score for the relative influence component. Where it was not program related, Cadmus assigned a 0.25 score. We also reduced this score by 50% if the respondent indicated they planned to complete their project prior to learning about OBF-AP for the Working Group, OBF with Rebates, and Revised Working Group methods. Table 24 shows

³⁴ The 2018 Small/Medium Commercial ESPI Evaluation report describes the authors’ decision to reject the unconstrained influence score they used in previous evaluations in favor of a second counterfactual score. The unconstrained influence score was generally out of line with the relative influence and the original counterfactual scores in their approach, and results showed little variance, tending to cluster around 5.0. The authors also noted including it amounted to double-counting influence information relative to counterfactual information, which they viewed as an unreasonable emphasis on influence. Considering this score to be unreliable and not informative, the authors discarded it and included a second counterfactual score from their data instead.

the average unconstrained and relative influence scores, the counterfactual scores, and the NTGs by method.

Table 24. Average Component Scores by Method (n=23)^a

Component	Financing NTG	Working Group	OBF with Rebates	Illinois TRM	Revised Working Group
Influence - Unconstrained	N/A	0.61	0.61	1.00	N/A
Influence - Relative	N/A	0.42	0.42	0.66	0.42
Counterfactual #1	N/A	0.65	0.65	0.74	0.65
Counterfactual #2	0.74	0.69 ^b	N/A	N/A	0.62
NTG	0.74	0.45	0.54	0.80	0.57

^a Some methods calculate freeridership, instead of NTG scores. Cadmus converted the freeridership scores to NTG for ease of comparison.

^b The Counterfactual #2 value in the Working Group method is a multiplier applied to the final score, referred to as the Partial Freeridership multiplier.

Across all comparison methods, both types of influence scores were lower than the counterfactual score, reducing the overall NTG (with the one exception of the Illinois TRM unconstrained influence score, discussed below). The Working Group and OBF with Rebates unconstrained influence scores clustered around 0.5, because respondents tended to say that both program and non-program factors were extremely important to their decision. As a result, most respondents received a score calculated as a numerator of around 5 and a denominator of around 10 (using Cadmus' 5-point scale). The relative influence scores were even lower than the unconstrained influence scores, due to the adjustment for timing of OBF-AP awareness. Eighteen of 23 respondents' relative influence scores were multiplied by 0.5 since they planned to implement their project before they learned about OBF-AP. (Without this adjustment, the relative influence scores for both the Working Group and OBF with Rebates methods would be higher than the unconstrained influence scores.)

The Illinois TRM unconstrained score uses a different calculation than the California methods. As a result, this method delivers a significantly different score, and implies a completely different conclusion with regard to the program's influence on participant decisions. Because all respondents gave at least one program factor the maximum possible rating, each respondent's score, equal to the maximum assigned rating over the maximum possible rating, was 1.00. The average score was also 1.0, the highest of any component score for any method.

Analysis by Project

Figure 16 shows the 23 individual respondent NTG scores using the Financing NTG protocol, and each of the four alternative methods. This figure presents the trends discussed above: Financing NTG scores tend to be the highest, followed by the Illinois TRM scores (which include project acceleration, and the very high unconstrained influence score). The Working Group scores, which double-counted freerider savings for 11 of 23 respondents, are generally the lowest score for each respondent.

Figure 16. Comparative NTG Scores by Respondent

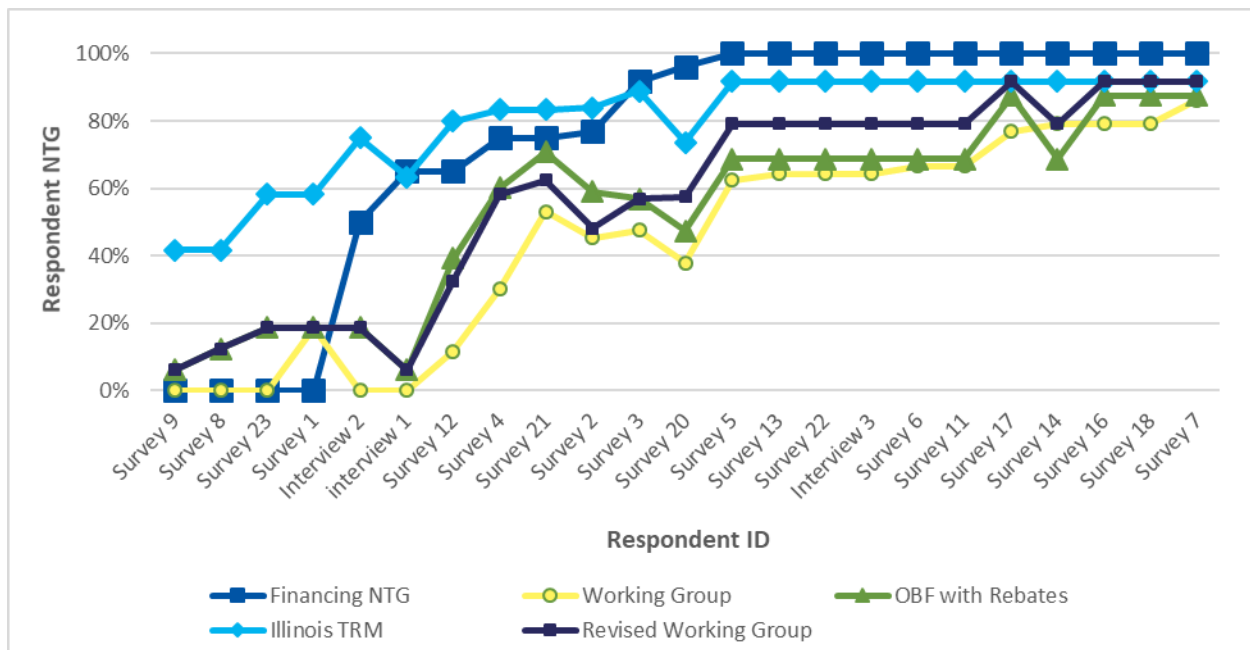


Figure 16 demonstrates that all methods recognized the same respondents as having the highest NTGs. The 11 projects that were scored as 100% NTG by the Financing NTG protocol included the 11 top NTG projects from each of the other methods except the OBF with Rebates method, for which 10 of the top 11 overlapped. The variation in program NTGs under the different methods is therefore tied in large part to differences in how the remaining 12 respondents were scored.

Figure 16 also illustrates that the Cadmus method is the only one that scored any single respondent as having an NTG of 1.00 (while the highest NTGs from other methods were 0.92 or less). After the Working Group method, Cadmus' approach also scored the most respondents (four) as having NTGs of 0.0. This range is due to the absence of influence scores in the Financing NTG method. As noted above, the California protocols' influence scores cluster around 50%, drawing program NTGs away from the extreme ends of the scale. (The counterfactual scores for all methods ranged from 0 to 1, or 0 to 10, depending on the scale).

As noted above, the difference in the treatment of project timing was a significant driver of NTG differences across methods. In the most extreme example, the respondent identified as Interviewee 1—who would have completed the exact same project over a period of 5 years, but only completed 35% of it in the same year—was scored as between 0.0 NTG and 0.1 NTG by the methods that did not grant the program credit for accelerating a project, while the Financing NTG protocol and Illinois TRM method scored this project as having a 0.6 NTG.

The Revised Working Group method modifies the approach used in the OBF with Rebates evaluation by swapping a counterfactual score in place of one of the two influence scores. Since counterfactual scores tended to be higher in this sample, this has the effect of increasing the overall NTG (the unweighted

average increased from 54% to 57%). But the Revised Working Group method still doesn't credit the program for project acceleration, and still includes other problematic elements, such as cutting the influence score in half if the participant planned to do the project before learning about the program. Scores using this protocol tended to be in the middle of the range.

Conclusions

Different protocols applied to the same data lead to very different results, which can have significant impacts on portfolio success, program cost-effectiveness, and ultimately how much net savings are "achieved." While it is possible to identify the specific calculations that lead to the difference, it is impossible to determine which approach is more accurate given we cannot truly measure the counterfactual. Given the potential consequences, it is unreasonable to add complexity that may or may not lead to improved accuracy, but reduces the overall savings claimed by a program with certainty.

The Financing NTG protocol is the only protocol demonstrated to allow a full range of scores, from 0% to 100% NTG. Conceptually, it is reasonable to assume that actual levels of freeridership would span the entire range. While this analysis does not prove that it is impossible to achieve a 0% or 100% score using the other methods, it does indicate that it would be much less likely, and potentially very rare. It is impossible to know which scoring outcome is most reflective of actual program impact, but the Financing NTG outcomes corresponded to the detailed context provided in in-depth interviews

Appendix C. Participant Survey

This survey collected data to evaluate the NTG for each OBF-AP participant. OBF-AP financing is repaid as a line-item on the participant bill and was structured such that the impact is bill neutral.

A. Introduction

- A1. Hello, I'm **[CALLER NAME]** calling on behalf of PG&E about the energy improvement retrofit for **[COMPANY NAME]** at **[SITE ADDRESS]**. May I speak with **[CONTACT NAME]**? **[IF NO NAME]** May I speak with the person who managed that project?

[IF NEEDED: This call is regarding the PG&E On-Bill Financing program. Through this program, PG&E provided financing for energy-efficient upgrades to your facility. Our records show that your organization completed this project in **[YEAR COMPLETED]**.

This call is for research purposes and is not a marketing or sales call].

1. (Yes)
 2. (No or not a convenient time) **[ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME OR IF YOU CAN LEAVE A MESSAGE FOR A MORE APPROPRIATE PERSON]**
 98. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
 99. (Refused) **[THANK AND TERMINATE]**
- A2. **[REPEAT GREETING IF NECESSARY]** I would like to speak to someone involved with your company's decision making related to using PG&E's on-bill financing. Are you the best person to speak to about the decision to use this program?
1. (Yes)
 2. (No, person is able to come to phone) **[ASK FOR CORRECT PERSON AND START AGAIN]**
 3. (No, person is not able to come to phone) **[GET NAME AND PHONE NUMBER, SCHEDULE CALL BACK]**
 98. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
 99. (Refused) **[THANK AND TERMINATE]**
- A3. We are conducting a survey today to better understand your company's experience with the program. We are able to offer a \$50 gift card to either Amazon.com or Home Depot as a thank you to everyone who completes the survey. Would you be able to participate?
- [IF RESPONDENT ASKS HOW LONG, SAY "APPROXIMATELY 10 MINUTES."]**
- [IF NEEDED:** This survey is for research purposes only and this is not a marketing call.]
- [ONLY IF ASKED FOR A PG&E CONTACT TO VERIFY THE SURVEY AUTHENTICITY, OFFER: [PG&E CONTACT]]**

B. Screener

- B1. Are you familiar with the energy efficiency project completed in **[YEAR COMPLETED]** at the building at **[SITE ADDRESS]**?
1. (Yes)
 2. (No) **[ASK TO SPEAK TO SOMEONE ELSE; OTHERWISE THANK AND TERMINATE]**
 99. (Refused) **[THANK AND TERMINATE]**
- B2. Our records show the project was financed with a loan from PG&E for about **[LOAN AMOUNT, ROUNDED TO NEAREST \$1,000]** that your **[COMPANY/ORGANIZATION/AGENCY]** is repaying on your energy bill. Does that sound right?
1. (Yes)
 2. (No)
 99. (Refused)
- B2a. Can you tell me what part of that description is not correct?
1. (Did not use PG&E financing) **[THANK AND TERMINATE]**
 3. (Not repaying on energy bill) **[THANK AND TERMINATE]**
 4. (Project loan amount incorrect) **[RECORD CORRECT AMOUNT; CONTINUE SURVEY]**
 98. (Don't know) **[THANK AND TERMINATE]**
 99. (Refused) **[THANK AND TERMINATE]**
- B3. Are you familiar with the decision-making process within your **[COMPANY/ORGANIZATION/AGENCY]** to develop and implement this project, including the decision to finance it with the loan from PG&E?
1. (Yes)
 2. (No) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN. IF NO ONE AVAILABLE, THANK AND TERMINATE]**
 99. (Refused)

C. Awareness

- C1. How did your **[COMPANY/ORGANIZATION/AGENCY]** first find out about PG&E on-bill financing? Was it through a... **[READ ALL RESPONSES, RANDOMIZE ORDER OF 1-4]**
1. Contractor or installer
 2. PG&E account manager or bill insert
 3. PG&E website or your own research
 4. From a friend or colleague
 5. Some other source **[SPECIFY]**
 98. (Don't know)
 99. (Refused)

- C2. Had your **[COMPANY/ORGANIZATION/AGENCY]** identified the need for part or all of the project you completed prior to learning about the on-bill financing from PG&E?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)
- C3. **[ASK IF C2=1]** Prior to learning about the on-bill financing from PG&E, was the cost of part or all of this project included in your organization's approved capital budget?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)
- C4. At the time your **[COMPANY/ORGANIZATION/AGENCY]** was planning the project, were you aware that PG&E also offered rebates for certain energy-saving improvements?
1. (Yes)
 2. (No) **[SKIPTO SECTION D]**
 98. (Don't know)
 99. (Refused)
- C5. Did your **[COMPANY/ORGANIZATION/AGENCY]** ever submit rebate applications for the equipment or improvements you installed using on-bill financing?
1. (Yes)
 2. (No)
 98. (Don't know) **[SKIPTO D1]**
 98. (Refused) **[SKIPTO D1]**
- C6. **[ASK IF C5=1]** Which of the following best explains why your **[COMPANY/ORGANIZATION/AGENCY]** did not receive rebates in addition to on-bill financing for this project? **[READ ALL RESPONSES]**
1. The rebate application was rejected
 2. The rebate application process took too long
 3. Other reason **[SPECIFY]**
 98. (Don't know)
 98. (Refused)

- C7. **[ASK IF C5=2]** Which of the following best explains why your **[COMPANY/ORGANIZATION/AGENCY]** did not pursue rebates in addition to on-bill financing for this project? **[READ ALL RESPONSES]**
1. You did not have the necessary information to apply for rebates
 2. The rebate amount was not large enough to bother with
 3. The contractor recommended avoiding rebates in order to receive financing faster
 4. Another reason **[SPECIFY]**
 98. (Don't know)
 99. (Refused)

D. Freeridership

- D1. Thinking about the project you financed through your on-bill loan, was the project something that could have been delayed longer than one year or did it have to get done right away?
1. (Yes, my **[COMPANY/ORGANIZATION/AGENCY]** could have delayed the project one year or more past the date it was actually completed)
 2. (No, my **[COMPANY/ORGANIZATION/AGENCY]** could **not** have delayed completion of the project one year or more past the date it was actually completed)
 98. (Don't know)
 99. (Refused)
- D2. **[ASK IF D1=2]** Why did the project need to be completed within one year of the actual completion date? Was it... **[READ ALL RESPONSES; ALLOW MULTIPLE RESPONSE]**
1. A need to address a regulatory compliance issue
 2. A need to address an urgent mechanical issue or issue with the building function
 3. A need to meet **[COMPANY/ORGANIZATION/AGENCY]** requirements for energy conservation or greenhouse gas reduction
 4. Another reason **[SPECIFY]**
 98. (Don't know)
 99. (Refused)
- D3. **[ASK IF D1=2 AND D2=1,2,3,4]** Can you provide a little more detail on the issue?
1. **[OPEN END]**
 99. (Refused)

- D4. Thinking back to when your **[COMPANY/ORGANIZATION/AGENCY]** was planning this project, imagine the PG&E on-bill financing were not available. How confident are you that your **[COMPANY/ORGANIZATION/AGENCY]** would have used other financing, cash, or another means to pay for some or all of the project? Are you... **[READ ALL RESPONSES]**
1. Very confident
 2. Somewhat confident
 3. Not too confident
 4. Not at all confident
 98. (Don't know)
- D5. **[ASK IF D1=2 AND D4=2, 3, 4, OR 98]** Earlier you indicated the project needed to be completed in a short time frame. If PG&E on-bill financing had not been available, why might your **[COMPANY/ORGANIZATION/AGENCY]** not have used a different means to pay for the project to complete it within the necessary timeframe?
1. **[OPEN END] [RECORD RESPONSE, OR ALLOW RESPONDENT TO CHANGE PREVIOUS ANSWER]**
 98. (Don't know)
 99. (Refused)
- D6. **[ASK IF D4=4]** To confirm, your **[COMPANY/ORGANIZATION/AGENCY]** would not have invested in any portion of the project in the foreseeable future without the PG&E on-bill financing?
1. (Yes, that's correct) **[SKIPTO D18]**
 2. (No, that's not correct) **[SAY "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D4]**
- D7. **[ASK IF D4=1, 2, OR 3]** Which of the following payment methods would your **[COMPANY/ORGANIZATION/AGENCY]** have been most likely to use, if the PG&E financing was not available? Please select all that apply. **[READ ALL RESPONSES]**
1. Cash or equivalent
 2. Loan or line of credit
 3. Grant
 4. Another method **[SPECIFY]**
 98. (Don't know)
 99. (Refused)

- D8. **[ASK IF D4=1, 2, OR 3]** If paying for the project with a **[ALL RESPONSES TO D7]**, would you have... **[READ ALL RESPONSES]**
1. Completed the exact same improvements, for the same total project cost, on the same schedule **[SKIPTO D16]**
 2. Changed some aspect of the project scope or timeline
 3. Not completed any part of the project at any time **[SKIPTO D17]**
 98. (Don't know)
 99. (Refused)
- D9. You mentioned you would have changed some aspect of the project scope or timeline. Think of the most likely changes to the project scope and timing if on-bill financing were not available. I'm going to read some possible outcomes. For each, please answer yes or no to indicate if it reflects how your project would likely have been different without on-bill financing.
1. Would you have reduced the quantity of equipment or improvements installed or eliminated some equipment or improvements from the project? **[RECORD YES/NO]**
 1. Would you have selected less expensive equipment that would have likely been less energy efficient? **[RECORD YES/NO]**
 2. Would you have completed some or all of the project more than one year in the future? **[RECORD YES/NO]**
 98. (Don't know)
 99. (Refused)
- D10. **[ASK IF D9=1]** You said you would have reduced the quantity of equipment or improvements installed. What percentage of the improvements in your project would you still have installed?
1. **[OPEN END %]**
 98. (Don't know)
 99. (Refused)
- D11. **[ASK IF D10=100%]** You said you would still have installed 100% of the measures or improvements you actually made, is that correct?
1. (Correct, would not have reduced the quantity) **[SAY "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D9.1]**
 2. (Not correct, would have reduced the quantity) **[REVISE RESPONSE TO D10]**

D12. **[ASK IF D9=2]** You said you would have selected less expensive equipment that would likely have been less energy efficient. Please indicate if all, most, a little, or none of the equipment would have been less energy efficient than what was actually installed.

1. (All of equipment would have been less efficient)
2. (Most of the equipment would have been less efficient)
3. (A little of the equipment would have been less efficient)
4. (None of the equipment would have been less efficient)
98. (Don't know)
99. (Refused)

D13. **[ASK IF D12=4]** You said none of the equipment installed would have been less efficient had on-bill financing not been available. Is that correct?

1. (Correct, would not have selected less efficient equipment) **[SAY "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D9.2]**
2. (Not correct, would have reduced the quantity of efficient equipment.) **[REVISE RESPONSE TO D12]**

D14. **[ASK IF D9=3]** Of the equipment you would have installed, or improvements you would have made, what percentage would you have installed within one year of the actual project you completed?

1. **[OPEN END %]**
98. (Don't know)
99. (Refused)

D15. **[ASK IF D14=100%]** You said you would have installed 100% of the equipment or improvements you would have made within one year, is that correct?

1. (Correct, would have installed all equipment within one year) **[SAY "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D9.3]**
2. (Not correct, would have installed some equipment more than one year later) **[REVISE RESPONSE TO D14]**

D16. **[ASK IF D8=1]** To confirm, not having the PG&E financing would have made no difference to the project you installed?

1. (Yes, that's correct)
2. (No, that's not correct) **[SAY, "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D8]**

D17. **[ASK IF D8=3]** To confirm, you would not have completed any aspect of the project in the foreseeable future if the PG&E on-bill financing were not available?

1. (Yes, that's correct)
2. (No, that's not correct) **[SAY, "OK, LETS REVISIT THE PREVIOUS QUESTION." RETURN TO D8]**

D18. I'm going to list a few factors that may have influenced your decision-making process. For each, please indicate on a scale of 1 to 5, with 1 being *not at all important* and 5 being *extremely important*, how important each factor was on your decision to complete the project. **[RANDOMIZE ORDER 1-6]** **[READ ALL RESPONSES]**

1. Financing with a fast application and approval process
2. Financing with 0% interest
3. Financing that covered most or all upfront project costs
4. Financing eligibility based on bill payment history only
5. Monthly payment offset by expected energy savings
6. Need to address deferred maintenance through the project
7. **[IF D2=1, 2, OR 3, INSERT D2 RESPONSE]**
98. (Don't know)
99. (Refused)

D19. Did the requirement to have energy savings from the project cover the monthly payment have...**[READ RESPONSES]**

1. A significant impact on the project design
2. Some impact on design, but not significant
3. No impact on project design
98. (Don't know)
99. (Refused)

D20. In your own words, what was the most important motivating factor influencing your final project scope and timing?

1. **[OPEN END]**

E. Spillover

E1. After completing the project, did your **[COMPANY/ORGANIZATION/AGENCY]** pursue additional energy-saving improvements at the same location, a different location, or both?

1. (Neither) **[SKIPTO F1]**
2. (Same location only)
3. (Different location only)
4. (Both)
98. (Don't know)
99. (Refused)

E2. **[ASK IF E1=2, 3, OR 4]** Did you receive utility rebates for all, some, or none of these projects?

1. (All) **[SKIPTO F1]**
2. (Some)
3. (None)
98. (Don't know) **[SKIPTO F1]**
99. (Refused) **[SKIPTO F1]**

- E3. **[ASK IF E1=2,4 AND E2=2,3]** What types of improvements were installed at the same location?
1. **[OPEN END]**
 98. (Don't know)
 99. (Refused)
- E4. Was your **[COMPANY/ORGANIZATION/AGENCY]**'s decision to make these improvements at the same location influenced in any way by the on-bill financing project?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)
- E5. **[ASK IF E4=1]** Did you receive any utility rebates for these additional improvements at the same location?
1. Yes
 2. No
 98. (Don't know)
 99. (Refused)
- E6. **[ASK IF E1=3 OR 4 AND E2=2 OR 3]** You mentioned improvements at a different location. At about how many locations in California did you make energy-saving improvements?
1. **[OPEN END NUMBER OF LOCATIONS]**
 98. (Don't know)
 99. (Refused)
- E7. What types of improvements did you make?
1. **[OPEN END]**
 98. (Don't know)
 99. (Refused)
- E8. Was your **[COMPANY/ORGANIZATION/AGENCY]**'s decision to make these improvements at other locations influenced in any way by the on-bill financing project?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)
- E9. **[ASK IF E8=1]** Did you receive any utility rebates for these improvements at different locations?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)

F. Satisfaction

- F1. Did your contractor, your PG&E account manager, or another PG&E representative help you complete the OBF application? **[SELECT ALL THAT APPLY]**
1. (Contractor)
 2. (PG&E account representative)
 3. (Other PG&E representative)
 4. (None of these)
 98. (Don't know)
 99. (Refused)
- F2. **[ASK IF F1=1]** How satisfied were you with the assistance from your contractor? Were you **[READ RESPONSES BELOW]**...
1. Very satisfied
 2. Somewhat satisfied
 3. Not too satisfied
 4. Not at all satisfied
 98. (Don't know)
 99. (Refused)
- F3. **[ASK IF F1=2 OR 3]** How satisfied were you with the assistance from PG&E representatives? **[READ RESPONSES BELOW]**...
1. Very satisfied
 2. Somewhat satisfied
 3. Not too satisfied
 4. Not at all satisfied
 98. (Don't know)
 99. (Refused)
- F4. Please tell me if you agree or disagree with the following statements about the OBF application process. **[READ ALL RESPONSES]**
1. The OBF application was easy to complete **[RECORD AGREE/DISAGREE]**
 2. The OBF application required a reasonable amount of documentation **[RECORD AGREE/DISAGREE]**
 3. The OBF application review and approval took a reasonable amount of time **[RECORD AGREE/DISAGREE]**
- F5. What suggestions do you have for improving the on-bill financing program?
1. **[OPEN END]**
 2. (None)
 99. (Refused)

G. Value of Non-Energy Benefits

- G1. Aside from saving energy, which of the following benefits did your **[COMPANY/ORGANIZATION/AGENCY]** realize from completing this project? Please indicate all that apply. **[READ ALL RESPONSES]**
1. Addressing regulatory or corporate requirements
 2. Improved comfort for users
 3. Improved competitiveness, for example by having brighter lights in a retail location
 4. Improved productivity
 5. Reduced maintenance costs
 6. Other benefits **[SPECIFY]**
 7. (None)
 98. (Don't know)
 99. (Refused)
- G2. **[ASK IF G1≠7,98, OR 99]** Can you tell me about how much your monthly loan payment to PG&E is, to the nearest thousand dollars, for the project at **[SITE ADDRESS]**? **[IF NEEDED: THIS IS THE AMOUNT INCLUDED AS AN ADDITIONAL LINE ITEM ON EACH MONTHLY BILL FROM PG&E.]**
1. **[RECORD VALUE]**
 2. (No/Don't know)
- G3. **[ASK IF G1≠7,98, OR 99 AND G2=1]** The energy savings from your project has an estimated dollar value about equal to your loan payment, which you estimated at **[RESPONSE FROM G2]** per month. Relative to that amount, would you say the additional benefits you mentioned are worth... **[READ ALL RESPONSES]**
1. Much more
 2. More
 3. The same amount
 4. Less
 5. Much less
 98. (Don't know)
 99. (Refused)
- G4. Why do you say that?
1. **[OPEN END]**
 98. (Don't know)
 99. (Refused)

- G5. Did your **[COMPANY/ORGANIZATION/AGENCY]** conduct a payback period analysis, return on investment analysis, or other similar analysis for the project you financed through PG&E?
1. (Yes, payback period)
 2. (Yes, return on investment)
 3. (Yes, other similar analysis)
 98. (Don't know)
 99. (Refused)
- G6. What types of financial benefits did you include in that analysis, other than energy cost savings?
1. **[OPEN END]**
 2. (None)
 98. (Don't know)
 99. (Refused)
- G7. When considering which model of equipment to purchase or what building improvements to make, what factors are typically key considerations for your **[COMPANY/ORGANIZATION/AGENCY]**?
1. **[OPEN END]**
 98. (Don't know)
 99. (Refused)

H. Early Pay-Off Plans

- H1. Does your **[COMPANY/ORGANIZATION/AGENCY]** plan to pay back the PG&E loan early?
1. (Yes)
 2. (No)
 98. (Don't know)
 99. (Refused)
- H2. **[ASK IF H1=1]** Why do you expect to pay the loan back early?
1. **[OPEN END]**
 99. (Refused)

I. Closing

Thank you. That completes the survey.

- I1. We can provide a gift card for either Amazon.com or HomeDepot.com. Which retailer would you prefer?

[IF WANT TO USE IN A PHYSICAL STORE: Home Depot gift cards can be used at a physical store location, by printing out the email with the gift card information.

IF ASKING WHY NOT A VISA GIFT CARD OR A CHECK: We are providing retailer-specific online gift cards as a way to avoid additional transaction fees, and to make it easier and faster for you to receive and use your gift card.

IF REQUEST A DIFFERENT STORE: Unfortunately, Amazon.com and Home Depot are the only authorized choices for this survey.]

1. (Amazon.com)
 2. (Home Depot)
 3. (Declined gift card)
 99. (Refused)
- I2. Can you provide the email address where you would like to receive your \$50 online gift card, as our thank-you for your participation?
 1. **[OPEN END** Email: _____@_____. _____ **READ BACK TO RESPONDENT TO CONFIRM]**
 2. (Declined gift card)
 - I3. Thank you. You should receive your gift card in two to three weeks at the email address you provided. Please check your spam folder if you do not receive your email.
 - I4. **[IF REQUESTED]** You can call the survey administrator for PG&E if you have any questions on your gift card. The survey administrator contact is Laura James, Cadmus, 503-467-7176

Appendix D. Participant Interview Guide

Recruitment Screener

Thank you for joining me today. To give you a little background, my company, Cadmus, has been hired by PG&E to gather feedback on customer experiences with their on-bill financing program. We are reaching out to all participants from the last two years. Your responses will be kept entirely confidential, and will be analyzed in combination with responses from other participants. Our goal with this study is to help PG&E understand how customers are learning about their program, how well it meets their needs, and to gather suggestions for improving the program. Do you have any questions before we begin?

A. Freeridership

I'm going to start with some survey-style questions that we are asking all respondents. These are primarily multiple-choice, so I will be reading you a list of choice options for each. After I go through these first questions, I will ask some more open-ended questions about your experience.

- A1. Thinking about the project you financed through your on-bill loan, was the project something that could have been delayed longer than a year or did it have to get done right away?
 - 1. (Yes, my [company/organization/agency] could have delayed the project a year or more past the date it was actually completed)
 - 2. (No, my [company/organization/agency] could **not** have delayed completion of the project a year or more past the date it was actually completed)
 - 98. (Don't know)
 - 99. (Refused)

- A2. [IF D1=2] Why did the project need to be completed within one year of the actual completion date? Was it... ...[READ ALL RESPONSES]
 - 1. A need to address a regulatory compliance issue
 - 2. A need to address an urgent mechanical issue or issue with the building function
 - 3. A need to meet [company/organization/agency] requirements for energy conservation or greenhouse gas reduction
 - 4. Another reason [SPECIFY]
 - 98. (Don't know)
 - 99. (Refused)

- A3. [IF D1=2 AND D2=1,2,3,4] Can you provide a little more detail on the issue?
 - 1. [OPEN END]
 - 99. (Refused)

- A4. Thinking back to when your [company/organization/agency] was planning this project, imagine the PG&E on-bill financing was not available. How confident are you that your [company/organization/agency] would have used other financing, cash or another means to pay for some or all of the project? Would you say... [READ ALL RESPONSES]
1. Very confident
 2. Somewhat confident
 3. Not too confident
 4. Not at all confident
 98. (Don't know)
 99. (Refused)
- A5. [IF D1=2 AND D4=2,3,4, 98, 99] Earlier you indicated the project needed to be completed in a short time frame. If PG&E on-bill financing had not been available, why might your [company/organization/agency] not have used a different means to pay for the project to complete it within the necessary timeframe?
1. [OPEN END] [RECORD RESPONSE, OR ALLOW RESPONDENT TO CHANGE PREVIOUS ANSWER]
 99. (Refused)
- A6. [IF D4=4] To confirm, your [company/organization/agency] would not have invested in any portion of the project in the foreseeable future without the PG&E on-bill financing?
1. (Yes, that's correct) [SKIP TO D18]
 2. (No, that's not correct) [SAY "Ok, Lets revisit the previous question." RETURN TO D4]
- A7. [IF D4=1,2,3] Which of the following payment methods would your [company/organization/agency] have been most likely to use, if the PG&E financing was not available? Please select all that apply. ...[READ ALL RESPONSES]
1. Cash or equivalent
 2. Loan or line of credit
 3. Grant
 4. Another method [SPECIFY]
 98. (Don't know)
 99. (Refused)
- A8. [IF D4=1,2,3] If paying for the project with [all responses to D7], would you have ...[READ ALL RESPONSES]
1. completed the exact same improvements, for the same total project cost, on the same schedule [SKIP TO D16]
 2. changed some aspect of the project scope or timeline
 3. not completed any part of the project at any time [SKIP TO D17]
 98. (Don't know)
 99. (Refused)

- A9. You mentioned you would have changed some aspect of the project scope or timeline. Think of the most likely changes to the project scope and timing if on-bill financing were not available. I'm going to read some possible outcomes. For each, please answer yes or no to indicate if it reflects how your project would likely have been different without on-bill financing.
2. Would you have reduced the quantity of equipment or improvements installed, or eliminated some equipment or improvements from the project? **[RECORD YES/NO]**
 1. Would you have selected less expensive equipment that would have likely been less energy efficient? **[RECORD YES/NO]**
 2. Would you have completed some or all of the project more than 1 year in the future? **[RECORD YES/NO]**
 98. (Don't know)
 99. (Refused)
- A10. **[IF D9=1]** You said you would have reduced the quantity of equipment or improvements installed. What percentage of the improvements in your project would you still have installed?
1. _____%
 98. (Don't know)
 99. (Refused)
- A11. **[IF D10=100%]** You said you would still have installed 100% of the measures or improvements you actually made, is that correct?
1. (Correct, would not have reduced the quantity.) **[SAY "Ok, Lets revisit the previous question." RETURN TO D9.1]**
 2. (Not correct, would have reduced the quantity.) **[REVISE RESPONSE TO D10]**
- A12. **[IF D9=2]** You said you would have selected less expensive equipment that would likely have been less energy efficient. Please indicate if all, most, a little, or none of the equipment would have been less energy efficient than what was actually installed?
1. (All of equipment would have been less efficient)
 2. (Most of the equipment would have been less efficient)
 3. (A little of the equipment would have been less efficient)
 4. (None of the equipment would have been less efficient)
 98. (Don't know)
 99. (Refused)
- A13. **[IF D12=4]** You said none of the equipment installed would have been less efficient had on-bill financing not been available. Is that correct?
1. (Correct, would not have selected less efficient equipment.) **[SAY "Ok, Lets revisit the previous question." RETURN TO D9.2]**
 2. (Not correct, would have reduced the quantity of efficient equipment.) **[REVISE RESPONSE TO D12]**

- A14. [IF D9=3] Of the equipment you would have installed, or improvements you would have made, what percent would you have installed within 1 year of the actual project you completed?
1. _____%
 98. (Don't know)
 99. (Refused)
- A15. [IF D14=100%] You said you would have installed 100% of the equipment or improvements you would have made within one year, is that correct?
1. (Correct, would have installed all equipment within one year) [SAY "Ok, Lets revisit the previous question." RETURN TO D9.3]
 2. (Not correct, would have installed some equipment more than one year later.) [REVISE RESPONSE TO D14]
- A16. [IF D8=1] To confirm, not having the PG&E financing would have made no difference to the project you installed?
1. (Yes, that's correct)
 2. (No, that's not correct) [Say, "Ok, lets revisit the previous question." RETURN to D8]

- A17. [IF D8=3] To confirm, you would not have completed any aspect of the project in the foreseeable future, if the PG&E on-bill financing was not available?
1. (Yes, that's correct) [SKIP TO Section B]
 2. (No, that's not correct) [Say, "Ok, lets revisit the previous question." RETURN to D8]
- A18. I'm going to list a few factors that may have influenced your decision-making process. For each, please indicate on a scale of 1 to 5, with 1 being not at all important, and 5 being extremely important, how important each factor was on your decision to complete the project. [RANDOMIZE ORDER 1-6] ... [READ ALL RESPONSES]
1. Financing with a fast application and approval process
 2. Financing with 0% interest
 3. Financing that covered most or all upfront project costs
 4. Financing eligibility based on bill payment history only
 5. Monthly payment offset by expected energy savings
 6. Need to address deferred maintenance through the project
 7. [IF D2=1,2,3: INSERT D2 RESPONSE]
 98. (Don't know)
 99. (Refused)
- A19. Did the requirement to have energy savings from the project cover the monthly payment have... [READ RESPONSES]
1. A significant impact on the project design?
 2. Some impact on design, but not significant?
 3. No impact on project design?
 98. (Don't know)
 99. Refused)

B. Motivation

Thank you! That concludes the survey-style section. The rest of my questions are intended to allow a more open-ended discussion.

- B1. I just asked you to rate some possible motivating factors. In your own words, what were the key motivating factors influencing your final project scope and timing?
- B2. And in your own words, what were the most important features of the OBF financing, that made you decide to use it to finance your project?
- B3. How does your organization typically identify which financing method, or lender, to use? **[If Govt Agency]** Would bond financing be an alternative you might have considered to the PG&E financing?
- B4. The OBF financing was provided at 0% interest. If you had had to use different financing, what interest rate would you have expected to pay?
- B5. **[Reference other financing options, if mentioned]** How did the process to obtain the PG&E loan differ, if at all, from the process you would use to obtain more traditional financing through a private sector lender?
- B6. **[IF NEEDED]** Earlier you described why this project needed to be completed within year. Can you clarify what would have happened if the project wasn't completed in that short time frame?

C. Awareness

- C1. What experience did you have with PG&E programs prior to using the OBF loan? Were you aware of PG&E financing programs? Had you ever received a rebate or financing in the past?
- C2. How did your **[company/organization/agency]** first find out about PG&E on-bill financing? (Probe: were they already looking into programs for a specific project, or did they find out through a contractor?)
- C3. And where were you in that process when you first learned about the OBF financing? (Probe: Had your **[company/organization/agency]** already identified the need for the project? Was it in the budget? What research or analysis had already been done?)
- C4. **[If project had already been identified]** How did the scope of the project change after you learned you could use PG&E financing? Why did you make those changes? (Probe: change details to meet savings requirements? Increase size/efficiency because more funding available? Or to take advantage of 0% interest?)

- C5. **[If not addressed]** At the time you were planning your project, were you aware that PG&E also offers rebates? Why did you choose to proceed with the financing option that did not also offer rebates? (Probe: amount not meaningful, process took too long, contractor recommended against it, etc.)
- C6. How does your organization usually determine what projects are a priority, and how much to spend? (Probe: Do you use any financial analysis, such as payback period or return on investment? Do you have maximum thresholds, or a target payback period?)
- C7. How did you select the developer or contractor you worked with on this project? (Probe: did they request bids? Was this someone they had worked with before?)
- C8. Our records show that [Proj Develop] was the project developer you worked with. How did you engage with this company? What role did the company play in the final design of the project? (how influential were they in determining the size of the projects and what measures to install?)

D. Satisfaction and Non-energy Benefits

- D1. Can you describe the process to apply for a loan? Who was involved internally and externally? (Probe: Did you receive support from the contractor or your PG&E account manager? Who conducted the savings analysis?)
- D2. How satisfied were you with the application process? What aspects worked well for you, and what aspects were challenging?
- D3. How satisfied have you been with the project you completed? Is the project meeting your expectations?
- D4. What benefits are you getting from the project, other than energy savings? For example, do you have better quality lighting, more comfortable heating and cooling now?
- D5. Were those benefits expected outcomes? (Probe: Did they contribute to your decision to complete the project?)
- D6. **[If Yes]** How do you think the non-energy benefits that you just mentioned impacted your decision making process? **[IF NEEDED: Refer interviewee back to the process to evaluate projects discussed above.]** Did you include them in the project financial analysis? Do you think those benefits played a role in determining how much you were willing to spend?
- D7. Do you think your organization will pay off the loan early? **[If yes: why do you think they will do that?]**

E. Spillover

- E1. Since completing the on-bill project, has your organization completed any other energy related projects, or are they considering any? Can you tell me a little about what you have done, or are planning to do? (Probe: Same location, or different locations?)
- E2. What are the motivations behind these additional projects? (Probe: How did the experience with the OBF project influence these additional projects?)
- E3. Do you expect to receive any rebates or financing for these other projects?

F. Closing

- F1. Looking on your experience with the program, do you have any suggestions for ways to improve the on-bill financing program?
- F2. That brings us to the end of the interview. We would like to offer you a \$50 gift card to either Amazon or Home Depot as a thank-you for participating today. Which would you prefer?
 - 1. Amazon _____
 - 2. Home Depot _____
 - 3. (Declined gift card) _____
- F3. Should I send it to the same email address I used for the invite?
 - 1. Yes _____
 - 2. Different email: _____

Appendix E. Response to Public Comments

PG&E posted this report for public review on July 21, and Cadmus presented an overview of this study in a public webinar on July 28, 2020. No comments were received.