

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE
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REVISED

July 12, 2016

Advice Letter, PG&E 3697-G /4812-E, 3697-G-A/4812-E-A

Erik Jacobson
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Subject: 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

Dear Mr. Jacobson,

The Commission Staff in Energy Division (ED) has determined that Pacific Gas and Electric Company's Advice Letter 3697-G /4812-E, 3697-G-A/4812-E-A is approved as supplemented on June 10, 2016. The Tier 1 Advice Letter is effective on the date PG&E timely filed it, July 1, 2016.

Commission Staff in Energy Division reviewed the proposal using the Review Sheet provided in Attachment 2. On April 14, 2016, The Utility Reform Network (TURN), Home Energy Analytics (HEA), and Energy First filed comments on the Advice Letter.

Attachment 1 contains a detailed discussion of the comments, reviewer feedback, and the Commission Staff's determination that the Advice Letter is compliant with the December 2015 Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs or Projects. Attachment 2 contains the review sheet that documents concerns and PG&E responses.

Please contact Carmen Best of the Energy Division management at, carmen.best@cpuc.ca.gov if you have any questions.

Sincerely,

Handwritten signature of Edward Randolph in black ink.

Edward Randolph
Director, Energy Division

Cc: Service list R.13-11-005
Pete Skala, Energy Division
Carmen Best, Energy Division

ATTACHMENT 1 Background, Discussion, and Conclusions

I. Background

On March 25, 2016, Pacific Gas and Electric (PG&E) filed a Tier 1 Advice Letter consistent with the December 30, 2015, “Assigned Commissioner and Administrative Law Judge’s Ruling Regarding High Opportunity Energy Efficiency Programs Or Projects” (HOPP). PG&E proposed the On Bill Financing Alternative Pathway (OBF Alternative path) as a HOPP. PG&E proposes to pair the opportunity to use metered energy data, with an alternative on-bill financing option to test whether financing alone without an incentive can support high energy efficiency projects. The zero interest loans offered by the utility will be based on projected meter-based gross savings. Gross energy savings will be calculated using the investor confidence project (ICP) specifications. To calculate net savings, for savings claims, the utility proposes to use quasi-experimental design approaches coupled with self-report. Commercial customers can receive up to a \$100,000 loan for five years, and government can receive up to a \$250,000 loan for ten years. The alternative path will leverage existing infrastructure as well as the existing on bill-financing program’s revolving loan fund.

On April 14, 2015, Environmental Defense Fund (EDF) filed comments on PG&E’s proposal. EDF points out that by leveraging the ICP investor ready energy efficiency certification, PG&E could create a new market based path to financing. EDF also notes that the proposal will reduce transaction costs and while maintaining quality by relying on industry standards and best practices. EDF suggests that many building owners choose not to make energy efficiency improvements due to the complexity, cost and time to submit rebates, and the uncertainty of due diligence processes associated with utility incentive programs. By using the ICP specifications, each project will be conducted based on industry standards and will include an engineering review. Project developers will select appropriate protocols, and accordingly conduct steps for baselining usage and predicting savings. Finally, EDF argues that the OBF alternative pathway is consistent with AB 802.

In order to determine if the proposal was consistent with the requirements laid out in the December Ruling, the Commission staff worked with its consultants and completed an initial review the results of which were shared with the Service List to R-13-11-005 on April 14, 2016. Commission staff had already informed PG&E that the proposal contained enough information to satisfy the initial review. The utility and review team also had multiple telephone calls with the utility to discuss issues that the proposal raised, and what was necessary to meet the December Ruling requirements. PG&E sent responses to the comments, which served as a pre-cursor to revising the proposal. The Review Sheet with Reviewer comments and PG&E’s responses is in Attachment B. The Commission staff requested that the utility file a supplemental advice letter to address stakeholder comments, and outstanding concerns. PG&E filed the supplemental on June 10, 2016.

II. Discussion and Conclusions of HOPP proposal requirements

1. Principles of HOPPS and General Program Description

The December Ruling summarized that in principle high opportunity programs should focus on activities that are newly permissible as a result of AB 802, and strive to reach stranded potential to achieve energy savings. Additionally, the ruling established a requirement that a proposal must include a program description.

Ability to Reach Stranded Potential

We requested that PG&E provide empirical evidence that customers and/or contractors would value the ability to base OBF savings on normalized change in consumption enough to forgo a rebate, and that the increased number of customers participating in the alternative pathway would result in a net increase savings and diversity of projects. We also asked PG&E to clarify if the loan pool would need to increase to accommodate loans through the alternative path. Additionally, we asked PG&E to identify how many service providers (and of what kind) would be need to be approved and registered in order to adequately support the OBF AP Program and how PG&E would engage with prospective service providers.

PG&E noted in its supplemental that 46 percent of surveyed customers preferred a zero percent interest loan, compared to 36 percent of customers that preferred a rebate. Additionally, contractors indicated they would be more willing to participate if the uncertainty around estimated savings decreased. PG&E explained that the OBF program is a revolving loan fund and repayments average \$1.5 million a month, which can be lent out again, and the total budget of \$20 million has not been fully subscribed, therefore PG&E does not expect it will be necessary to increase the loan pool. PG&E was not able to estimate the number of contractors that would need to participate in order to support the alternative pathway.

We questioned whether the HOPPs proposal could achieve 10-15 percent energy savings, and whether it would do so by allowing the same measures as are eligible for the current OBF program, and if so how it could achieve stranded potential, but are not rejecting the proposal on this basis.

PG&E noted in its supplemental filing that it is unclear the extent to which this new pathway will reach stranded potential. The utility indicated that 83% of loans were for projects with greater than 10% energy savings, and provided a list of measures that are eligible for the current program that are likely to be implemented with the alternative pathway. If the percent reduction in energy savings is more or less the same under the Alternate Pathway there will not be substantial additional savings as result of this proposal. However, as noted by PG&E, the OBF alternative pathway will test whether using a forecasted change in normalized consumption as a basis for savings, in exchange for losing the opportunity to receive a rebate will substantially broaden participation. Commission Staff accepts the proposed alternative approach as an opportunity to test this idea, and accepts that the proposed program may not reach significant stranded potential.

2. Measure Treatment

Per the December Ruling, proposals must describe measures and end uses that will be addressed by the program.

Commission Staff and the review team asked PG&E to clarify if all baseline types are allowable in the alternate OBF pathway.

PG&E explained that activities that would have been categorized as early retirement (RET), replace on burnout (ROB), normal planned replacement (NR), or retrofit add-on (REA) under the Energy Efficiency Policy Manual V5.0 framework, are allowable in the alternative pathway. The utility further explained that it does not anticipate applying code baselines to measures during project development. Instead, baseline adjustments that may account for code or other factors are considered in the evaluation for savings reporting, per the Ruling. Evaluation and savings calculations are discussed below.

3. Savings Calculation Methods

Proposals must describe savings calculation methods and provide access to models used for addressing normalized, metered energy consumption

PG&E proposed to use alternate savings calculation method when normalized metered energy consumption and/or experimental design approaches will not work. Commission Staff asked PG&E to clarify if project-specific baseline and post-installation data be maintained so that it is possible to always use an appropriate back-up EM&V method. PG&E's supplemental filing provided clarification on the standardized data that will be recorded for each project and made several changes to respond to specific comments (see Attachment B).

Commission Staff asked PG&E to provide more information on the survey that will be used to establish the comparison group for the proposed EM&V approach. We also advised the utility to either skip the billing analysis for projects identified as replace on burnout and instead use engineering/on-sites/metering, or prohibit replace on burnout projects all together.

PG&E did address the size, timing and cost feasibility concerns of a comparison group. However, PG&E is estimating that 100 customers will participate, which would require finding 100 non-participants that have installed the same measures without getting a loan. It is doubtful that PG&E will be able to find adequate comparison groups that would enable a meaningful net savings regression analysis, and hence will also plan to use a self-report survey for net attribution analysis.

PG&E indicated that it will collect data so that the EM&V contractor can identify projects as early retirement versus replace on burnout. The data will include measure baseline information from the contractor and project timing from the customer survey. PG&E suggested that the majority of projects will be early retirement because the 2012 OBF process evaluation found that OBF projects often compete with Direct Install (DI) projects, and even though the application processing time will be shorter for the alternative path, it will still be long enough to discourage replace on burnout projects.

PG&E's supplemental filing was responsive to Commission Staff review team recommendations for handling ex post savings for Replace on Burnout projects. The savings from replace on burn out will be quantified separately from early retirement by using engineering calculations, on site analysis and/or sub-metering. PG&E proposes a threshold for savings from replace on burnout components to be limited to 25% for a single project. While this still may allow for significant free ridership, Commission staff agrees that this requirement would contain the free ridership by directing the program toward comprehensive projects. Prior to the approval of a continuation and expansion of the OBF program, there should be a follow up assessment of the effectiveness of the program requirements at targeting comprehensive and early retirement projects. There should be appropriate data collection and evidence from field experience, to inform program adjustments in the future.

4. Incentive Design

Proposals must 1) provide the basis and rationale for payment structure including how the structure mitigates the risk that potential upfront payments do not overrun the value of the realized savings, 2) identify the estimated capital costs and what portions of costs are to be borne

by ratepayer and by implementer, 3) describe the terms and schedule of the incentive including true up over time, and 4) describe the long term tracking and reporting strategy for sustained savings with ongoing feedback.

The incentive structure was described in detail, but given the payment structure there may still be some risk that upfront incentives may overrun the value of the final savings. Since the financial benefit of the program is provided in the form of upfront loans, there is no “clawback” mechanism for these instances. However, it is not clear how frequent this may happen, or the amount of risk borne by the ratepayers, and Commission Staff is willing to accept this proposal with the caveat that data and information collected during implementation will be used to inform a follow up assessment before the program is offered at full scale. PG&E will have a third party Quality Control / Quality Assurance (QA/QC) provider review projects for approval for financing and will provide the project documents after projects are in progress. Commission staff find this proposal acceptable, with the following provisions to review the effectiveness of the QA/QC: Staff should have an opportunity to review the qualifications of the QA/QC providers being retained, QA/QC documentation shall be accessible for ex post evaluation purposes, and this effectiveness of using independent QA/QC providers shall be assess when continuation or expansion of the program is being approved.

Overall, PG&E’s supplemental filing adequately addressed outstanding questions and meets the requirements of the December Ruling. See Attachment B for details.

5. Normalized Metered Energy Consumption and Type of Program

Proposals must document the methods for normalizing data. The models to normalize the data should use recognized, transparent tools, and methods that are repeatable, and reviewable. Additionally, proposals for non-residential programs must explain the link between the meter or meters and building that is acceptable for projects in the program. Programs must include a minimum of 1 year of post-intervention data for retrofits, and a minimum 3 years of post-intervention data for behavioral, retrofit, or operations projects.

PG&E’s supplemental filing adequately addresses outstanding questions and meets the requirements of the December Ruling. See Attachment B for details.

6. Threshold for Expected Savings

Proposals must include a description of the expected saving from the proposed program or project intervention, and literature or data to support that demonstrate the expected impacts and certainty of the estimates.

PG&E’s supplemental filing adequately addresses outstanding questions and meets the requirements of the December Ruling. See Attachment B for details.

7. Baseline Adjustments

The proposal must 1) document the baseline assumptions and strategy for collecting necessary information, 2) describe how normalization methods capture (or not) baseline assumptions, and 3) describe the methods that will be used to adjust the baseline for non-routine adjustments.

PG&E’s supplemental filing adequately addresses outstanding questions and meets the requirements of the December Ruling. See Attachment B for details.

8. Application of Behavioral, Operational and Retro-commissioning activities (BROs)

If the program will include BROs, then the proposal must identify that there will be training and maintenance components included in the program. If the program will include behavior and operational activities, then the program must demonstrate multiyear savings.

PG&E's supplemental filing adequately addresses outstanding questions and meets the requirements of the December Ruling. See Attachment B for details.

Conclusion

For the reasons stated above, and the details outlined in the review sheet and supplemental filing, this proposal is approved.

REVIEW SHEET FOR 2016 HOPPs PROPOSALS

PG&E responses to comments in red font.

PROGRAM ADMINSTRATOR: PG&E **PROPOSAL TYPE:** Program **PROPOSAL NAME:** On Bill Financing Alternative Pathway **AL #** 3697-G/4812-E

ORIGINAL SUBMISSION DATE: 3/25/16 **DATE OF RESUBMISSION :** 6/10/16 **DATE OF ED DISPOSITION** 7/8/16

CPUC staff find PG&E’s responses to comments and questions to be sufficient and acceptable, except where otherwise noted.

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated “not included”, or “don’t accept”, provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| Principles of HOPPs (p. 6) | 1. Proposal demonstrates how the program/project will focus on activities that are newly permissible under CPUC code 381.2 (b), by a) Program/project will reach stranded potential by utilizing the new approaches to value and measure savings b) Focus on interventions that PAs could not previously do. | | Yes | More information needed | <p>This proposal appears to rest on an assumption that many customers and/or contractors would value the ability to base OBF savings on normalized change in consumption highly enough relative to the ability to claim rebates, and that the alternative track would result in a significant net increase in the magnitude of savings and the diversity of projects. Can PG&E offer any empirical evidence in support of this assumption?</p> <p>PG&E: In the California 2010-2012 On-Bill Financing Process Evaluation and Market Assessment (CALMAC ID CPU0056.01), OBF participants were asked about a hypothetical situation in which they had to choose between rebates and 0% financing. A significant proportion (46%) of respondents preferred 0% financing over rebates (34%). Fewer customers were undecided (19%) when asked to choose between the value of rebates and 0% financing. (Figure 24, page 59).</p> <p>In the process of designing this program, PG&E staff conducted interviews with contractors and service providers who have participated in the OBF program. A number of those contractors and service providers indicated that would be more willing to participate in the future if the uncertainty around estimated savings, upon which their revenue depends, decreases.</p> <p>Our impression is that PG&E does not anticipate any funding increase for OBF to accommodate this proposal, and that OBF is already close to fully subscribed. If this is correct, how can this alternative track result in a significant increase in the magnitude of</p> |

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| | | | | | <p>savings and the diversity of projects over the long term?</p> <p>PG&E: Yes, we do not anticipate near-term budget increases for the Alternative Pathway OBF HOPP, largely because the currently loan pool is not close to being fully subscribed and repayments continue to be strong (which are then eligible to be relent). PG&E has \$20M in funds available through OBF loan pool, customer repayments average \$1.5M per month this ensures the ability to handle large initial influx of projects. Because OBF is a Revolving Loan Fund, repayments are immediately available to be re-lent for projects, which can support projects over the loan term.</p> <p>Please provide data to demonstrate that current OBF program offered by PG&E is saving 10-15% of facility energy usage and explain why this magnitude of savings can be realized in the HOPPS proposal which plans to use a different delivery structure, focuses on the same measures and customer segments but removes rebates and incentive available in current offering. Support explanation with the list of measures that are currently not offered in the OBF program but will be allowed in the HOPPS Alternate OBF Pathway.</p> <p>PG&E: Each measure will be one of the following:</p> <ul style="list-style-type: none"> i. Currently eligible for our programs and utilize OBF (this is an opportunity to get energy savings with less ratepayer funds – no rebate) ii. Currently eligible for our programs that do not currently utilize OBF (there could be structural barriers from using OBF limiting energy savings. this is an opportunity to get more energy savings and/or with less ratepayer funds – no rebate) iii. Not currently eligible for our programs, such as measures that only meet code. (Incorporating these new measures represents an opportunity to reach stranded potential, while eliminating the risks of one-way incentive payments paid to customers who may have installed the measures anyway.) <p>Current OBF participants largely install lighting, refrigeration, and controls measures. While PG&E expects Alternative Pathway OBF</p> |

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| | | | | | <p>participants may install a similar measure mix, we also expect contractors to leverage new opportunities and measure mixes that were not previously allowable. Some possible activities are listed below:</p> <ul style="list-style-type: none"> • Boiler retrofit (controls, insulation, new boiler, process, other) • Envelope retrofit (window, insulation, sealing, other) • HVAC retrofit (AC split system, AHU/package unit, chiller, controls, cooling tower, exhaust, other) • Lighting retrofit (interior LED fixture, exterior LED fixture, controls, scheduling, other) • Pools retrofit (pool cover, pool heating, pump VFD, other) • Process retrofit (controls, compressed air, fan, motor, pumps, other) • Refrigeration retrofit (compressor, condenser, controls, evaporator, insulation, other) • Retrocommissioning (hardware, controls, other) <p>2. In order to estimate the percent energy savings, PG&E looked at a number of available data points to determine that it is reasonable to assume that customers will save 10-15% of facility energy use. At this early point in the program we are being mindful that we don't know specifically what customers or measures the contractors will target.</p> <p>PG&E looked at the average projected energy savings that was used to generate loan agreements for the current OBF program. For SMB customers this averaged \$900 per month. PG&E Medium Businesses average \$2,300 per month in total average energy use. PG&E knows that OBF users tend to be higher energy use from Data Analytics (2x average user). This results in average savings of 19% (\$900/\$4500).</p> <p>PG&E then looked at the average OBF Loan monthly repayment compared to the Customers billed electric and gas usage. This indicated that 83% of loans were for projects with greater than 10% energy</p> <p>CPUC: This response addresses staff concern.</p> |

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| | | | | | |
| General Program Description (p.24) | 1. Description of the intervention strategy employed, with reference to the type of known existing business model being employed (e.g. Standard Performance Contracting, ESCO models, retro-commissioning, experimental design, financing) | | Yes | More information needed | <p>What processes will be in place to ensure that projects acceptable to financial institutions will have claimable energy savings under the CPUC framework?</p> <p>PG&E: PG&E is leveraging a firm that works with financial institutions that finance EE/RE for the development of the program framework. PG&E believes that leveraging the thought process of financial institutions will benefit ratepayers by generating incremental savings, but doing so in a manner that reduces transaction costs associated with traditional financial institutions.</p> <p>What will be PG&E's role in the oversight of the QA/QC contractor?</p> <p>PG&E: The QA/QC contractors are a key service provider in the pilot. PG&E will set the QA/QC requirements for who can provide the services and provide oversight. PG&E (and our vendors) will also review the contractor for compliance with program requirements post project including disciplinary functions (up to and including barring from the program)</p> <p>CPUC: the data and documentation from QA/QC contractor work need to be available for ex post review, to be sure that they are reliable in the long run.</p> <p>What is the role of financial institutions when loans will be made using rate-payer funds?</p> <p>PG&E: Financial institutions (FIs) are not involved in the OBF HOPPS proposal, but were consulted in its development. They do not have a role, but some specialty FI's have indicated an interest in the possibility of being a service provider for the pilots.</p> |

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| | 2. Provides specifics on the terms of the program structure | | Yes | More information needed | <p>Please provide clarity on how many service providers (and of what kind) PG&E considers necessary to have approved/registered in order to adequately support the OBF AP Program and how PG&E proposes to engage with prospective service providers to ensure sufficient diversity and competition (i.e. competitive pricing) among approved service providers.</p> <p>PG&E: PG&E believes that service providers are integral to enabling contractors (especially smaller contractors) to participate in the program. PG&E has begun outreach in conjunction with partners to identify and engage service providers to provide input on how they propose to meet the program rules. (This was requested during PG&E's public outreach call on this program that was conducted on 2/16/2016.)</p> <p>PG&E notes that contractor and service provider interest has been strong and some local governments and NPO's have indicated an interest in helping to drive awareness for the Program.</p> <p>Project-and application-specific data on the 13-14 period participants of OBF program has been difficult to extract and link with loans made. What changes will be made to the existing PG&E information systems to link loans with project-specific data on implemented measures, loan installments, meter number, decision-maker contact information, initial estimate of savings, EUL, and other relevant information required for making a savings claim and evaluating projects?</p> <p>PG&E: This was due to the fact that some OBF loans included multiple rebate/incentive measures (multiple records in the claims database). PG&E is addressing this root problem, and believes that data integrity is a key aspect of this and all of our programs.</p> <p>Under HOPPS – all project data will be in the OBF loan tracking database. PG&E will have all data fields within the OBF tracking database (Salesforce), but will also retain the full amount of project data required under the Program Framework with the project.</p> |

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| | 3. Explains how the project/proposal addresses past challenges that have arisen with the business model being employed? | | Yes | More information needed | <p>Please provide a table listing each barrier cited in Section 2 and show proposed solution(s) for the alternate OBF Pathway, and demonstrate the proposed solution is consistent with the CPUC policy framework.</p> <p>PG&E: PG&E will provide a table of barriers and proposed solutions in the revised proposal.</p> <p>For example, cash flow of contractors is cited as a barrier. Is PG&E planning to fund contractors from the ratepayer funds before a project is implemented and verified?</p> <p>PG&E: No – projects will be only funded after project is installed. The barrier is created by existing programs due to uncertainty in the timing of reviews for project funding. PG&E believes that removing this uncertainty will address this barrier.</p> <p>CPUC: PG&E's response is sufficient.</p> |
| Measure Treatment (p.25) | 1. Measures and end uses that will be addressed- describe what type of intervention activities will be applied to what measures. If implementers propose to use deemed savings values, then the DEER value applicable to the site's existing condition baseline treatment must be identified (or an alternative work paper offered per CalTF vetting process) | | Yes | More information needed | <p>Please provide more information related to the savings-to-investment ratio that determines eligible projects. For example, is the SIR calculated over the expected life of the project or just the life of the OBF loan?</p> <p>PG&E: See page 12 of Attachment A of proposal "Savings-to-investment ratio = (Annual Energy Savings * Average Cost of Electricity * Estimated Useful Life) / OBF loan amount"</p> <p>The proposal allows all measures that reduce energy usage as eligible. Will eligible measures conform with the definition of energy efficiency measure as described in the EE Policy Manual V5.0?</p> <p>PG&E: Yes – definition of Measures from EE Policy Manual:</p> <ol style="list-style-type: none"> 1) Specific customer actions which reduce or otherwise modify energy end use patterns. 2) A product whose installation and operation at a customer's premises results in a reduction in the customer's on-site energy use, compared to what would have happened otherwise. |

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| | | | | | <p>CPUC: PG&E's response is sufficient.</p> <p>Are all baseline types allowable in the alternate OBF pathway (RET, ROB, NC, REA, NR)?</p> <p>PG&E: No, New Construction measures are not allowed. In order to be eligible for OBF the loan repayment is required to be equal to projected customer specific energy savings for the customer (bill neutral).</p> <p>Other activities that would have been categorized as RET, ROB, NR, or REA under the EE Policy Manual V5.0 framework, are allowable. However, we do not anticipate applying code baselines to measures during project development. Baseline adjustments that may account for code or other factors are considered in the evaluation for savings reporting, per the Ruling.</p> <p>CPUC: In another section, PG&E indicates that ROB (and by extension, NR) must be limited to 25% of the total savings in the project.</p> |
| <p>Savings Calculation Methods (p.25)</p> | <p>1. For normalized metered energy consumption, detailed description of the savings calculation methods and provide access to models used for addressing normalized, metered and energy consumption, detailed in Attachment A.</p> | | | <p>More information needed</p> | <p>PG&E proposes to use alternate savings calculation method if normalized metered energy consumption and/or experimental design approach are unlikely to work. Will project-specific baseline and post-installation data be always maintained to use an appropriate back-up EM&V method?</p> <p>PG&E: Customers will authorize to share energy data leveraging the PG&E Share My Data Functionality. This data will be available for evaluation.</p> <p>Please provide more information on the survey that will be required to establish the comparison group in order to enable the proposed EM&V approach. Sample size? Timing? Who will field the survey? What customer attributes will the survey focus on? Will the survey frame, instruments, and results be shared with ED?</p> <p>PG&E: PG&E originally proposed that we conduct two surveys and</p> |

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| | | | | | <p>share the survey frame, instruments, and results with ED:</p> <ol style="list-style-type: none"> 1. Current program participants to collect net-to-gross data, including whether projects were early retirement, and for early program feedback. Since the pilot OBF is anticipated to have approximately 100 projects the first year, PG&E will attempt to interview all participants. To minimize the problem of recall, the interviews will be conducted with participants at the conclusion of each quarter. 2. Future program participants (identified once they have joined the program after the evaluation timeframe), to establish a control group for gross billing analysis. The primary purpose was to confirm that these future participants did not install program-qualified equipment during the evaluation timeframe (i.e., confirm that a comparison to future participants will control for exogenous changes and yield a more accurate estimate of gross savings, not net savings). However, PG&E will change the proposal so that, instead of administering this second survey, we include a question on the OBF application forms (both for Alt OBF and the main OBF) on equipment installed in the past few years. This will be more cost-effective, and will help PG&E obtain the ~100 future participants needed for the billing comparison group, because it allows PG&E to draw from Alt OBF and main OBF participants, as well as customers that completed an application but ultimately did not participate in OBF. <p>Please provide more information on how PG&E proposes to leverage IPMVP Option D (building simulation) as a "back up" method for EM&V? What additional data collection would be required to support that approach? Who would bear the cost/responsibility for such additional data collection?</p> <p>PG&E: PG&E had originally proposed this back-up method to address ROB related concerns. PG&E will instead propose one of the methods suggested by the ED below – i.e., IPMVP Option A - engineering analysis/on-site metering, or excluding some types of ROB projects from participation.</p> |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | | | | | <p>It seems like it will be like looking for a needle in haystack to find a sample of non-participants who both match individual participants closely and installed similar but non-qualifying equipment for ROB projects.</p> <p>PG&E: PG&E agrees that identifying these non-participants through a survey may not be feasible, and will clarify that we are not proposing a massive screening survey.</p> <p>Would you consider the following alternatives:</p> <ul style="list-style-type: none"> • Skip the billing analysis for projects featuring measures identified as ROB, and instead use engineering/on-sites/metering for them. In order to know whether this would be viable, we would need to know more about what kind of mixture of ROB and non-ROB measures we can expect. OR • Design the program to bar ROB measures from going through the HOPPS track at all. Given the stated objective of encouraging a broader array of measures, such an approach would seem to be consistent with the program theory. Customers who are using OBF to replace failed measures seem relatively unlikely to be simultaneously pursuing the kind of broader retrofit strategy that is envisioned for this track. <p>PG&E: PG&E will retain the originally proposed net savings method for projects that are early retirement, which we anticipate to be the majority of projects. PG&E will collect data so that the EM&V contractor can identify projects as early retirement vs. ROB. This data will include information collected by the contractor (including measure baseline information) and through the participant NTG survey (including questions on project timing). PG&E anticipates that the majority of projects will be Early Retirement because:</p> <ol style="list-style-type: none"> 1. While PG&E does not have early retirement rates for past OBF |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | | | | | <p>programs, the 2012 OBF process evaluation found that OBF projects often compete with Direct Install (DI) projects¹, indicating that DI and OBF target similar customers and project types. Lighting projects have historically been the most common project type for OBF, and DI programs have had an early retirement rate of ~79% for T-5 linear replacements and 84% for delamping².</p> <p>2. The application processing time – while shorter than the existing program – will still be long enough that it discourages ROB projects that have immediate replacement needs.</p> <p>PG&E will also provide data from the current OBF program showing that average savings is over 10% of total energy use, to justify the use of billing analysis in general.</p> <p>PG&E will follow one (or a combination of both) of the ED's recommendations for ROB projects. PG&E is currently discussing which of these recommendations we should follow – i.e., whether we use IPMVP Option A, or exclude some types of ROB projects from this program.</p> |
| | 2. For deemed savings projects that are providing incentive payments based on ex ante values, standard custom project savings calculation methods apply. | NA | | | |
| Incentive Design (p. 25 & 26) Customer incentives (Attachment A) | 1. Basis and rationale for payment structure--Explain the payment structure, including the basis for setting the upfront payment (if any) and how the structure mitigates the risk that potential upfront payments | | Yes | More information needed | <p>Will PG&E true up loan installment after post-installation M&V is completed?</p> <p>PG&E: No. The loan agreement for OBF specifies that while we use the projected energy savings to calculate the loan repayment, OBF is</p> |

¹ Cadmus 2012, "California 2010-2012 On-Bill Financing Process Evaluation and Market Assessment), P. 5, http://www.calmac.org/publications/On_Bill_Financing_Process_Evaluation_Report_2010-2012.pdf

² Itron 2016, DRAFT "2014 Nonresidential Downstream Deemed ESPI Lighting Impact Evaluation", p. 4-23.

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| p. 11-12) | do not overrun the value of the realized savings. | | | | <p>a financial obligation that is repaid by the participating customer regardless of the actual savings that are achieved.</p> <p><u>OBF Rate Schedule</u> 6c - Monthly Loan Payment Amount: The monthly loan payment amount will be established by PG&E and stated in the OBF Loan Agreement. The monthly loan payment amount will not change during the term of the agreement. The monthly loan payment amount will be based on an estimate of the average annual savings the customer would potentially realize as a result of the installation of the energy efficiency measures.</p> <p><u>OBF Loan Agreement</u> Customer shall repay the Loan Balance to PG&E as provided in this Loan Agreement irrespective of whether or when the Work is completed, or whether the Work is in any way defective or deficient, and whether or not the Work delivers energy efficiency savings to Customer.</p> |
| | 2. Measure costs and capital burden—Identify the estimated capital costs and what portions of costs are to be borne by ratepayer and by implementer. | | Yes | More information needed | <p>Provide a comparison of the administrative, marketing and program implementation costs in the alternate OBF pathway and current OBF offering.</p> <p>PG&E: Program Implementation, Program Administration— OBF Alternative Pathway will be administered by OBF Program Team.</p> <p>Loan Funds disbursed – OBF Alternative Pathway will be reported and tracked separately.</p> <p>Loan performance (repayment of the loans) – will be tracked closely and compared to existing loan performance.</p> <p>Will PG&E maintain measure- and project-level cost documentation? PG&E: Yes – itemized invoices are required for all projects.</p> |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | 3. Partial or incremental payments with true up over time—Describe the terms and schedule of the incentive | NA | | | |
| | 4. Strategy for tracking persistence—describe the long term tracking and reporting strategy for sustained savings with ongoing feedback. | | Yes | More information needed | <p>Behavioral, operations and maintenance measures have been proposed as eligible but the program focus is stated as capital investment. If BRO measures are allowable, provide full details of tracking savings persistence.</p> <p>PG&E: The proposal requires monitoring for all loans to ensure savings persistence over the repayment period (expected to be typically between 2 and 5 years).</p> <p>The body of Ruling requires maintenance plans for three years if incentives are paid for maintenance measures; Appendix A of the ruling indicates that a maintenance contract is in place if incentives are paid for behavioral, Retrocommissioning, or operational measures.</p> <ol style="list-style-type: none"> 1. Maintenance measures typically do not require a loan to implement, however, if OBF loans are used to implement a maintenance measure, a three year maintenance plan would be required. 2. Behavioral and Operational measures are not eligible for OBF loan funding. 3. Retrocommissioning measures included in the loan will require a (minimum) three year maintenance plan. |
| Normalized Metered Energy Consumption (Attachment A p. 1-4) | 1. Programs and projects must document the method for normalization and list <ol style="list-style-type: none"> a) the variables included in the normalization process and | | Yes | | |
| | 1b) Documentation of specific program actions that are intended to drive savings. | | Yes | | |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | 2 Models, methods, and tools must use recognized engineering, economic or statistical approaches to normalization. | | Yes | Inconsistent with policy | <p>Gross savings calculation proposed for demand savings does not use the CPUC definition of peak demand. The proposed method, therefore, is inconsistent with the CPUC policy.</p> <p>PG&E: PG&E will calculate demand savings to align with the CPUC definition of peak demand.</p> |
| | 3 Models, methods and tools must be transparent, reviewable and replicable by peer reviewers. | | Yes | | |
| | 4 In addition to normalized savings as defined here, programs and projects shall also report absolute changes in consumption expressed with a common denominator. | | Yes | | |
| | 5 Models must include pre and post-intervention data streams. Minimum 1 year post data for retrofits, and minimum 3 years for Behavior Retrofit or Operations. | | Yes | | |
| | 6 Models, methods, tools must be transparent, reviewable and repeatable | | Yes | | |
| | 7. Meter does not necessarily equal whole building, so proposals must make clear the link between meter and building | | Not included | More information needed | <p>Please provide more information on how meter-to-building or meter-to-premise matching is proposed to be conducted and how situations such as shared meters will be addressed.</p> <p>PG&E: OBF Loans are assigned to the customer premise. The Baseline requirements specify that the meters have to be accounted for.</p> <p>PG&E is unable to originate an OBF loan for a 'shared meter' since repayment of the OBF loan is a disconnectable charge for utility service.</p> <p>Has PG&E considered the issue of how to deal methodologically with meters that do not equal the whole building or site?</p> |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | | | | | PG&E: Yes, this will be documented in the Baseline requirements |
| | 8 Proposals for programs or projects must document the market barriers they are designed to address and the interventions planned to achieve reductions in energy consumption | | Yes | More information needed | See principles of HOPPs and general program description above PG&E: Addressed above. |
| | 9 If proposal deviates from Attachment A, PA must provide clear rationale. | NA | | | |
| Type of Program or Project (Attachment A p. 5-6) | 1. Description of the nature of the proposed program or project intervention with respect to whole building or single measures | | Not included | | See NMEC # 7 above PG&E: Addressed above. |
| | 2. Site level results will be discernable at building level for verification purposes. | | Yes | More information needed | Proposal does not indicate if or how savings would be discernable from these combinations of measures. Using the IPMVP options, please explain the nature of site-specific monitoring proposed to be conducted. PG&E: PG&E proposes a meter-based approach to determine EM&V savings, which could result from a combination of measures. However, the project application will include engineering estimates for each measure, the contractor will document baseline data, the Program Framework will require site specific monitoring, and all customers will authorize ShareMyData to share data with implementer and for EM&V. Consequently, the evaluator will be able to estimate the fraction of meter-based savings for each measure if desired. Please provide clarity with respect to the minimum relative/absolute project savings to be eligible for the OBF AP Program and how PG&E anticipates their proposed EM&V methodologies to be able to detect such savings levels. PG&E: While there is no minimum % savings, the minimum loan is |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | | | | | \$5K. Based on current OBF program participants, average savings are > 10% of total energy use, so projects will be detectable through billing analysis. PG&E can provide data documenting the typical savings in current OBF program. |
| Threshold for Expected Savings (Attachment A p. 6-7) and Principles of HOPPs (p. 6) | 1. Description of the expected saving from the proposed program or project intervention | | Yes | More information needed | Expected savings are 10-15% of facility energy usage, but the basis for the savings estimates is unclear and is unsupported. Please refer to prior comments. PG&E: Addressed above in "4. Strategy for tracking persistence" section. |
| | 2. Literature or field performance data demonstrating the expected impact and expected certainty of estimates. | | Yes | More information needed | Please refer to prior comments. |
| Baseline Adjustments (Attachment A p. 8-9, and under "Normalized", p. 2) | 1. Documentation of the baseline assumptions and strategy for collecting necessary information | | Yes | More information needed | Clarify whether measure-specific baseline type will be assigned and recorded. PG&E: Measure specific baseline adjustments will not be made at project development. However, PG&E will collect information and provide to CPUC EM&V team that can be used to inform baseline adjustments if needed. PG&E will require that contractors provide information on the efficiency level of equipment removed and that contractors follow the US DOE Building Energy Data Exchange Specification (BEDES) data standardization process, which includes baseline data requirements. |
| | 2. Description of how normalization methods capture (or not) baseline assumptions | | Yes | More information needed | It may not, in a control group design. Confirm that project-specific data required to use IPMVP approaches will be maintained. PG&E: Project level data will be maintained. Project monitoring will be done in accordance with Program Framework. |
| | 3. Description of the methods that will be used to adjust the baseline for non-routine adjustments, when applicable for the type of proposal. | | Yes | More information needed | It is unclear who will collect data periodically on non-routine adjustments and where it is being used in modeling. PG&E: The data collected for every project will enable PG&E and ED to investigate non-routine adjustments. The project M&V requirements will also help contractors and customers identify non-routine adjustments that impact project performance. |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| Application to Behavioral, Operational, Retro-commissioning (B.R.Os) (Attachment A p. 9-10) | 1. Program/project proposals shall: Include requirement that participant sign up for a maintenance plan for at least three years. | | Unclear | More information needed | It is unclear whether BRO measures will be offered; if so, the manner in which contractor engagement with customers will require a maintenance plan for at least three years. Additionally, if BRO measures will be offered the proposal must identify that these requirements will be met. PG&E: Addressed above. |
| | 2. Program/project proposal shall: Include requirement that participants commit to install a minimum set of measures according to PA pre-defined criteria. | | Not included | | See 1 above. PG&E: There is no minimum number of measures required, but there is a minimum energy savings requirement for OBF. |
| | 3. PA is encouraged to include a training component to program/project offerings. | | Not included | | See 1 above PG&E: Addressed above. |
| | 4. Performance post-intervention: a) Must ensure persistence of savings that ensures multiyear savings for measures that are based in changes in behavior or operational practices. | | Not included | | Other than monitoring usage data, continued persistence of measures is not proposed to be verified. Who will verify persistence of savings, at what frequency and how will it be reported? PG&E: Persistence of energy savings is accounted for at two levels. 1. Participating customers (project level) – OBF is a disconnectable charge if savings do not persist and a customer’s utility bill increases, it puts customers at risk of utility disconnection. Contractors will be required to provide OM&M and M&V for projects. This will give participating customers incrementally better results than existing offers. 2. Program level – EM&V and control group will track at a program level. |
| | 4b) During the claimable expected useful life (EUL) period of one year, continuous feedback should be in place. | | Not included | | The nature of contractor engagement over the loan life to provide feedback has not been described in terms of frequency of contractor interaction with the participant. Please describe contractor engagement. PG&E: This will be determined in the Program Framework. Interactions will be at least once per year over the loan, but we have |

| Compliance Area | PA Proposal Requirements | Not applicable | Initial Review: Included in proposal? Yes/No/ Unclear/ More Info | Full Proposal Review Accept/ Don't accept | Comments: If you indicated "not included", or "don't accept", provide a summary of what is missing, what is needed, and/or what needs to be changed. |
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| | | | | | not defined what the interaction is (face to face/ phone/etc.). Stakeholders suggested that this is a key point for contractor/service provider input to account for differences in project size. |
| | 4c) PAs shall consider incentive structures that encourage long term savings | | Not included | | See 1 above |
| | 4d) Incentives shall only be paid once participant commits to a maintenance plan for a minimum of three years (evidence should be made available to Commission staff upon request). | | Not included | | It is unclear whether loan is contingent on expectations of contractors or participant to maintain equipment. PG&E: See above – participating customer is required to repay loan. |
| Financing (Attachment A p. 12) | 1. Description of any use of financing programs or external financing to support the program or proposed project. | | | | |
| Additional Comments from Review Team | | | | | |



June 10, 2016

Advice 3697-G-A/4812-E-A

(Pacific Gas and Electric Company ID U 39 M)

Public Utilities Commission of the State of California

Subject: Supplement to the Submission of High Opportunity Projects and Programs (HOPPs) Proposal – On-Bill Financing Alternative Pathway Program

I. Purpose

Pacific Gas and Electric Company (PG&E) hereby submits to the California Public Utilities Commission (CPUC or Commission) a supplement to the above-referenced Advice Letter, which was originally submitted on March 25, 2016. In this supplemental Advice Letter, PG&E provides additional information in support of its proposal to operate an On-Bill Financing (OBF) Alternative Pathway program as a High Opportunity Projects and Programs (HOPPs) sub-program under PG&E's existing OBF Program. By providing more certain and timely zero percent financing of energy efficiency projects, the OBF Alternate Pathway program should enable a broader group of contractors to offer efficiency measures to consumers and thereby obtain "stranded" energy efficiency savings.

This request for approval is authorized by the December 30, 2015 *Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs and Projects (ACR)*. The ACR allows Program Administrators to submit proposals for HOPPs to the Commission for expedited review, specifically, to the Commission's Energy Division via Tier 1 Advice Letters.¹

The ACR found that PG&E's modification of its existing OBF program so that "energy savings would be based on pre/post measurement rather than rebate/incentive program participation" is an acceptable HOPP program.² PG&E requests the Commission to approve its OBF-AP HOPP as of July 1, 2016, which is 21 days after the submission of this supplemental advice letter.

¹ ACR, paragraphs 1 and 2.

² ACR, pp. 32 and 33.

II. Background -- The Commission's HOPPs Initiative

On October 8, 2015, the Legislature enacted Assembly Bill (AB) 802, which amended Section 381.2 of the Public Utilities Code. New subsection (b) requires the Commission to authorize, by September 2016, electrical corporations or gas corporations to provide financial incentives, among other things, to increase the energy efficiency of existing buildings based on the reduction of metered energy consumption as a measure of energy savings. New subsection (c) states that "Effective January 1, 2016, electrical corporations and gas corporations are authorized to implement the provisions of subdivision (b) for high opportunity projects or programs." The idea behind HOPPs is to identify "high opportunity" interventions clearly within the ambit of Legislative direction before the Commission adopts a comprehensive program to provide incentives to improve the energy efficiency of existing buildings.

On October 30, 2015, the assigned Commissioner and Administrative Law Judge (ALJ) issued their scoping memorandum regarding energy efficiency "Rolling Portfolios" and established a process specifically for addressing "high opportunity programs or projects," along with other aspects of AB 802.

The December 30, 2015 ACR provides minimum standards for the development and implementation of HOPPs. HOPPs may be funded from unspent funds in existing programs. There are no minimum requirements for expected savings for HOPPs. HOPPs may feature a variety of incentive structures, so long as the payment strategy reflects an accurate valuation of the savings. All HOPPs must incorporate a measurement and verification (M&V) plan, including the M&V protocols set out in the ACR. A key feature is that HOPPs proposals should emphasize measurement of the effects of interventions as detailed in Attachment A of the ACR.

The ACR allows program administrators (PA) to submit High Opportunity Program proposals with the documentation and specifications listed in the ACR. High Opportunity Project proposals are to be submitted through the CPUC Energy Division's existing Custom Measure and Project Archive (CMPA) system.

This supplemental advice letter provides all of the material needed to meet the PA filing requirements, and addresses all the ACR's preferred principles of HOPP program design. PG&E's HOPP:

- (1) focuses on existing buildings,
- (2) draws upon studies, input from a diverse stakeholder group, the EM&V results of a similar offering, and best practice EM&V methods, and
- (3) focuses on energy efficiency activities that are newly permissible under the statutory changes by considering all energy efficiency achievements, as measured at the customer's meters, and by using a new intervention strategy and savings measurement regime.

III. PG&E's Proposal -- the "On-Bill Financing Alternative Pathway"

A. Underlying Concepts

1. Increased Energy Savings through Improved Cash Flow

PG&E's existing OBF program offers non-residential customers 0% interest loans to finance the purchase and installation of energy efficiency measures when they also receive a rebate or incentive through PG&E's energy efficiency program. The customers repay the loan principal, which is in the amount of project cost less the rebate or incentive amount, as a fixed monthly charge on their PG&E bill.

The On-Bill Financing (OBF) Alternative Pathway program is a variation of PG&E's existing OBF program that increases the potential for participating contractors to deliver energy savings. Contractors are a main driver of energy efficiency projects. They have told PG&E that the certainty and timeliness of cash flow for projects often contributes more toward project viability than the rebates offered by PG&E's EE programs. Based on this feedback, PG&E has designed the OBF Alternative Pathway subprogram to provide cash flow certainty for contractors and customers, while preserving the integrity of the evaluation, measurement and valuation (EM&V) process.

The existing OBF program requires that a customer also participate in an EE rebate or incentive program for verification purposes. The OBF post-install review cannot be completed until the rebates and/or incentives have been approved, which introduces uncertainty regarding the timing of loan funding. To address this uncertainty, the OBF Alternative Pathway provides a process for customers to secure an OBF loan without requiring participation in an EE rebate or incentive program - reducing risk for both the customer and contractor. Verification under the OBF Alternative pathway is performed by a third-party to ensure that the project meets the quality assurance/quality control (QA/QC) requirements of the Program Framework. Since it is not contingent upon a separate rebate/incentive process, the timing of the loan disbursement is more predictable, allowing contractors to cover costs in the interim with less business and financial risk.

In addition to providing greater certainty for contractors, which is expected to increase participation, this subprogram design has the added benefit of avoiding the cost of paying rebates. Customers participating in the OBF Alternative Pathway will forego any applicable rebates and incentives on the measures within the scope of the project. Contractors have indicated that the rebates are sometimes not as desirable as might be expected due to the uncertainty of when rebates will be paid and the fact that rebate requirements may change. The uncertainty of the rebate-driven OBF model discourages small contractors who are less able to absorb the burden of cash flow uncertainty and may also limit the availability of OBF-assisted measures to smaller customers who may be served by local contractors.

PG&E will continue its existing OBF program which may serve as a benchmark for comparison to fine-tune the OBF Alternative Pathway program.

2. Responsive to Recent Legislation

OBF Alternative Pathway will offer customers the same financing product as the existing OBF program for energy efficiency projects that are ineligible for or do not receive rebates or incentives. This includes to-code and above-code projects. OBF Alternative Pathway will utilize existing agreements and systems used to originate OBF loans, but will create a new QA/QC model for projects. In doing so, OBF Alternative Pathway will facilitate high-quality energy-efficiency projects for non-residential customers at a lower cost to ratepayers compared to existing rebate and incentive programs.

OBF Alternative Pathway employs two features of AB 802 to achieve more energy savings. First, OBF Alternative Pathway will be a tool for customers and contractors to target stranded savings potential at customer facilities because financing will be offered for all energy saving measures, not just measures that are eligible for rebates and incentives. OBF Alternative Pathway will allow PG&E to obtain early data about stranded potential energy savings opportunities that can be used by Program Administrators and regulators to support future program development. Second, OBF Alternative Pathway will measure normalized metered energy usage and report savings achieved by the portfolio while monitoring individual projects for the benefit of participating customers.

OBF Alternative Pathway also addresses the increased energy efficiency target adopted by SB 350. It enables customers to procure more energy savings per program dollar than the existing OBF because it does not rely on rebates, which are not self-renewing. Customers receiving zero-interest OBF program funds repay their loans through monthly payments so that funds, less interest costs and potential defaults, are renewed.

B. Features of the OBF Alternative Pathway

The features of the OBF Alternative Pathway are summarized in the following table, followed by a description of the OBF Alternative Pathway's operational framework. Additional details about the program structure are provided in Attachment A, and an extensive description of the proposed OBF Alternative Pathway evaluation, measurement and verification (EM&V) methodology is provided in Attachment B.

| | |
|-----------------------|---------------------------------------------|
| Program Name: | On-Bill Financing (OBF) Alternative Pathway |
| Proposal Type: | High Opportunity Program |
| Sector: | Non-Residential |

| | |
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| <p>Brief Description:</p> | <p>The OBF Alternative Pathway HOPPs Program will create an alternative pathway for customers and contractors to participate in the OBF program without also participating in a rebate or incentive program. Verification under the OBF Alternative pathway is performed by a third-party to ensure that the project meets the quality assurance/quality control (QA/QC) requirements of the Program Framework. Energy savings will be determined using meter-based energy data (see EM&V Methodology).</p> <p>The OBF Alternative Pathway meets the criteria for a High Opportunity Program for the following reasons:</p> <ul style="list-style-type: none"> • Speed to Market – the OBF Alternative Pathway Program will leverage existing OBF program infrastructure to ensure that the program can be launched quickly and in a timely manner. • Scalable opportunity to generate incremental energy savings – the OBF Alternative Pathway will provide a low cost opportunity for program administrators to generate incremental energy savings. • Leverages new opportunities allowed under AB 802 – the OBF Alternative Pathway leverages the ability to use metered based energy efficiency to create a new opportunity for market actors to deliver incremental energy efficiency projects. |
| <p>Incentive Design:</p> | <p>The OBF loan is sized based on project cost and considers the projected energy savings at the customer’s facility. Commercial customers can receive a loan of up to \$100,000 based on five years of projected energy savings. Government agency customers can receive up to \$250,000 for ten years of projected energy savings, or \$1,000,000 for unique energy savings opportunities.</p> <p>Under the Program the ‘incentive’ is the OBF zero interest loan with favorable underwriting and security requirements. The loan is required to be repaid in full by the participating customer, with the threat of utility disconnection for non-payment.³</p> |
| <p>Measure Treatment:</p> | <p>Primarily lighting, refrigeration, and controls, as well as other energy efficiency and some conservation measures.</p> <p>At the same time, OBF_AP aspires to move away from a widget-based savings approach and include more comprehensive activity which may include Retrocommissioning and operational improvements. However, savings from Retrocommissioning and operational improvements are expected to be relatively small as the program is designed to primarily support capital investments.</p> <p>Contractors will maintain a role in maintenance and monitoring of energy savings over the lifetime of a loan to maximize potential energy savings.</p> |

³ See PG&E OBF Loan Agreement – Section 13
http://www.pge.com/tariffs/tm2/pdf/ELEC_FORMS_79-1118.pdf

| | |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EM&V methodology: | <p>Energy savings calculations to determine the OBF loan terms will be performed using a method consistent with Investor Confidence Project (ICP) specifications. These savings calculations however will not directly inform ex-ante or ex-post savings claims but may facilitate validation of savings claims and cost effectiveness through cross verification.</p> <p>PG&E proposes a savings calculation method initially based on a gross savings calculation method using quasi-experimental design using a “difference of differences” approach. PG&E will couple this with custom surveys to understand what participants would have done in the absence of the program, and thereby derive net savings.</p> <p>A detailed EM&V Proposal is included in Attachment B.</p> |
| Proposed Budget: | <p>The OBF Alternative Pathway will leverage the PG&E OBF Program Implementation Budget and Revolving Loan Fund. Program expenditures will be tracked and costs will be allocated between the OBF Program and the OBF Alternative Pathway in accordance with CPUC program funding tracking requirements.</p> |
| Budget source(s): | <p>PG&E’s OBF Program</p> |
| PG&E contact(s): | <p>Primary Contact and Policy Lead: Halley Fitzpatrick (hdf2@pge.com) Program and Transaction Services Lead: Alfred Gaspari (a3g1@pge.com) EM&V Lead: Brian Smith (B2SG@pge.com)</p> |

C. Program Operation

The OBF Alternative Pathway program incorporates a new Program Framework that will reduce project uncertainty for customers and contractors and will test OBF as a standalone incentive. The OBF Alternative Pathway Program Framework is based on the Environmental Defense Fund’s (EDF’s) Investor Confidence Project (ICP) Targeted Commercial Protocols.⁴ ICP is an award-winning international program that has created standard protocols to convert energy efficiency opportunities into investment opportunities. The Program Framework will provide project standardization and documentation for the project’s design, through life of loan monitoring. Compliance with the Program Framework will replace the verification of rebate eligibility after project completion for funding of the loan.

PG&E will engage an experienced Transactional Advice Consultant that will help with adapting the protocols for the Program Framework and support review of early projects. Contractors will submit their proposals for OBF Alternative Pathway funding, including information on measurement and verification (M&V) plans, to an approved Project

⁴ <http://www.edf.org/sites/default/files/icpfactsheet07132015.pdf>

Quality Assurance Provider. The Project Quality Assurance Provider will be responsible for determining whether the contractor's proposal includes proper documentation, certification of energy savings, and sufficient M&V requirements. All Project Quality Assurance Providers will be ICP-Credentialed Quality Assurance Providers. OBF Alternative Pathway will use the estimated energy savings to determine the loan repayment amount for a given customer. The OBF Alternative Pathway customer will agree to fully repay the loan based on the projected energy savings.

The loan will not be funded until the project is installed and the customer approves and accepts the project. The PG&E OBF processing team will provide turnaround time targets for processing each stage of the application (currently five days from receiving completed applications). These turnaround times will be significantly shorter than those for the existing OBF program, as they will not be delayed by rebate/incentive processing and approvals. PG&E will track and provide metrics on average turnaround times. The key indicator that the process has been improved will be contractor feedback and engagement once OBF Alternative Pathway is launched.

To ensure that OBF Alternative Pathway provides a tool that works for market actors, PG&E will solicit input from relevant stakeholders (customers, contractors, and Service Providers) both during the finalization of the Program Framework and throughout the term of OBF Alternative Pathway. The Transactional Advice Consultant will bring significant experience working with energy project investors to ensure that the Program Framework protects participating customers and ratepayers, while incorporating suggestions from contractors and Service Providers.

PG&E will continue its existing OBF program as a benchmark to evaluate results and to fine-tune the OBF Alternative Pathway program. The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) and the CA Investor-Owned Utilities (IOUs) will also be launching On-Bill Repayment (OBR) pilots. Those programs differ from OBF in that their loans are provided by third-party lenders rather than the IOU Revolving Loan Fund. Lessons learned through OBF Alternative Pathway may be used in the design of OBR programs and in potential changes to the existing OBF program.

Per the ACR, PG&E does not intend to claim gross ex ante savings for this HOPPs program; however, PG&E will track gross savings for internal program and/or account executive goals. PG&E will submit completed projects to the Custom Measure and Project Archive (CMPA) system in accordance with D.11-07-030 Attachment B.⁵ PG&E will work in conjunction with the ED to further assess the project results ex post for savings claims and in order to inform this and other programs.

PG&E will claim energy savings under the OBF Alternative Pathway based on the guidance of AB 802 for estimating savings based on meter-based approaches – i.e.,

⁵ http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/139860.PDF

based on actual energy savings captured in participant's energy usage data. Energy savings from completed OBF Alternative Pathway projects will be determined in accordance with the EM&V processes and procedures described in Appendix B of this advice letter. Where possible, savings should be estimated using weather-normalized billing analysis, which may include comparison groups to control for changes in energy use that are not related to the OBF Alternative Pathway-funded project.

IV. Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, facsimile or E-mail, no later than June 30, 2016, which is 20 days after the date of this filing. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit
505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E either via E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-7226
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that

the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

V. Effective Date

PG&E requests that this Tier 1 advice filing become effective on July 1, 2016 which is 21 days after the date of this supplemental filing.⁶

VI. Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.13-11-005. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter filings can also be accessed electronically at: <http://www.pge.com/tariffs>.

/S/

Erik Jacobson
Director – Regulatory Relations

Attachments:

Attachment A - Detailed Proposal for High Opportunity Program– On-Bill Financing Alternative Pathway

Attachment B - Evaluation, Measurement, and Verification Plan for the PG&E On-Bill Financing Alternative Pathway Program

cc: Service List R.13-11-005

⁶ ACR, p. 26.

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING SUMMARY ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No. **Pacific Gas and Electric Company (ID U39 M)**

Utility type:

ELC GAS
 PLC HEAT WATER

Contact Person: Yvonne Yang

Phone #: (415) 973-2094

E-mail: Qxy1@pge.com and PGETariffs@pge.com

EXPLANATION OF UTILITY TYPE

ELC = Electric GAS = Gas
PLC = Pipeline HEAT = Heat WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: **3697-G-A/4812-E-A**

Tier: **1**

Subject of AL: **Supplemental to the Submission of High Opportunity Projects and Programs (HOPPs) Proposal - On-Bill Financing Alternative Pathway Program**

Keywords (choose from CPUC listing): Compliance, Energy Efficiency

AL filing type: Monthly Quarterly Annual One-Time Other _____

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: N/A

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL: _____

Is AL requesting confidential treatment? If so, what information is the utility seeking confidential treatment for: No

Confidential information will be made available to those who have executed a nondisclosure agreement: N/A

Name(s) and contact information of the person(s) who will provide the nondisclosure agreement and access to the confidential information: _____

Resolution Required? Yes No

Requested effective date: **July 1, 2016**

No. of tariff sheets: N/A

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed: N/A

Pending advice letters that revise the same tariff sheets: N/A

Protests, dispositions, and all other correspondence regarding this AL are due no later than 20 days after the date of this filing, unless otherwise authorized by the Commission, and shall be sent to:

California Public Utilities Commission
Energy Division
ED Tariff Unit
505 Van Ness Ave., 4th Flr.
San Francisco, CA 94102
E-mail: EDTariffUnit@cpuc.ca.gov

Pacific Gas and Electric Company
Attn: Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177
E-mail: PGETariffs@pge.com

Attachment A: Detailed Proposal for High Opportunity Program– On-Bill Financing Alternative Pathway

The On-Bill Financing (OBF) Alternative Pathway (OBF_AP) is a High Opportunity Projects or Programs (HOPPs) program enabled by the provisions of Assembly Bill 802 (AB 802) that will create an alternative means for customers to receive energy efficiency financing from the Revolving Loan Fund.

I. Program Description

A. A More Comprehensive Zero-Interest Loan Program for Energy Efficiency Improvements

The existing OBF program was designed to reduce the barriers to EE by providing customers with a zero interest loan to fund EE project costs net of the rebate or incentive. OBF loan terms are based on projected energy savings and the balance is repaid on the customer's bill. OBF utilizes a Revolving Loan Fund consisting of ratepayer EE funds that PG&E administers on behalf of its customers.¹ OBF is administered on the customer's PG&E bill, and failure to repay the loan balance in accordance with the terms of the agreement could result in interruption of utility energy service and other negative repercussions for participating customers.

Eligibility to receive an OBF loan in the existing program is contingent upon the customer's eligibility for and receipt of rebates. The rebate approval process can be lengthy and is subject to uncertainty. Delays in loan disbursement resulting from issues with rebates or incentives can deter customers and contractors from participating in OBF. In particular, contractors may be reluctant to offer OBF to their customers if they are uncertain regarding the timing of payment.

Research indicates that the OBF Loan is a key factor in energy efficiency investment decisions. In the California 2010-2012 On-Bill Financing Process Evaluation and Market Assessment (CALMAC ID CPU0056.01), OBF participants were asked about a hypothetical situation in which they had to choose between rebates and 0% financing. A significant proportion (46%) of respondents preferred 0% financing over rebates (34%). Fewer customers were undecided (19%) when asked to choose between the value of rebates and 0% financing. (Figure 24, page 59).²

OBF_AP will provide customers with an OBF loan for the full cost of the EE project, including required Measurement and Verification (M&V) and Operations and Maintenance (O&M) costs in accordance with existing OBF funding rules.³ Under OBF_AP, the customer and the contractor will forego eligible rebates and may install energy savings measures that are not eligible for

¹ OBF is a statewide program, however, the administration and source of the loan funds vary by IOU.

² California 2010-2012 On-Bill Financing Process Evaluation and Market Assessment (CALMAC ID CPU0056.01).

³ www.pge.com/eef

rebates under existing California Public Utility Commission (CPUC) authorized programs. OBF_AP will offer the OBF loan as the sole financial incentive for customers and contractors to complete high-quality EE projects.⁴

B. A New Program Framework to Support Contractor Participation

The OBF_AP framework (Program Framework) establishes a new savings evaluation protocol plus requirements for projects, contractors, Service Providers, project certification, and Project Quality Assurance Providers.⁵ Existing rebate and incentive program requirements are designed to ensure that the ex-ante savings claims are accurate and the incentives paid are appropriate based on rules. Under OBF_AP PG&E will not initially claim ex ante savings, but rather rely on measured meter-based energy savings for the projects. The OBF_AP Framework will focus on ensuring that the expected site specific savings are calculated correctly and that project energy savings materialize, through ongoing project M&V and O&M to support participating customers and the program. PG&E will claim energy savings one year after loan origination.

PG&E will use the Environmental Defense Fund's (EDF's) Investor Confidence Project (ICP)⁶ Targeted Commercial Protocols and engage a Transactional Advice Consultant to assist in creating the Program Framework under which all projects under the OBF_AP will be implemented. PG&E will solicit stakeholder input to ensure that the Program Framework is appropriate for the contractors and Service Providers serving projects included in OBF_AP. This is particularly relevant given that OBF_AP will support much smaller projects (loans as low as \$5,000) than are typically targeted by firms offering ongoing M&V services.

Contractors will be able to offer customers project financing under OBF_AP in accordance with the Program Framework. Projects submitted under OBF_AP will be documented in a standardized format. The project certification will state that the project was installed and documented in accordance with the Program Framework, and that the calculations, data, and project documentation are complete and accurate.

Contractors will be required to offer support services, which include project M&V, commissioning, project certification, and meter-based energy monitoring, from Service Providers. These services are necessary to measure the productivity of financed projects over time. Independent Service Providers are needed to provide support services because PG&E has found that many of the contractors providing EE services to the Small Medium Business (SMB) customer market do not have the capacity to meet the M&V requirements included in OBF_AP on their own. PG&E will actively recruit Service Providers to support OBF_AP and ensure availability of necessary services for participating contractors. Potential Service Providers include professionals previously engaged by the ICP and others identified by PG&E.

⁴ The EE Policy Manual defines a Financial Incentive as: Financial support (e.g. rebates, low interest loans, free technical advice) provided to customers as an attempt to motivate the customers to install energy efficient measures or undertake energy efficiency projects.

⁵ See Appendix B for definitions of new terms and stakeholders.

⁶ <http://www.edf.org/sites/default/files/icpfactsheet07132015.pdf>

Contractors will be required to identify their Services Providers in any proposals that they submit for OBF_AP financing.⁷

It is critical that OBF_AP design include an effective market-based Quality Assurance / Quality Control (QA/QC) process with sufficient rigor at minimum cost for OBF loans, which average \$26,000 for PG&E SMB customers. The OBF_AP QA/QC process is based on a third-party project certification process that will engage third-party Project Quality Assurance Providers. PG&E will review the reports of these Project Quality Assurance Providers to ensure that loans meet OBF_AP criteria. This will allow contractors to offer broad-based EE opportunities to customers through a project process that will be clear and transparent. Loans will not be held up while EM&V studies needed for PG&E's energy savings are being conducted. Thus in exchange for adhering to the Program Framework, contractors will have greater control over their project and funding timelines.

OBF_AP is designed to attract the highest quality contractors and some contractors may not be interested in or able to meet the criteria. PG&E believes that starting with a small number of experienced contractors will allow OBF_AP to demonstrate success, which will encourage other contractors to adopt their business models to participate in the OBF_AP.

PG&E's Transactional Advice consultant has completed a bottom-up estimate of the costs required to participate in OBF_AP and found that it should be reasonable for contractors to participate in the program. PG&E has also stress tested cost assumptions against existing OBF Loans. PG&E reviewed 697 OBF loans for SMB customers where the customer did not provide their own funds for a portion of the loan. When the incentive was excluded, the average loan term was *44.3 months* and the average loan amount was \$29K. Assuming that the Service Provider costs were \$5,000 (4 times the target of \$1,250 for these loans) the average term for these loans would be *52 months* meaning that the loans would still be eligible for the OBF loan for the full amount of the project cost and the payback would be below the average estimated useful life (EUL) of 7 years.

Ensuring the costs of complying with the Program Framework are workable for SMB customer projects is a key objective of the OBF_AP. PG&E and its Transactional Advice Consultant are including these discussions in outreach to stakeholders. To date, these discussions have indicated that the cost targets are obtainable. PG&E will closely monitor costs as OBF_AP rolls out to determine if modifications to the Program Framework are necessary.

⁷ The third-party project certification process is akin to the process that issuers of financial statements currently utilize, in which an issuer hires a Certified Public Accountant (CPA) to certify or audit the issuers of a financial statement. The CPA then issues a certification that the financial statements are accurate and presented in accordance with accounting rules. Under OBF_AP, the project certification will state that the project was installed, the documentation was performed in accordance with the Program Framework, and calculations, data, and project documentation are complete and accurate.

C. Transition from Widget-based Savings to Savings for Existing Buildings

PG&E expects OBF_AP to include projects similar to those being installed under its existing OBF program, at an anticipated lower expense to ratepayers. These include a majority of lighting⁸, refrigeration, and controls projects. At the same time, OBF_AP aspires to move away from a widget-based savings approach and include more comprehensive activity that may include Retrocommissioning and operational improvements.

In addition, OBF_AP will allow measures that do not currently receive a rebate or incentive to be financed, including Energy Management Technologies (EMT) in keeping with the goals of AB 793. OBF_AP is designed to leverage market actors such that contractors can develop energy savings interventions that align with businesses' and customers' needs.

Eligible Measures

Eligible measures for OBF_AP are based on the definition of Energy Efficiency Measures from the Energy Efficiency Policy Manual.⁹ OBF_AP will use the same loan terms as existing programs, so it is likely to see similar types of measures installed through OBF_AP. These measures have an EUL of five years or more, but produce enough savings to offer the typical commercial customer a simple payback of less than five years. PG&E notes that Commercial customer loans typically have a five year maximum term, however it is possible to extend the term under the existing OBF Tariff beyond five years if the measure EUL and the customer's credit and other risk factors support it.¹⁰

PG&E also expects contractors to target customers that are similar to those that leverage the existing OBF program; however, contractors can address a variety of sectors. PG&E expects most measures to be in the Indoor/Outdoor Lighting, HVAC, Food Service Equipment, and Service End Use categories. The specific measures are likely to include but are not limited to

⁸ Note that non-advanced- i.e. non-Light Emitting Diode (LED) – lighting measures are limited to 20% of project cost for OBF loans. For OBF_AP, non-advanced lighting measures will not be eligible.

⁹ Energy Efficiency Measure - An energy using appliance, equipment, control system, or practice whose installation or implementation results in reduced energy use (purchased from the distribution utility) while maintaining a comparable or higher level of energy service as perceived by the customer. In all cases energy efficiency measures decrease the amount of energy used to provide a specific service or to accomplish a specific amount of work (e.g., kWh per cubic foot of a refrigerator held at a specific temperature, therms per gallon of hot water at a specific temperature, etc.). For the purpose of these Rules, solar-powered, non-generating technologies are eligible energy efficiency measures (D.09-12-022, OP 1).

http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPpolicyManualV5forPDF.pdf

¹⁰ http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHS_E-OBFF.pdf 6b Loan Term: The loan term in months will be established by PG&E at the time of the OBF Loan Agreement initiation. Commercial loans may have their loan terms extended beyond five years, not to exceed the expected useful life (EUL) of the bundle of energy efficiency measures proposed, when credit and risk factors support this. Loan terms will not exceed the EUL of the installed energy efficiency measures. The maximum loan term shall be sixty (60) months excepting: 1) loans to Government Agency Customers will have a maximum loan term of one hundred and twenty (120) months or the EUL of the installed energy efficiency measures, which ever is less; and 2) loans to customers where, in PG&E's sole opinion, credit and risk factors support a loan term longer than sixty (60) months.

insulation, split/package AC and heat pumps, duct sealing/repair, lighting fixtures, lamps, laundry, and commercial refrigeration chillers, compressors, condensers, and controls (for boilers, HVAC, lighting, refrigeration, etc.).¹¹

PG&E will include OBF_AP project data for review via the custom measure and project application (CMPA) submission process. OBF_AP projects will submit data to CMPA within 30 days following the loan issuance – instead of prior to installation as is typical with most CMPA submissions. This process is supported for two unique reasons: (1) PG&E will receive the final project data from contractors after the installation of equipment, (2) the customer financial incentive and gross savings claims are not tied to an ex ante savings estimate. PG&E believes that OBF_AP projects will be treated similarly to Custom projects that are not selected by the ED for Ex Ante Review. This process will ensure timely feedback for program design and ensure that all stakeholders are informed about the status of the program without disrupting the project development process of OBF_AP for customers and contractors.

For EM&V, PG&E will compare actual savings for program participants against a control group (i.e., customers that did not participate in any PG&E program during the evaluation timeframe, and that are similar size and business type). PG&E will then collaborate with the ED to further assess the ex post program results in order to inform this and other programs. PG&E provides more detail on its EM&V Plan in Attachment B. A logic model and program theory table for OBF_AP is provided in Appendix A.

D. Opportunities for Market-Based Solutions

OBF_AP is designed to advance market-based EE financing solutions and thereby accelerate the adoption of EE. A key way to grow the market is to increase the capacity of the contractor community to serve the market and link contractors with various support services.

1. Contractor Capacity

Third-party financial institutions are developing innovative EE offerings such as those allowing customers to purchase EE as a service (e.g. Energy Service Agreement (ESA) models). A UC Berkeley Law Report¹² indicates that these financial institutions are unable to identify qualified

¹¹ In the AB802 Technical Analysis Navigant stated that ‘*There is more stranded potential than what this preliminary forecast captures.....Very few to-code measures were considered. We believe that additional stranded potential lies in building envelope measures (insulation, roofing, windows, air sealing, etc.) and commercial refrigeration measures.*’ (Page 11).

¹² A UC Berkeley Law Report (<https://www.law.berkeley.edu/wp-content/uploads/2016/03/Powering-the-Savings.pdf>) identifies the following Top Four Barriers to Achieving Deep Energy Retrofits in Commercial Buildings:

- 1) **Lack of standard measurement and verification of energy efficiency savings** to provide a basis for pay-for-performance financing and investment at a large scale;
- 2) **Lack of regulatory certainty and rate design to encourage innovative efficiency programs** that allow more robust third-party and utility investments in energy retrofits;

contractors that can provide the services needed by these financial institutions. Contractors that participate in OBF_AP will need to meet an established set of criteria to ensure their experience and credibility. This due diligence process will ensure that contractors in OBF_AP are viable candidates to work with these financial institutions, especially for larger or integrated projects ineligible for support through OBF. While financial institutions will not be part of OBF_AP, PG&E will perform the same level of diligence that a financial institution would conduct. Therefore, contractors will be prepared to serve the growing third-party financed EE market.

2. Contractor Support Services

Existing programs do not use Service Providers who can help contractors deliver more savings at lower cost. OBF_AP will encourage contractors who are not able to provide comprehensive project development services and meet OBF_AP requirements to work with Service Providers who offer contractor support services. These could include loan origination (documentation services), third-party certifications, information technology (IT) monitoring providers, and other offerings. OBF_AP will create an opportunity for these Service Providers to create deployment models for their technology that will OBF_AP more accessible to contractors and the EE financing market overall. PG&E will ensure appropriate outreach to these firms to support development and implementation of this program. This will include making the costs of their tools affordable to the contractor. For example, monitoring costs for the lifetime of the loan can be capitalized and included in the OBF loan.

E. Comparison with Current On-Bill Financing Program

1. Creating Opportunities for Greater Energy Savings

Administrative/Implementation Costs: Meeting the increased EE goals set forth in SB 350 calls for scalable, sustainable models for PAs to support customer investments. OBF_AP creates a scalable model that allows PAs to generate energy savings leveraging OBF RLF rather than relying on traditional incentives and rebates, reducing program incentive costs. OBF_AP also reduces administrative costs by requiring the customer and contractor to fund the QA/QC process.

In addition, the Program Framework will streamline the underwriting process to reduce overall transaction costs. PG&E averaged roughly 400 originated OBF loans per year in 2014 and 2015. As PG&E seeks to scale OBF_AP and serve more customers, it will be important to identify opportunities to drive operational effectiveness (generating cost efficiencies via economies of scale) for all OBF stakeholders– including PG&E’s program team and account representatives, as well as participating contractors and implementers.

Alignment/Engagement with Contractors over OBF Loan Lifetimes: PG&E collects OBF loan repayment on a customer’s bill for up to five years for commercial entities and ten years for

-
- 3) **Lack of standardized energy data to measure energy efficiency performance** and reduce program costs while encouraging innovation and large-scale capital market financing and investment; and
 - 4) **Lack of an energy efficiency workforce to execute and market retrofit projects** once measurement technologies and financing programs achieve the promise of scale.

government agencies¹³. As discussed above, participating contractors are not typically incentivized to maintain engagement with a customer over the lifetime of a loan under existing programs. This disconnect can create complications when customers are either dissatisfied with an installation, or save less energy than originally estimated by the contractor (which could result in the OBF loan *increasing* the customer's bill). By creating an investment model that requires M&V, O&M, and standard project documentation, OBF_AP will ensure better results for participating customers.

Customer Reach: PG&E has over 400,000 small business customers, with unique facilities and energy needs. While PG&E's EE rebate and incentive programs are appropriate for some, OBF_AP allows PG&E to serve a broader customer base by increasing eligible activity and with an alternative project development process.

The intent of OBF_AP is also to increase the number of energy efficiency measures and savings by responding to a documented customer preference for financing over rebates. In the California 2010-2012 On-Bill Financing Process Evaluation and Market Assessment study,¹⁴ OBF participants were asked about a hypothetical situation in which they had to choose between rebates and 0% financing. A significant proportion (46%) of respondents preferred zero-percent financing, while fewer respondents (34%) chose rebates. Even fewer customers were undecided (19%) when asked to choose between the value of zero-percent financing versus rebates.¹⁵

OBF_AP should also increase customer usage of financing assistance to produce energy savings. Customer research finds that SMB customers are especially reluctant to invest in energy efficiency, even with zero interest loans, due to concerns that energy savings will not materialize.¹⁶ Currently, programs rewards program implementers, who are generally contractors, on the basis of "deemed" saving values that are published in the Database of Energy Efficiency Rules (DEER) or custom savings calculated at the time of installation. The one-time rebates and incentives do not motivate contractors to provide ongoing support in the event that savings fail to materialize after project completion. OBF_AP requires the contractor to produce savings over the life of the loan, which assures the customer that the projected savings will materialize.

In addition, OBF_AP will facilitate data gathering on a large number of projects whose energy savings are documented by before and after meter readings. This will provide PG&E, the CPUC, and other PAs with reliable metered energy savings project data that be used to design OBF_AP and other non-residential programs.

2. Improving Participation Rates

The current OBF program, combined with traditional rebates and incentives, has successfully supported a host of customer projects to date. However, certain barriers to entry are inherent in

¹³ www.pge.com/eef

¹⁴ CALMAC ID CPU0056.01

¹⁵ CALMAC ID CPU0056.01 Figure 24, Page 59.

¹⁶ Energy-Efficiency Financing Customer Research Focus Group Findings – Cadmus Group
http://www.caleefinance.com/wp-content/uploads/2014/02/PGE-FinancingFocusGroupReport_21June2013.pdf

the current OBF program design, including those listed below. A full list of barriers/challenges and proposed solutions under OBF_AP is provided in Appendix B, Table B4

a. Contractors

Cash Flow. Contractors that implement projects under OBF for small businesses are often small and not well capitalized. Given that OBF loans are funded after project completion, this can create cash-flow constraints for some of these contractors— particularly if there is a delay in project implementation and approval related to the rebate/incentive program in which a customer participates.

The OBF_AP program will decrease the end-to-end cycle, from loan application to loan origination for funding loans as compared to the existing process. The current OBF program targets a five business day turnaround time for both pre- and post-installation reviews after receiving a complete application. However, in practice, the post-installation review cannot begin until *all related rebates and incentives have been approved*, meaning the actual turnaround time from project completion to review completion varies significantly between OBF loans, but can be significantly longer than targeted turnaround times. PG&E tracks end-to-end project timelines for all OBF loans and will compare existing data to OBF_AP project timelines for comparable projects.

OBF_AP Solution. OBF_AP loans will still be funded after project completion, but are not contingent upon the contractors' receipt of rebates. Therefore, OBF_AP review can commence immediately upon receipt of a completed application, resulting in a faster, more reliable turnaround time and payment to the contractor. In addition, a pre-installation review and execution of an initial loan agreement will not be required for OBF_AP, removing upfront project delays and allowing customers and contractors to begin work at their convenience.

Project Control. Rebate and incentive programs may require inspections by Program Administrator staff or third parties, which can impact project timelines beyond contractors' control. This can create complications with revenue, resources, cash-management, and customer satisfaction that could lead some contractors to discontinue OBF and other EE offerings, even in instances in which it would allow customers to engage in more comprehensive projects.

OBF_AP Solution. OBF_AP provides a transparent, well-structured framework that will give contractors more control over the loan process and associated timelines. With more control over the process, contractors will be better able to take on more and larger projects with less risk of delay and associated cash flow issues.

Long-term Contractor Engagement. Contractors do not have a clear motivation for updating their business models to support customers over the lifetime of an OBF loan or project payback period. With rebates/incentives typically disbursed upon project installation, contractors are neither required nor encouraged to provide ongoing assistance to the customer.

OBF_AP Solution. Contractors that participate in OBF_AP will be required to provide ongoing M&V over the expected useful life of a given project.

b. Customers

Savings Realization. EE projects carry risk for customers, given that they require an up-front investment with the expectation of future energy utility bill savings. For OBF-funded EE projects in particular, PG&E adds a line item charge on customers' PG&E bill for the lifetime of the OBF loan. Non-payment of the OBF loan is equivalent to the customer not paying their energy charges and could result in service interruption. While projected energy savings are used to calculate the loan repayment term, these savings levels are not guaranteed. Energy savings can be impacted by external conditions such as weather, occupancy, rate changes, time of usage, and other factors. Performance risk and uncertainty can impact the customer's ability to service their debt and is often cited by potential customers as the reason they choose not to execute EE projects.

OBF AP Solution. By requiring contractors to provide ongoing M&V and third-party QA/QC, the Program Framework will help customers mitigate performance risks and provide them with a greater level of confidence that the projected savings will materialize.

Missed EE Project Opportunities and Stranded Potential: California's existing widget-based EE programs often lead contractors and IOU account representatives to focus more on specific measures that are currently incentivized than on customers' individual facility needs. This can result in missed energy savings opportunities, as well as equipment installations that do not consider the entire facility.

OBF AP Solution. The removal of rebate eligibility requirements and the Program Framework will encourage contractors to pursue more comprehensive EE projects, tailored to a customer's needs and including measures that are not currently eligible for a rebate or incentive.

II. Program Implementation

The OBF program at PG&E is a fully operational program with defined policies, procedures, IT systems, CPUC-approved rate schedules, and CPUC-approved loan agreements. OBF AP is designed to fully utilize the existing OBF operational infrastructure including the existing CPUC-approved rate schedules and forms.

A. Program Sequence and Timing

Under OBF AP, PG&E has engaged a Transactional Advice Consultant to assist in developing a streamlined framework to allow contractors and their partners to apply for OBF AP. The Program Framework will be based on the ICP Targeted Commercial Protocol,¹⁷ which is designed to create a consistent and transparent process for investments in EE that are under \$500,000 in total project costs. Contractors that leverage the ICP Targeted Commercial Protocol will be eligible to participate in OBF AP. PG&E will add criteria to the protocols as needed to support OBF Program requirements and to ensure that customers leveraging OBF for loans as small as \$5,000 can be supported.

¹⁷ <http://www.eepformance.org/>

PG&E has stress-tested the assumption against existing loans. PG&E reviewed 697 OBF loans for SMB customers in which the customer did not provide their own funds for a portion of the loan. When the incentive was excluded, the average loan amount would have been \$29,000 with an average term of 44.3 months. Assuming that the Service Provider costs were \$5,000 (4x the target of 5% of project costs for these loans), the average term for these loans would be 52 months, which is well within the maximum loan term of 60 months and the average EUL of 7 years. Following these assumptions, the entire amount of project installation and compliance costs would be eligible for an OBF loan.

PG&E and the Transactional Advice Consultant have engaged in a significant amount of outreach to market actors and other stakeholders while developing the Program Framework. While the requirements of the pilot will be new, both bottoms up analysis (looking at the costs of each effort individually) and top down analysis (described above) indicate that the offering will be feasible for some contractors. OBF_AP is designed to attract the highest quality contractors; some contractors may not be interested in or able to meet the criteria.

PG&E believes that starting with a small number of experienced contractors will allow OBF_AP to demonstrate success which will encourage other contractors to adopt the program. Initial feedback from stakeholders has indicated that the cost targets for the additional M&V and QA/QC required are obtainable, but PG&E will also closely monitor these costs during implementations and will adapt the ICP protocols as needed and appropriate based on stakeholder input. PG&E and the consultant will also create tools, resources, and program documents for contractors. The Program Framework includes the following project requirements, including standard documentation requirements:

- Baseline site-specific energy use for the building;
- Project eligibility requirements that are independent of Deemed or Custom project criteria and that use approved, transparent energy savings calculation methodologies;
- Project M&V requirements over the loan period;
- Required O&M protocols;
- Responsibilities of eligible third-party certification firms, which can include 1) performing project and document review, and, 2) providing certification of quality and completion criteria

B. Strategic Integration

OBF_AP closely aligns with the Strategic Plan, Market Transformation, and other key state objectives as follows:

AB 802: OBF_AP is enabled by AB 802. It allows PG&E to create a program that allows contractors and customers to implement projects based on meter-based EE savings, including to-code measures that are not currently eligible for rebates or incentives.

California Long-Term Energy Efficiency Strategic Plan: Financing options for EE investments are a key Strategic Plan goal. This offering also provides an opportunity to leverage lessons-learned to improve OBR pilots.

Market Transformation: OBF_AP is designed to enhance the EE offering that contractors provide to customers, create a new framework for customers to invest in EE,

and provide a model that can be leveraged and inform private financial institutions (via OBF) .

AB 793: AB 793 requires IOUs to incentivize customers to purchase and install energy management technology (EMT). Since the nascent EMT industry still has relatively high-cost products, OBF_AP will help SMB customers overcome the cost barrier to adopting EMT measures by allowing them as part of the scope of financed projects. OBF_AP will also allow PG&E to gather additional data on the performance of these products that may facilitate the future development of rebates or incentives for EMT measures.

AB 758: This Program supports California’s Existing Buildings Energy Efficiency Action Plan,¹⁸ developed under AB 758. OBF_AP directly supports Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives, with respect to Streamlined Timing and Alternative Models, and sets the groundwork needed to further support Strategy 5.1 Foster Private Capital Market.

C. Best Practices and Lessons Learned

PG&E will leverage the statewide IOU EE Finance team to disseminate real-time lessons-learned on the Program. This new strategy is consistent with the intention expressed around cross-cutting initiatives,¹⁹ as it is not redundant or cross-purpose with other EE finance initiatives, and will provide an opportunity to study different options for broader statewide deployment.

PG&E will include provisions to limit the inclusion of measures that are likely to have been counted in other programs. As is discussed in the Navigant AB802 Technical Analysis: “*Double counted savings are most likely to happen when Replace on Burnout Measures are upgraded during a whole building renovation.*”²⁰ OBF_AP is not designed to be an add-on to existing whole building retrofits or alterations but is rather designed to be a tool for contractors to engage customers on new projects.

PG&E will closely monitor projects to ensure that double counting of savings that would have been claimed through the Codes and Standards programs are minimized.

To alleviate the concern that customers are using OBF_AP to replace broken equipment, PG&E will require that the Contractor attest that no more than 25% of the loan is for the replacement of equipment that is not functioning. The project documentation will include information on the removed equipment, including pictures, to document that the equipment is not in working order.

To alleviate the concern that OBF_AP will be used to support existing renovations or major alternations already underway, the required documentation will include the project proposal submitted to the customer. Any projects that are clearly only add-ons to existing renovations or major alterations will not be approved.

¹⁸ www.energy.ca.gov/ab758/documents/

¹⁹ R.13-11-015, p. 52.

²⁰ Page 40.

D. Stakeholder Engagement:

To refine OBF_AP program design and ensure that the offering is attractive to market actors, PG&E collaborated with and gathered input from numerous stakeholders as detailed below:

- **Financial Lenders:** PG&E reviewed its lessons-learned from the existing OBF program and new program design with financial lenders, with the goal of ensuring that such parties can use OBF_AP to support their own offerings as they evaluate opportunities to engage with the OBR pilots.
- **Contractors:** PG&E has sought to ensure that trade professionals and implementers are able to utilize OBF_AP.
- **Environmental Defense Fund (EDF) Investor Confidence Project (ICP):** PG&E is an ally of the ICP project and has utilized the ICP protocols to support the design of this Program, as well to evaluate its ability to join the ICP Investor Network.
- **Natural Resources Defense Council (NRDC):** PG&E developed its program design in accordance with best practices and emerging opportunities nationally.
- **The Utility Reform Network (TURN):** PG&E discussed the role of IOUs in financing activities.
- **California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA):** PG&E has reviewed the program design with CAEATFA to ensure that OBF_AP offering is complementary to the upcoming OBR pilots.
- **Local Governments:** PG&E is working with local governments to leverage their relationships with contractors to raise awareness about OBF_AP.

Implementation Team:

The initiative will be managed by PG&E's Energy Efficiency Transaction Services team:

Manager – Alfred Gaspari (A3G1@pge.com)

Program Manager – Noah Proser (N1PG@pge.com)

Policy – Halley Fitzpatrick (HDF2@pge.com)

EM&V – Brian Smith (B2SG@pge.com)

III. Program Metrics

A. Program Goals and Objectives

Through OBF_AP, PG&E proposes two key solutions that are designed to meet challenges in the current EE marketplace:

1. **Create a scalable sustainable EE solution for non-residential customers to invest in EE and achieve deep savings:** The high cost of implementation and reliance on one-way incentives makes directly scaling current programs challenging. Additionally, traditional widget-based incentive and rebate programs limit opportunities to engage with customers. OBF_AP Program addresses these challenges by minimizing ratepayer investment through the use of the Revolving Loan Fund and eliminating one-way incentive payments, and by allowing customers to adopt a variety of EE measures, the energy savings for which are determined from measurements at the meter.

2. **Remove customer barriers to EE investments:** PG&E’s non-residential customers face several challenges to investing in EE, including the difficulty of accessing capital financing and the opportunity-cost of EE investments as well as the lack of project support required to ensure that EE investments deliver on their economic promise. To remove these barriers, OBF_AP provides a customer-centric mechanism to facilitate access to financing and allow customers to fund the cost of inspections and energy monitoring through an OBF loan.

The availability of funds in the OBF Revolving Loan Fund limits the number of projects that can be conducted. PG&E currently has roughly \$20 million (M) in capacity for originating loans under the OBF Revolving Loan Fund as of the end of February 2016, with approximately \$1.5M in loan repayments being received each month. PG&E anticipates an increase in OBF loans as OBF_AP comes on line; however, PG&E is able to manage a significant increase over the 2015 loan origination volume of \$18M. PG&E is not currently proposing an increase to the Revolving Loan Fund incremental to what was planned for 2016 to support the new OBF_AP offering.

The OBF loan pool should constitute an effective solution for finance providers, contractors, and customers. OBF_AP will inform the deployment of the upcoming OBR pilots by providing data and market analysis, and by readying contractors for working with third-party financial institutions. As third-party capital is deployed through the OBR pilots, PG&E will evaluate the role of the ratepayer-funded Revolving Loan Fund in conjunction with the statewide team.

B. Program Metrics

| Goal | Metric | Target |
|--------------------------------------------|---------------------------------|-----------------------------|
| Develop Scalable Business Models | Participating contractors | 10 in year 1 |
| | Participating Service Providers | 2 Service Providers |
| Remove Customer Barriers to EE Investments | Number of loans | 25% of originated OBF loans |

C. Program Data Objectives

“The Staff White Paper on Energy Efficiency Baselines” for implementation of AB 802 notes the need to collect additional data to *“understand the overall energy savings implications of new existing conditions programs.”*²¹ Recommendation 8²² in the white paper provides recommendations for data that should be collected on the equipment that is being replaced.

²¹ Page 32: <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M159/K980/159980778.PDF>

²² Page 72: <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M159/K986/159986262.PDF>

As new programs seeking below-code savings are implemented, program administrators should carefully document the age, type, and condition of equipment that is being replaced by program participants. These data could inform future field data collection efforts to obtain statistically representative data of the existing population. They could

OBF_AP was selected as a High Opportunity Program by PG&E because it provides an opportunity to generate both incremental energy savings and data that will be useful in addressing these questions as AB 802 is implemented. OBF_AP will allow PG&E to gather this data in a way that is low cost/low risk to ratepayers, since under OBF_AP participating customers are agreeing to repay all project costs. It is important to note that the OBF HOPPS program is a lower cost alternative to the existing OBF program, where customers receive both financing and a one-way incentive.

The ability to claim metered savings has allowed PG&E to create a program that relies on standard data collection and project framework, but does not introduce the complexity around baseline considerations to the participating customer or contractor. OBF_AP projects will include monitoring, operations, and maintenance support for the life of the loan that will not only enhance the offering for customers, but also generate incremental data that can be compared to Smart Meter data to support program evaluation. The contractors will provide project data about what was installed and what was removed from the facility, what interventions were completed post installation and will obtain customer authorization to share pre- and post-project energy data about the project to support program evaluation. Under this program PG&E will collect and report on this data.

OBF_AP will leverage PG&E’s Customer Relationship Management (CRM) database to ensure that data is complete, accurate and easily accessible. In addition, PG&E will employ the best practices that are being developed and implemented in the EE Financing pilots. PG&E will also continue to examine opportunities to utilize emerging national data specifications such as the United States Department of Energy (DOE) Building Energy Data Exchange Specifications (BEDES) taxonomy to further increase program data quality.

D. Proposed Program Timeline

PG&E proposes the below accelerated timeline to facilitate launching the program in 2016:

| Date | Milestone | Dependency or Potential Delay |
|-----------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| March 25, 2016 | PG&E submits Advice Letter (AL) | |
| ~April 15, 2016 | CPUC reviews and provides additional guidance on AL | Potential protests, or request for additional information |
| April 18, 2016 | PG&E provides initial program participation criteria to interested parties for their feedback and input | Ongoing - CPUC approval |
| June 6, 2016 | PG&E starts evaluating initial projects to further refine Program Framework | None |
| June 10, 2016 | PG&E submits Supplemental AL | |

also serve as an initial “litmus test” to see if programs are indeed capturing stranded potential (replacing equipment beyond its EUL) vs. capturing double counted savings.....

| | | |
|---------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| ~June 30, 2016 | CPUC reviews and approves Supplemental AL | Potential protests, or request for additional information |
| July 5 th 2016 | <i>Program full launch</i> | <i>CPUC approval; contractor and Service Provider outreach and support</i> |
| July 2016-December 2017 | Program implementation and initial feedback provided | CPUC approval: contractor and Service Provider outreach and support Quarterly reporting and stakeholder engagement provided |

IV. Measure Treatment

OBF_AP financing will be available for any EE or conservation measure (ECM) satisfying the following three conditions:

- ECM is installed in accordance with applicable laws and standards
- ECM is installed in accordance with the Program Framework
- Project savings-to-investment ratio (SIR) is greater than 1.0²³

OBF_AP requires a facility-specific energy assessment and can finance any EE project with projected (metered) savings. The loan term cannot exceed the Expected Useful Life (EUL) of the included measures. Estimates of annual energy savings and implementation costs are key components of the financial evaluation of an EE project. Detailed descriptions of the measures must be developed so that these estimates can, in turn, be accurately refined.

To alleviate the concern that customers will use OBF_AP to replace broken equipment, PG&E will require that the contractor assert that no more than 25% of the loan is for the replacement of equipment that is not functioning. The project documentation will include information on all equipment removed, including pictures, to document that it is in working order at the time of removal. In addition, a copy of the project proposal submitted to the customer will be required as part of OBF_AP documentation. Any projects that are simply add-ons to existing renovations will not be approved.

Behavioral and O&M measures will be included in the measure mix, as projects will require O&M over the lifetime of the OBF loan. However, energy savings generated from behavioral measures will not be included in the initial savings estimates used to determine the loan terms. If actual metered savings do not materialize, the project would not remain bill neutral, hence putting the participating customers at risk. Once greater certainty is established for behavioral measures, their inclusion in project estimates will be reconsidered. Contractors will train and agree with customers both in installation and monitoring energy savings over the lifetime of a loan for all measure types.

OBF_AP will require that any lighting measures included in the scope of a project are included on DesignLights Consortium’s Qualified Product List (QPL). In addition, non-advanced (i.e. non-LED) lighting measures will not be eligible for financing through OBF_AP.

²³ Savings-to-investment ratio = (Annual Energy Savings * Average Cost of Electricity * Estimated Useful Life) / (OBF loan amount).

V. Savings Estimate and Program Budget

A. Savings Targets

The savings are estimated in the first year as 25% of the 2015 energy savings that were generated from OBF customer projects in 2015. PG&E anticipates that a successful first year will lead to greater participation and savings in OBF_AP, shown in the table above as 20% annual growth.

| Metric | 2016 | 2017 | 2018 |
|-------------------------|-------------|-------------|-------------|
| Electric Savings (GWh) | 4.28 | 5.14 | 6.16 |
| Demand Reduction (MW) | 0.55 | 0.66 | 0.79 |
| Gas Savings (MM Therms) | 0.00 | >=0.00 | >= 0.00 |

PG&E does not anticipate significant therm savings from OBF_AP, given that low natural gas prices continue to negatively impact uptake of customers' natural gas efficiency projects. PG&E does not foresee a significant number of natural gas savings projects in the near term for OBF_AP, which is similar to the results that are seen on the OBF program.

B. Savings Assumptions

PG&E analysis has found that the average OBF customer uses twice the energy of the average PG&E non-residential customer by size. It is likely that customers with higher energy usage than their peers will continue to be predominant participants of OBF_AP.

PG&E has over 400,000 Small Business customers with average electric expenditures of \$4,600 and over 100,000 Medium Business customers with average electric expenditures of \$11,600. Many of these customers are cash and resource constrained. OBF_AP will provide a mechanism for contractors to reach more of these small and medium customers with EE investment opportunities.

C. Savings Calculation Method

Energy savings calculations to determine the OBF loan terms will be performed using a method consistent with ICP specifications. These savings calculations would not directly inform ex ante or ex post savings claims, but may facilitate validation of savings claims through cross verification.

To evaluate the incremental energy savings benefits of OBF_AP, PG&E proposes an Evaluation, Measurement, and Verification (EM&V) plan that will both address "early M&V" (i.e., to estimate gross and net savings to inform our savings claims) and a "process evaluation" (i.e., to collect early and ongoing program feedback to refine our offering and improve its delivery). In addition, because many of OBF_AP strategies are new, and because PG&E has not claimed savings under the existing OBF program, there is no precedent for an OBF savings-estimation framework. (PG&E also looked for impact evaluations for OBF programs run outside of California and was not able to find any.) Thus, one of the goals of the initial implementation of

OBF_AP will be to develop a robust evaluation method for this type of program, and to ensure that a rigorous methodology is in place once OBF_AP grows over time.

PG&E proposes to calculate net savings using two approaches:

1. A quasi-experimental design using a “difference of differences” approach, using a comparison group selected to estimate net savings. PG&E will calculate energy savings for each project (pre-installation minus post-installation energy) normalized by a comparison group comprised of all eligible members of the population, some of which may have installed an energy savings project during the evaluation timeframe. PG&E only proposes to use this approach for certain types of projects where the baseline should be existing conditions, including early retirement projects, retro-commissioning (RCx) projects, and projects to install measures that are often repaired indefinitely, and shell and building system improvements. For estimating net savings from measures that replace failed equipment, PG&E proposes to use engineering estimates.
2. A gross savings calculation method using quasi-experimental design using a “difference of differences” approach that will be coupled with customized net-to-gross (NTG) surveys to understand what participants would have done in the absence of the program. For the gross savings estimate, PG&E will calculate energy savings for each project (pre-installation minus post-installation energy) and use a comparison group comprised of similar, non-participating customers that likely did not install any type of energy savings projects during the evaluation timeframe, to control for exogenous changes.²⁴

The primary reason for calculating net savings using two approaches is improve accuracy and confidence in the estimate. The secondary reason is to provide a contingency plan in case one methodology is determined to be inaccurate, inappropriate, or infeasible for certain customers or project types.

A comprehensive EM&V plan proposal that details these strategies and other considerations is included in Attachment B.

Note that a robust effort for Finance EM&V is imminent, and the impact evaluation for OBF in 2013/2014 is currently underway. The findings and results from the EE Finance EM&V plan will be incorporated into this Program as appropriate.

VI. Budget Assumptions

OBF_AP will utilize existing OBF program systems and support staff. OBF_AP will have an EEGA code established for reporting of savings and costs. Costs for administration and program implementation are expected to be proportional to the overall OBF program based on the number of loans. PG&E is not proposing any direct marketing of OBF_AP in the first year.

²⁴ The control group will likely be future participants in the Alt OBF and main OBF programs, because future participants would likely not have installed energy savings projects during the evaluation timeframe.

Table to compare costs of Admin, Marketing and Program Administration for OBF and OBF_AP.

| Cost Category | OBF_AP | OBF | Total |
|------------------------|-----------|-------------|-------------|
| Administration | \$67,996 | \$203,988 | \$271,984 |
| Marketing | \$0 | \$550,000 | \$550,000 |
| Program Implementation | \$544,504 | \$1,633,512 | \$2,178,016 |
| Total | \$612,500 | \$2,387,500 | \$3,000,000 |

Cost-Effectiveness Calculation

While finance programs are considered resource programs per D.12-11-015²⁵, PG&E treats its finance programs as non-resource in the cost-effectiveness calculator from a costs and benefits perspective. In 2013, California IOUs submitted a work paper for EE Financing. The ED rejected the work paper, stating that “It is expected that IOUs will work collaboratively with Commission staff to define the cost-effectiveness inputs appropriate for the EE financing pilots.” This ongoing effort between the CPUC and IOUs was leveraged in the development and evaluation of this Program.

OBF_AP is designed to measure all energy savings at the meter, and therefore will be able to account for benefits and costs in the cost-effectiveness calculator. PG&E estimates that OBF_AP will have a Total Resource Cost (TRC) and Program Administrator Cost (PAC) of over 1.0 by the second year of program operations. The TRC and PAC will be dependent on the costs that are included for the OBF program. This is an active discussion in the EE Finance EM&V work and the results from that work will be leveraged in OBF_AP evaluation.

This Program is notable in that it will provide incremental data which can be reviewed by both IOUs and CPUC staff to study the impact of AB 802. Since OBF_AP will likely result in reduced ratepayer funds for customer projects as compared to other interventions, the study places less of a burden on ratepayers.

As noted in the HOPPs Ruling, the full measure cost is used when determining the cost effectiveness of measures when using an existing condition baseline. As described in the Section, Savings Calculation Methodology, for this Program, PG&E proposes to calculate energy savings for many types of Alternative OBF projects (including early retirement projects, retrocommissioning, and measures that are often repaired indefinitely) using an existing condition baseline, but adjusted for exogenous changes using a comparison group. When energy savings baseline adjustments are made, corresponding cost adjustments should also be applied to maintain the integrity of cost-effectiveness calculations.

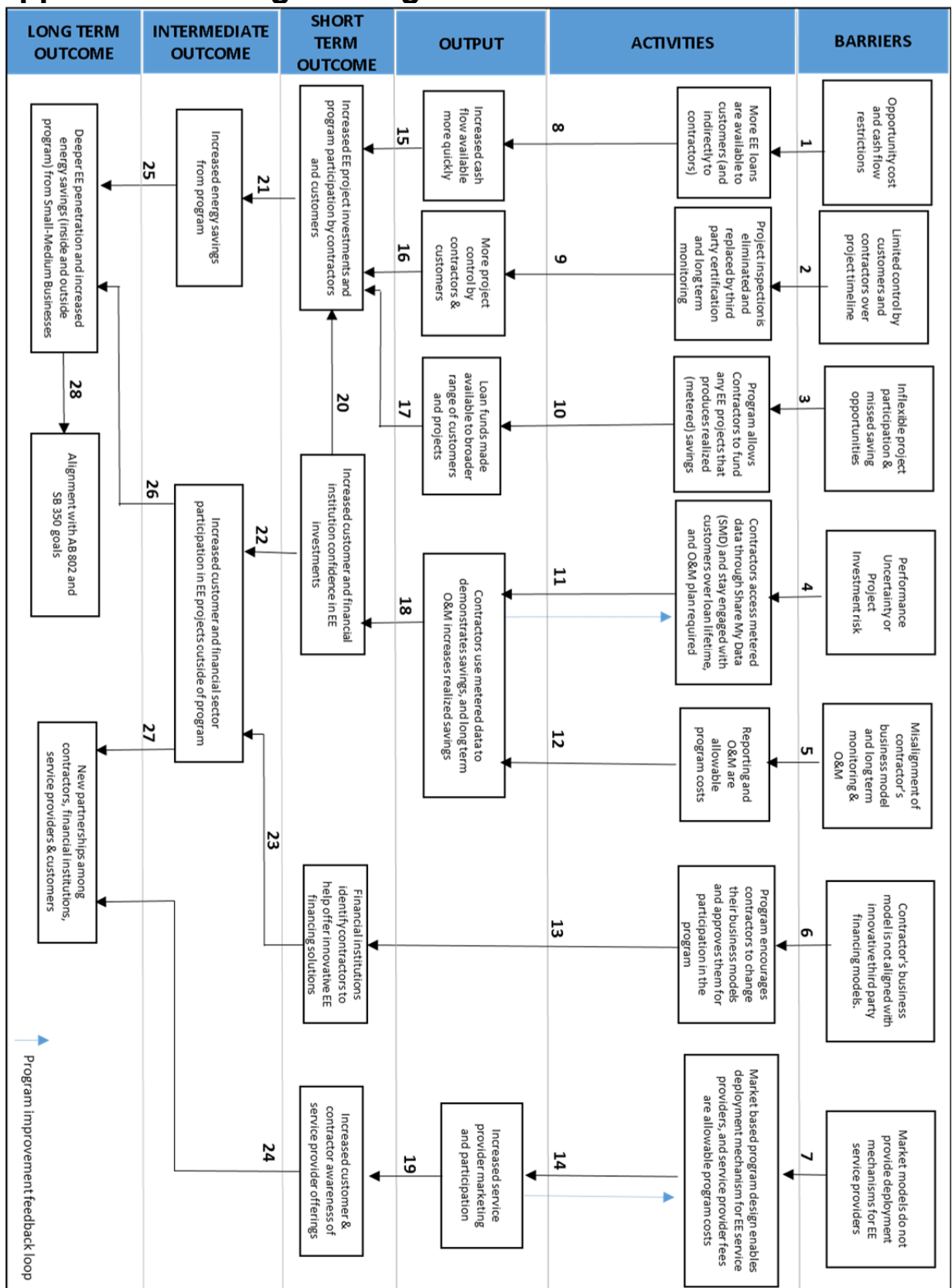
OBF_AP will use existing OBF functionality, budget, and Revolving Loan Fund. PG&E does not anticipate requesting additional budget for this program, and will track and report costs that are directly related to this offering. OBF_AP will leverage existing OBF infrastructure to support OBF loan origination and awareness.

²⁵ http://www.lgc.org/wordpress/docs/events/seec/seec_webinar15-2013-14%20EEDecision.pdf

The offering will result in incremental costs to customers for complying with the Program Framework. It will be important to evaluate these costs relative to the savings in customer-acquisition costs and project delivery (due to the contractor-driven timing), as a standardized investment framework should allow for more investments by customers.

O&M and M&V are estimated to comprise 5% of total project costs to ensure that projects remain cost effective and attractive to customers. Technology firms are developing automated project-monitoring solutions for a fraction of these costs that could be explored for future use. A key priority for OBF_AP will be to provide more useful project and energy savings data to customers at a cost that is appropriate for the size of a project. These costs will be monitored by PG&E and included in the evaluation.

Appendix A – Program Logic Model



Appendix B – Program Operations Information

Table B-1

| Key Terms and Definitions: | |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Framework | <p>The Program Framework will document OBF_AP participation requirements for participating contractors and Service Providers. The Program Framework will include the project specifications, required O&M, required project M&V, required documentation to be submitted, and guidelines for the project certification process.</p> <p>The Program Framework will leverage the ICP Targeted Commercial Protocol. There will also be additional requirements for PG&E's OBF_AP, as well as possible adaptation of the ICP protocols. The adaptation is required because OBF can support loans as small as \$5,000 – which is much smaller than the average user of the ICP protocols as well as ensuring that the projects meet CPUC guidance on HOPPs.</p> <p>PG&E will continue to engage with both the ICP team and market actors for input on the Program Framework.</p> |
| Contractors | <p>Contractors will be able to apply to OBF_AP to serve customers.</p> <p>Contractors will include Project Developer which will be required to be approved for OBF_AP. Initially OBF_AP will be open to Project Developers that have completed the ICP Project Developer Credential Process and had their references and credentials validated by the ICP. http://www.eepformance.org/project-developers.html The required training is free and offered on a regular basis.</p> <p>PG&E and our implementation partners will review early projects and solicit stakeholder input to determine if incremental credentials or requirements are required.</p> |
| Service Providers | <p>Service Providers can include data and control vendors, loan origination vendors, M&V firms, remote-monitoring firms, and project-certification firms. These firms comprise the infrastructure that will offer services to enable more contractors to offer OBF_AP to customers.</p> <p>Service Providers could include a number of firms both that are new start-ups looking for models to deploy their technology and existing firms that are looking for models to directly engage contractors. The ICP has a Software Provider Credential provides is an opportunity to engage Service Providers as well as existing vendors in the EE space. http://www.eepformance.org/software-providers.html</p> |
| Project Certification | <p>Project certification is the process by which a project is approved by an authorized third-party Project Quality Assurance Provider. The project certification will include verification that the project was installed</p> |
| Project Quality Assurance Providers | <p>PG&E will approve Project Quality Assurance Providers to provide QA/QC services in OBF_AP. PG&E will leverage existing certifications, such as ICP-credentialed QA providers. PG&E will set criteria and oversee these providers to support the broad range of potential EE projects possible through OBF_AP.</p> <p>Project Quality Assurance Providers are a key QA/QC function in the pilot design as they allow contractors to offer OBF_AP to customers and to have loans funded. They will have professional requirements around technical and ethical practices for the project certifications that they manage.</p> |

| | |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>Initially OBF_AP will be open to ICP Credentialed Quality Assurance Providers which have been vetted and trained by the ICP. http://www.eepformance.org/quality-assurance-providers.html</p> <p>The certification is free and offered on a regular basis. PG&E and our implementation partners will review early projects and solicit stakeholder input to determine if incremental credentials or requirements are required.</p> <p>PG&E will closely monitor their performance and ability to participate in OBF_AP.</p> |
| Transactional Advice Consultant | <p>PG&E has engaged a firm that is experienced in working with financial institutions that offer project finance for EE and renewable energy. This consultant will help PG&E evaluate the Program Framework, contractors, Service Providers, project certification, and Project Quality Assurance Providers. The consultant will work with PG&E to evaluate requests for adaptations to the protocols and assist in early Program monitoring. PG&E believes that viewing OBF_AP through the eyes of an EE investor (which is what ratepayers are) will help ensure that the program design gives PG&E sufficient flexibility to engage market actors, while protecting ratepayer funds.</p> |
| Investor Confidence Project (ICP) | <p>The Environmental Defense Fund (EDF) has designed and delivered to market a set of standard protocols for the design, development, and M&V of EE projects through the ICP's credentialing and certification system. One of the major obstacles to the pursuit and completion of EE projects is the perceived unpredictability of energy savings, which undermines the confidence of building owners and funders that projected financial returns will be realized. By addressing threshold market issues of performance risk, ICP's is to create a standard class of investable assets designated as Investor Ready Energy Efficiency™ (IREE) projects to reduce transaction costs and accelerate adoption of EE through more efficient and transparent markets.</p> |
| ICP Protocols | <p>The ICP protocols are a standardized set of industry-driven best practices for project development and measurement comprised of targeted (single measure), standard (whole building, small project), and large (whole building, deep savings) project types, for multifamily and commercial buildings. These protocols represent an assembly of existing standards and practices in a standard system that spans the full lifetime of a project.</p> |
| Investor Ready Energy Efficiency (IREE) | <p>Investor Ready Energy Efficiency™ (IREE) is a certification that creates confidence in projected savings on EE retrofit projects at the time of underwriting. Projects that have been developed by an ICP-credentialed project developer and verified by an independent ICP-credentialed QA provider for compliance with the ICP protocols can then be certified as IREE. The IREE certification signifies to investors, building owners, utilities, and funders that a project utilizes industry best practices, has consistent documentation, and can be underwritten with confidence.</p> |
| Eligible Measures | <p>An energy using appliance, equipment, control system, or practice whose installation or implementation results in reduced energy use (purchased from the distribution utility) while maintaining a comparable or higher level of energy service as perceived by the customer. In all cases energy efficiency measures decrease the amount of energy used to provide a specific service or to accomplish a specific amount of work (e.g., kWh per cubic foot of a refrigerator held at a specific temperature, therms per gallon of hot water at a specific temperature, etc.).</p> |

Table B-2

| | | Existing OBF program Workflow | Proposed OBF Alternative Pathway Workflow |
|----------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Development | Customer and Measure Eligibility Determination | Customer Eligibility: Non-Residential PG&E Customers with approved bill payment history Measures Eligibility: Measures eligible for existing rebate and incentive programs | No change |
| | Project Origination | PG&E account managers, PG&E Program Managers, third-party (3P) program implementers, Trade Professionals and other external contractors | PG&E account managers and approved contractors |
| Approval | Loan Agreement | <ul style="list-style-type: none"> ▪ Based on Deemed/Custom measure eligibility and expected rebate amounts ▪ Proposal review/approval by OBF program, including confirmation call by OBF program to customer before loan agreement execution | <ul style="list-style-type: none"> ▪ Based on standard project savings calculation template ▪ QA/QC conducted by third-party firm ▪ Proposal review by OBF program, including confirmation call by OBF program to customer before loan agreement execution |
| Implementation | Project Installation | Conducted by eligible contractor (as specified by rebate/incentive programs) | Conducted by a contractor eligible for OBF_AP |
| Verification | Post-Installation Review/ Inspection | <ul style="list-style-type: none"> ▪ Post-installation process (Custom)/ Centralized Inspection Process (CIP) (Deemed) ▪ OBF on-hold until review completion/ rebate approval | <ul style="list-style-type: none"> ▪ Certification by third-party firm ▪ Incremental Review/Inspection if required after loan funded |
| | Final Loan Agreement | <ul style="list-style-type: none"> ▪ Created based on confirmed Deemed/ Custom measure eligibility and approved rebate ▪ Proposal review/approval by OBF program | <ul style="list-style-type: none"> ▪ N/A (unless update needed based on inspection results) |
| | Loan Check | Written based on net project cost | Written to include eligible costs associated with project M&V, as well as optional purchase of project performance guarantee |
| Monitoring | Performance Assessment/ M&V | None required | Conducted on annual basis for lifetime of loan, beginning one year after loan execution |

Table B-3: Program Theory Table

| | Program Theory | Potential Indicators and Examples |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 1 | More loans are provided through the Program to customers, which reduces cash-flow constraints for customers and contractors implementing EE projects. | Increase in loan applications |
| 2 | Because the Program replaces project inspections with third-party certification and long-term monitoring, the contractor does not encounter "rebate risks", such as project delays to accommodate project inspections or the possibility the rebate will not be approved. | Increase in contractors participating |
| | | Increase in number of projects per contractor |
| 3 | The Program allows any project that will generate meter-based savings to be enrolled and funded, thereby increasing flexibility and widening the energy savings opportunities available for EE projects. | Greater variation of measures and end-uses affected |
| 4 | Long-term engagement (including tracking of metered data) and O&M plans are required by contractors, which helps ensure that installed projects deliver as predicted, and reduces investment risk for customers. | Increase in number of monitoring plans provided by contractors |
| | | Increase in number of O&M plans provided by contractors |
| 5 | The Program allows metered data reporting and O&M costs to be included in total project costs financed by the OBF loan, which encourages contractors to change business models to include these services. | Program/loan applications include data reporting and O&M costs |
| | | Contractors submit more O&M plans for maintenance and Retrocommissioning (RCx measures) |
| 6 | The Program approves contractors with demonstrated EE experience and that meet other requirements to participate in the program, providing contractors with forum for providing EE loans of this size, and creating publicly-available list of qualified EE contractors. | Approved contractor database created and made available to financial institutions, customers, and other market actors |
| 7 | The Program provides a framework to engage Service Providers and allows their costs to be financed by the OBF loan, which facilitates greater participation of Service Providers. | Increased Service Provider participation |
| | | Increased Service Provider offerings in program |
| 8 | Increased loan offerings allow more projects to participate in the Program. | Increase in participating projects |
| 9 | The replacement of the on-site project inspection requirement with monitoring and third-party certification provides customers and contractors with more control over when a project can be implemented. | Increase in participating customers and contractors |
| | | Increase in number of projects per contractor |
| 10 | Flexibility in project eligibility allows customers and contractors to finance a variety of projects (not just those eligible for a rebate or incentive), resulting in a broader range of projects financed through the Program. | Increase in the types of participating contractors and types of measures installed |
| | | Increase in custom projects, projects with multiple end uses, and total measures funded by loans |
| 11 | Contractors use metered data to demonstrate payback of EE and viability of EE for reducing customer costs. O&M requirements help ensure that projected savings are realized. | Predicted savings better aligns with projected savings |
| | | Database of participating projects and case studies developed to demonstrate success of EE projects |
| 12 | Reporting and O&M costs can be funded through loans and are required by the Program, increasing performance of project and providing examples of successful EE projects. | Increase in loans that include O&M and reporting fees |
| 13 | Contractors adapt business models to include EE loans that can be financed through the program, which will later enable these contractors to leverage EE loans developed by financial institutions. | Approved contractor database created and made available to financial institutions |

| | | |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 | Service Providers with innovative EE support offerings can more easily provide these services to customers and contractors, because their fees can be funded through the Program. | Increase in Service Providers participating in the Program |
| 15 & 16 | The increase in cash flow early in the project process and the greater control of project timing for contractors and customers encourages more new customers and contractors to participate, and increases the number of projects that contractors can deliver. | Increase in participating customers and contractors Increase in average number of projects delivered by contractors |
| 17 | There are an increased number of EE loans for a wider range of participants and project types, because there are far fewer restrictions on the types of projects that can participate. | Increase in number and type of customers and contractors |
| 18 | Successful projects- highlighted through case studies, a database, or other documentation- demonstrates the viability of EE projects to customers and financial institutions. | Database of participating projects and case studies developed to demonstrate success of EE projects |
| 19 | Service Providers increase their participation in the Program, making customers and contractors more aware of the services that they provide to streamline and enhance EE projects. | Increase in Service Providers participating in Program |
| 20 | As demonstrations give customers more confidence in EE projects, more new customers invest in EE projects within the Program, and past participants are encouraged to participate again. | Increase in participating projects |
| 21 | As more contractors and customers participate, and as contractors participate at a higher level, the Program generates more energy savings. | Increased kWh and Therms from Program |
| 22 | Financial institutions see a viable market and begin developing financing products for smaller EE loans. The financial sector develops offerings outside of the Program, and customers are more willing to pursue these market-based EE loans after seeing examples of successful EE projects from the Program. | Increase in financial institutions offering EE loans |
| 23 | The database of Program-approved contractors enables financial institutions to identify and partner with contractors that have EE experience. | Contractors that had participated in the Program begin working with financial institutions to deliver EE projects |
| 24 | Contractors and customers develop partnerships with Service Providers after gaining experience with these market actors through the Program. | Service Providers work with contractors and financial institutions outside of the Program to deliver EE projects |
| 25 & 26 | Increased participation in EE projects, both within the Program and from market-based initiatives (i.e. outside of the Program) generates greater EE within the SMB segment. | More EE projects implemented in SMBs through financing programs, and Program partners report that they are conducting EE projects for SMBs outside of Program |
| 27 | New offerings from the financial sector for EE loans serving SMBs create new partnerships within this sector among customers, financial institutions, contractors, and Service Providers. | Program partners report that they are conducting EE projects for SMBs outside of Program |
| 28 | Deeper penetration of EE projects in existing buildings, and the use of metered data to track energy savings, aligns with State Bill (SB) 350 and Assembly Bill (AB) 802 goals. | Reporting of OBF_AP savings, and benchmarking data |

Table B-4: Barriers and Proposed Solutions

The following table summarizes barriers to implementing PG&E's OBF_AP and proposed solutions. The program logic model and program theory table provide more detail on how Program activities will address barriers, as well as the short, mid, and long-term outcomes of Program activities.

| Barrier | How OBF Alternative Pathway (OBF_AP) Addresses Barrier |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current programs require project inspections, and uncertainty of when inspections will be conducted leads to cash flow timing uncertainty. Requirements for the partner programs providing rebates/ incentives can also delay financing. | Project inspection is eliminated and replaced by third-party certification and long-term monitoring. Because participation is not tied to a rebate/ incentive program, delays related to these programs do not affect the funding of the loan under OBF AP. |
| Contractors do not have a clear motivation for updating their business models to support customers over the lifetime of an OBF loan or for providing O&M plans. Poor equipment performance (due to sub-par installation, inadequate O&M, or other factors) can reduce actual energy savings compared to predicted savings. This represents an investment risk for customers, and reduces customer satisfaction with the loan. | OBF AP requires contractors to provide long-term reporting and O&M plans, and the costs for these services are allowable program costs. Contractors access metered data through PG&E's Share My Data (SMD) functionality and stay engaged with customers over the loan lifetime. By creating an investment model that requires M&V, O&M, and standard project documentation, the OBF AP will ensure better results for participating customers. |
| Customers typically bear the performance risk for EE projects. Performance risk and uncertainty can impact the customer's ability to service their debt and is often cited by potential customers as the reason they choose not to execute EE projects. | The Program Framework will help customers mitigate performance risks and provide customers with a greater level of confidence that the projected savings will materialize. |
| PG&E has over 400,000 small business customers, each with unique facilities and energy needs. California's existing programs serve some customers well, but can overlook individual facility needs or not consider the entire facility. This can result in missed energy savings opportunities. | OBF AP requires a facility-specific energy assessment and allows contractors to fund any EE projects with projected (metered) savings. The OBF AP allows PG&E to serve a broader customer base, focusing on whole-facility reduced energy usage. The removal of the rebate also presents customers with a greater variety of options to achieve more savings. |
| Current programs can have high implementation costs, due to disbursement of rebates and incentives and quality assurance (QA) done by the PAs (or 3P contractors). In addition, the existing OBF program can provide only a limited number of loans, because the partner programs have limited budgets for providing the accompanying rebates/ incentives. These limitations reduce PG&E's ability to increase the number of OBF loans provided, and reduce PAs' ability to meet EE goals in SB 350 for scalable, sustainable models. | OBF_AP leverages the OBF Revolving Loan Fund, in which the loan money "comes back" to the PAs- rather than incentives and rebates, which are one-time payments to participants. Program costs are reduced by: <ol style="list-style-type: none"> 1. Removing incentive costs; 2. Reducing implementation costs, because customers participate in one program instead of two, and by requiring the customer and contractor to fund the QA/QC process. 3. Reduce transaction costs via streamlined Program Framework 4. Reduce costs further as project pool grows and Program benefits from economies of scale OBF AP is a scalable program, since loan funds can be loaned out repeatedly. |
| Existing programs do not leverage Service Providers who can help contractors deliver more savings at lower cost. These market actors can provide loan origination (documentation services), third-party certifications, information technology (IT) monitoring providers, M&V, O&M and other services to meet the needs of customers and/or contractors. | OBF_AP will encourage contractors who are not able to provide comprehensive project development services and meet Program requirements to work with Service Providers who offer contractor support services. Thus, OBF_AP provides an opportunity for Service Providers to add value to the project development process and incorporate their fees into the loan (fees are allowable program costs). Including Service Providers in EE projects benefits customers, contractors, and the EE financing market overall. |
| Financial institutions are unable to identify qualified contractors that can provide the services needed to deploy their projects. Existing contractor business models often do not align with innovative third-party financing models for EE. | Contractors that participate in OBF_AP will need to meet an established set of criteria to ensure their experience and credibility. This due diligence process will ensure that contractors in OBF_AP are viable candidates to work with these financial institutions, especially for larger or integrated projects ineligible for support through OBF. While financial institutions will not be part of OBF_AP, PG&E will perform the same level of diligence that a financial institution would conduct. Therefore, contractors will be |

| | |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>prepared to serve the EE market that utilizes third party financing The requirements of the Program framework will also encourage contractors to change their business models to better align with third-party financiers by requiring that the contractors are engaged over the life of the loan repayment. In the long term, financial institutions will see a viable market for EE loans and develop more financing products for these projects.</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Attachment B:
Evaluation, Measurement, and Verification
Plan for the PG&E On-Bill Financing
Alternative Pathway Program

Prepared by the Pacific Gas and Electric Company

June 10, 2016

Contents

| | | |
|-----|----------------------------------------------------------------------------------------|-------------------------------------|
| 1. | Evaluation, Measurement and Verification (EM&V) Overview | 1 |
| 2. | Quasi-Experimental Approach for Estimating Net Savings | 6 |
| 2.1 | Comparison Group | Error! Bookmark not defined. |
| 2.2 | Net Savings Regression Model | Error! Bookmark not defined. |
| 2.3 | Illustration of Net Savings using Quasi-Experimental Approach | 9 |
| 2.4 | Other Possible Comparisons | 9 |
| 3. | Self-Report Approach to Estimating Net Impacts | 9 |
| 3.1 | Self-Report Estimate of the NTGR | 15 |
| 3.2 | Gross Savings Estimate | 10 |
| 3.3 | Illustration of Net Savings Approach Based on Self-report NTGR and Gross Savings | Error! Bookmark not defined. |
| 4. | Project-Level Measurement and Verification | 15 |
| 4.1 | M&V Requirements and Program Framework | 16 |
| 4.2 | Program Performance Metrics (PPMs) | 18 |
| 5. | Process Evaluation | 18 |
| 5.1 | Research Objectives | 19 |
| 5.2 | Primary Data Collection | 19 |
| 5.3 | Establishing Evaluation Data Requirements | 20 |
| 6. | Major Threats to Internal Validity | 21 |
| 7. | Alternative Methods Considered | 23 |
| 8. | References | 26 |

1. Executive Summary

The following summarizes the proposed Evaluation, Measurement, and Verification (EM&V) plan for the On-Bill Financing Alternative Pathway (OBF_AP). The primary goal of this EM&V framework for the OBF_AP Program is to provide options for estimating net energy and demand savings that are tailored to the characteristics of specific OBF_AP projects. Pacific Gas and Electric Company (PG&E) recommends that this EM&V plan serve as a general framework, for later adaptation and elaboration. We anticipate that the characteristics of projects will vary tremendously with respect to size, measures, and premise characteristics. Because the appropriate EM&V approaches depend somewhat on the type of measures and projects installed, PG&E proposes to modify this document to create a more detailed EM&V plan (in coordination with the Energy Division – ED) once the program has launched. While PG&E can provide educated predictions on the types of projects and measures that customers will install based on projects conducted through the main (existing) OBF program, and based on PG&E’s conversations with market actors (such as contractors), the actual composition of projects will not be known until customers begin enrolling.

This EM&V Plan follows the guidance of AB802 for estimating savings based on meter-based approaches – i.e., based on actual energy savings captured in participant’s energy usage data. Where possible, PG&E proposes that the evaluator estimates savings using weather-normalized billing analysis, with comparison groups to control for changes in energy use that are not related to the OBF_AP funded project. The use of meter-based approaches will be possible because:

1. PG&E anticipates that the vast majority of OBF_AP projects should use an existing conditions baseline (e.g., early retirement projects¹, controls or other energy-add on measures, retro-commissioning or other optimization projects, or shell improvements). While the application processing time will be shorter than the main (existing) OBF Program, it will still be too long to allow most customers to replace burned out equipment through OBF_AP. In addition, PG&E has designed the program to discourage replace-on-burn out (ROB) projects, as discussed in section 3.
2. Based on historical data from the main OBF program, projects (on average) will save at least 10% of a facility’s energy use, making energy savings detectable.

For these projects where existing conditions should be the baseline, PG&E’s framework proposes triangulating net energy and demand savings using two methods. Using multiple methods whenever possible increases the reliability of our estimates and it also hedges the risk that one of the methods will not be feasible in some cases or produce implausible results. When these different methods produce savings estimates that are inconsistent with one another, a rules-based approach will be used to resolve these inconsistencies. The net savings approaches are:

- A. Quasi-Experimental Approach using a non-equivalent comparison group: Savings from participants are determined by subtracting pre-project energy use from post-project energy use (after normalizing for differences in weather). This energy savings is then normalized by the change in energy use with pre- vs. post energy consumption from a comparison group, comprised of non-participating customers that are similar in size and business type. These customers may

¹ Savings for early retirement projects will need to be adjusted to account for a dual baseline, as described later in Section 5.3.

have installed energy savings projects during the evaluation timeframe, so the “difference of differences” yields net savings.

- B. Gross savings from regression analysis, adjusted to net savings using customer surveys: Gross savings are calculated using weather-normalized pre vs. post billing data from participants, and these energy savings are then adjusted by pre vs. post energy use changes during the same time frame of future participants. Future participants are likely to have not conducted energy savings projects during the evaluation time frame², so the “difference of differences” yields gross savings. These gross savings estimates will then be adjusted to net savings using a participant survey that asks questions regarding program influence and the participant’s actions in the absence in the program – i.e., the self-reported net-to-gross ratio (NTGR) survey method³.

For a minority of projects (e.g., new additions and projects for replacement of failed equipment) for which the efficiency codes or industry standard practice baselines apply, PG&E proposes that the evaluators use engineering approaches⁴ to estimate *gross* savings for all individual measures. These *gross* savings estimates will then be adjusted to net savings using the participant survey described above (under method B). The evaluator may also need to use engineering approaches to estimate savings from certain groups of participants if power analysis indicates that regression analysis is not feasible.

All of the methods that PG&E proposes are consistent with the *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals* (California Protocols) and the Department of Energy’s *Uniform Methods Project* (UMP).

PG&E will report claimed savings to meet the requirements in the California Protocols. In addition, PG&E proposes to provide program performance metrics (PPMs) that include the number of participating contractors and service providers, and the average energy savings as a fraction of total facility energy use.

2. Evaluation, Measurement and Verification (EM&V) Overview

This EM&V plan for the OBF_AP leverages established EM&V methods to evaluate a novel program. PG&E has developed this plan based on data from projects that have participated in the main (existing) OBF program, and based on conversations with market actors that are interested in participating in OBF_AP. However, because this program encourages a variety of customers and projects to participate, and was designed to be flexible to reach stranded potential and attract hard-to-reach customers, there is some uncertainty on the types of projects that will be implemented and the relative proportion of these project types. Because the feasibility of certain EM&V approaches depend somewhat on project type, PG&E recommends that this EM&V plan serve as a general framework; PG&E will continue to work with the ED to develop a detailed EM&V plan based on the types of customers who participate in OBF_AP and the measures and projects that they implement.

AB802 provides for the simple estimation of savings based on the difference in normalized annual consumption from the pre to the post period. For this High Opportunity Program and Projects (HOPPs)

² The hypothesis that future participants did not install energy savings projects during the evaluation timeframe will be corroborated through a question on the program application form.

³ The survey will be based on the *Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers* (Nonresidential Net-To-Gross Ratio Working Group, 2008).

⁴ PG&E proposes that the evaluators use the International Performance Measurement & Verification Protocol (IPMVP) Option A.

program, PG&E plans to *claim estimated net energy savings*.⁵ Estimated net energy savings results in the best estimate of the *incremental* benefit of the pilot and is used in benefit/cost calculations such as the Total Resource Cost (TRC) Test. Moreover, estimated net energy savings is the preferred basis for assessing whether program administrators have met their energy savings goals which are a key input in the calculation of utility earnings for the administration of energy efficiency programs.

OBF_AP differs significantly from the main (traditional) OBF offering in that it does not require non-residential customers to participate concurrently in another PG&E incentive/rebate program. In addition, because many of the OBF_AP program strategies are novel, and because PG&E has not claimed savings under the main (existing) OBF program, there is no precedent for an evaluation framework for estimating savings.⁶ Thus, one of the goals of the evaluation for OBF_AP will be to provide an opportunity to refine and test evaluation methods for this type of program design during the initial pilot stage, to ensure that a rigorous methodology is in place if and when the program is expanded.

The primary goal for this evaluation is to estimate the net energy and demand impacts of OBF_AP, aggregated across all OBF_AP participants. **PG&E proposes to use two methods to calculate net savings:**

- A. A quasi-experimental design that uses the non-equivalent comparison group design to develop regression analysis using billing data. (In the section, Alternative Methods Considered, we describe why we selected this evaluation design rather than a randomized control treatment [RCT] or random encouragement design [RED].) PG&E proposes to use this quasi-experimental method to estimate net savings from projects that should be compared to an existing conditions baseline, which should comprise the bulk of projects.
- B. A self-report NTGR (collected on a quarterly basis for a sample of participants) that is multiplied by an estimate of gross savings that will be based on either
 1. Regression analysis using billing data, or
 2. Engineering analysis.

For those projects for which the *existing condition is appropriate*, two approaches (Approach A and Approach B.1) will be used. The primary reason for estimating net savings using two approaches (where possible) is to triangulate⁷ the estimate of net savings. If both approaches appear to provide credible savings estimates, the evaluator should develop a rule-based method for combining results, which will depend on factors such as the estimated reliability of each approach.⁸

⁵ Net savings are defined as “The total change in load that is attributable to the utility DSM program. This change in load may include, implicitly or explicitly, the effects of free-drivers, free-riders, state or federal energy efficiency standards, changes in the level of energy service and natural change effects” (*California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. The TecMarket Works Team, 2006, pp. 233-234).

⁶ PG&E’s research to identify impact evaluations for on-bill financing programs run outside of California was not successful.

⁷ Triangulation is a powerful technique that facilitates validation of data through cross verification from two or more sources. In particular, it refers to the application and combination of several research methods in the study of the same phenomenon. Triangulation as a means to verify estimates derived from another method is supported by the *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals* (The TecMarket Works Team, 2006, p. 101).

⁸ As a recent example, in the 2013-2014 California Upstream and Residential Lighting Impact Evaluation, DNV-GL (2016) used triangulation to estimate NTGR, and combined results from two approaches by applying a 70% weight to one approach (modeled results) and a 30% weight to the second approach (results from supplier interviews). The OBF_AP evaluator could use a similar method if they believe that one approach proposed here is more reliable.

The secondary reason for calculating net savings using two approaches is to provide a contingency plan in case one method is determined to be unreliable or inconclusive (e.g., regression models might have insufficient statistical power to detect an effect of the hypothesized magnitude). However, there are a number of additional conditions that, if not met, will make the use of Approach B.2 the preferred choice:

- The expected statistical power⁹ of Approach A or Approach B.1 is too low
- The available data for Approach A will not support rigorous approaches for controlling for self-selection

For those projects for which the *existing condition is not appropriate*, only Approach B.2 will be used.

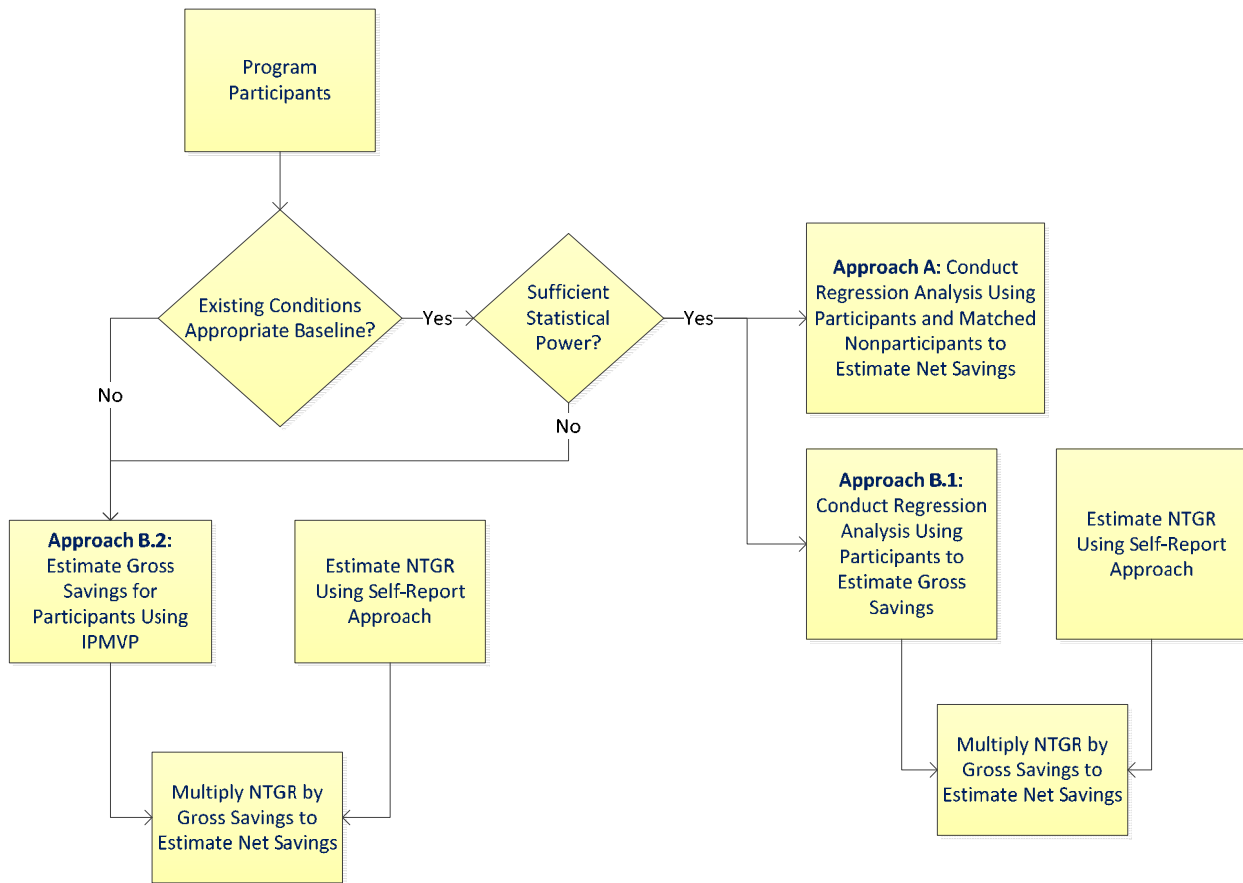
In the sections below, we provide more detail on each of the two proposed approaches. Note that we expect regression analysis using billing data should be possible, because past OBF projects have electricity savings that are estimated to exceed 10% of facility energy use, on average, which is the threshold for program impacts that can be expected to be observed in a billing analysis¹⁰.

Error! Reference source not found. summarizes the framework proposed for estimating net savings for different project types. Section 3 provides guidance on whether the existing conditions baseline is appropriate for certain project types.

⁹ Power is the probability that you will detect an “effect” that is there in the true population that you are studying. Put another way, the power of a statistical test of a null hypothesis is the probability that it will lead to a rejection of the null hypothesis when it is false, i.e., the probability that it will result in the conclusion that the phenomenon exists. The “effect” could be a difference between two means, a correlation between two variables (r), a regression coefficient (b), a chi-squared, etc. See Appendix D (*A Primer for Using Power Analysis to Determine Sample Sizes*) of the California Protocols for further details and references.

¹⁰ Based on project participation data for 2015 and Quarter 1 of 2016, the monthly OBF loan repayment (in \$) divided by the total electricity and gas bill (in \$) was an average of 38%, and was a weighted average of 13%, when weighted by total electricity and gas bill.

Figure 1. Framework for Estimating Net Savings



PG&E’s proposed approach uses meter-based savings estimates where possible (i.e., in Approaches A and B1), which aligns with AB802 guidance. PG&E recognizes that meter-based savings approaches can be challenging, because of the various factors that can affect customers’ energy use besides the energy-savings projects, such as changes in operating hours, or changes in the number of employees or facility production due to economic reasons. PG&E proposes using a matched comparison group (Approach A) to help control for these factors, including those influenced by economic changes. For Approach B.1, future participants will be used to help control for these factors. However, such controls are only implicit in B.1. (the pooled fixed effects time-series cross-sectional regression model). Additional information will be collected from participants regarding major changes (such as changes in hours of use, and installation or removal of major equipment) that would affect energy use, and their approximate dates, as part of the NTG surveys. Such information could be directly incorporated into the second regression model in Approach B.1.

While PG&E proposes a meter-based approach to determine EM&V savings, 1) The project application will include engineering estimates for each measure, 2) The contractor will document baseline data, 3) The Program Framework will require site-specific monitoring, and 4) All customers will authorize ShareMyData to share data with the implementer and for EM&V purposes (as described in Section 6.1). Consequently, the evaluator will be able to estimate the fraction of gross savings for each measure if desired. Similarly, while information on existing equipment will not be needed for the evaluation of most projects under the proposed EM&V approach (since PG&E proposes evaluation based on whole building

metered data), PG&E will require that contractors provide information on the efficiency level and operational status of equipment removed. This information will also be available for the evaluator.

Natural gas measures (or measures that will save both electricity and gas) are permissible for OBF_AP funding. However, PG&E does not anticipate a high volume of natural gas projects in OBF_AP because of the low price of natural gas, which makes it difficult for natural gas projects to meet the program payback time requirements (and often the customers' internal payback goals). If participants install natural gas savings measures, PG&E proposes that the evaluator use Approach B.2. – i.e., engineering analysis to estimate gross savings, and the customer self-reported NTG to adjust to net savings.

In addition, because of the unique qualities of OBF_AP, PG&E proposes to conduct a process evaluation that will provide early and on-going feedback to program administrators so that any necessary mid-course corrections in the design and implementation of the program can be made. PG&E proposes that process evaluation questions for participants be added to the proposed quarterly NTGR interviews; in other words, PG&E proposes to conduct one participant survey on a quarterly basis that captures both NTGR data and feedback to improve program design, and to provide results to the evaluator and to the program administrator.

We conclude this section by noting that during the program period, the EM&V activities and results will not affect the individual customer's project or monitoring, which aligns with the overall OBF_AP program theory and goals.

3. Applicability of Method: Projects that Should Use Existing Conditions Baseline

As shown in

Figure 1, the EM&V approach for estimating net savings will depend on whether the project should use an existing conditions baseline. Determining the appropriate baseline is a challenging issue, and the CPUC is currently working on providing more guidance, such as through the recent publication of recommendations, “Staff White Paper on Energy Efficiency Baselines”¹¹. For the initial EM&V plan, PG&E proposes that the following project types be compared to Existing Conditions. PG&E or the OBF_AP evaluator may need to adjust existing conditions projects based on the final CPUC baseline recommendations¹².

- Shell and building system measures, such as those identified in the Staff White Paper, including duct sealing
- Installed measures which are non-energy using add-ons such as installation of Energy Management Systems (EMS), controls, or variable speed drives.
- Retro-commissioning (RCx), optimization, or behavior measures.
- The replacement of equipment that is typically repaired rather than replaced, such as those identified in the Staff White Paper.
- Accelerated retirement of operable equipment, although these savings in some cases may require adjustment to account for a dual baseline, such as those described in Section 5.3.

Overall, PG&E anticipates that most OBF_AP project types should be compared to existing conditions. This is because:

- To alleviate the concern that customers are using OBF_AP to replace broken equipment, PG&E will require that no more than 25% of the loan be for replacing equipment that is not operating. The project documentation will include information on the removed equipment, including photographs, to document the working status of the equipment.
- The application processing time – while shorter than the main (existing) OBF program – will still be sufficiently long so as to discourage replacement of failed equipment projects that typically have immediate replacement needs.
- The program has also been designed to minimize double counting of savings that would have been claimed through the Codes and Standards programs are minimized. For example, the OBF Loan cap of \$100,000 for Commercial Customers will reduce the number of whole building renovations, which the Navigant AB 802 Technical Analysis identified as the most likely scenario for double counting energy savings.¹³

For the minority of projects that will be replacements of failed equipment, PG&E proposes an engineering approach to ensure that only above code savings will be claimed.

4. Approach A: Quasi-Experimental Approach (Non-Equivalent Comparison Group) for Estimating Net Savings

A quasi-experimental method uses a non-equivalent comparison group design to calculate a “difference-of-differences”. The applicability of quasi-experimental design is dependent on the appropriate baseline, which will be based on the project type. For eligible projects, PG&E proposes to match participants to a group of nonparticipants who were eligible to participate in the OBF_AP based on such variables as

¹¹ CPUC, “Staff White Paper on Energy Efficiency Baselines” (“Staff White Paper”, April 27, 2016).

¹² Based on the CPUC Draft, “Administrative Law Judge’s Ruling Requesting Comments Regarding Energy Efficiency Baseline Policy in the Rolling Portfolio Proceeding (R.13-11-005).” April 27, 2016.

¹³ Double counted savings are most likely to happen when Replace on Burnout Measures are upgraded during a whole building renovation.” Navigant, AB802 Technical Analysis, page 40.

business segment (e.g., NAICS code), size (e.g., monthly kWh use), and other key parameters¹⁴, and develop a regression model to estimate net savings.

4.1 Net Energy Savings

To estimate net savings from projects under the quasi-experimental design method, a pooled, fixed-effects, time-series/cross-sectional (panel) regression model that incorporates the treatment and comparison group will be estimated. As described above, the treatment and comparison groups would be matched on key variables such as consumption level, business type, and geography. The evaluator will develop a regression model that uses a comparison group comprised of the eligible population for all project types for which existing conditions should be used as the baseline. Any *observed* differences in the composition of the treatment and comparison groups can be controlled statistically.¹⁵ Equation 1 illustrates one possible specification.

$$ADC_{it} = \alpha_i + \delta_m + \beta_1 Post_t + \beta_2 Treatment_i \cdot Post_t + \beta_3 HDD_{it} + \beta_4 CDD_{it} + \sum \beta_k X_i + \varepsilon_{it} \quad (1)$$

Where:

ADC_{it} = Average daily consumption (kWh or therms) for customer i at time t

α_i = Customer-specific intercept

δ_m = 0/1 Indicator for each time interval m , time series component that track systematic change over time

β_1 = Coefficient for the change in consumption between pre and post periods

β_2 = Coefficient for the change in consumption for the treatment group in the post period compared to the pre period and to the control group. This is the basis for the net savings estimate.

β_3 = Coefficient for Heating Degree Days (HDD)

β_4 = Coefficient for Cooling Degree Days (CDD)

Post = dummy variable for pre (Post=0) and post (Post=1)

Treatment = dummy variable for treatment (Treatment=1) and control (Treatment=0)

HDD_{it} = Sum of heating degree-days (e.g., base 65 degrees Fahrenheit)

CDD_{it} = Sum of cooling degree-days (e.g., base 75 degrees Fahrenheit)

β_k = A vector of k coefficients that reflect the energy change associated with a one unit change in the k^{th} explanatory variable

¹⁴ At a minimum, comparison group customers should be in the same climate as the participant to control for weather effects. If possible, comparison group customers should be in the same zip code, because building conditions and age are often similar within neighborhoods.

¹⁵ Inverse Mills ratios interacted with δ_m will also be explored as a way to control for *unobserved* differences between the treatment and comparison groups.

X_i = A vector of explanatory variables (i.e., covariates), such as changes in square footage, for the i^{th} factor

ε_{it} = Error

To obtain the final estimate of net savings for the OBF_AP, the coefficient β_2 is then multiplied by the total number of OBF_AP participants who are represented in the model. For example, the evaluator would multiply the β_2 calculated using the eligible population by the number of participants for which this is appropriate.

The final specification of this model will depend on which strategies for addressing self-selection are used and the availability of information to provide the covariate terms. We will assess the robustness of the models by performing a variety of diagnostic checks (e.g., measurement error, outliers, heteroscedasticity, and autocorrelation) (Kennedy, 2008; Belsley et al., 1980).

For program-level *EM&V*, PG&E recommends that the regression model be developed with as much energy use data as is available, with a minimum of 12 months of pre- and 12 months of post-implementation data. For project-level *M&V*, the contractor will track the energy use of each participant over the life of the loan, as discussed in Section 4, Project-Level Measurement and Verification.

4.2 Net Demand Savings

To calculate net demand savings, PG&E recommends that the evaluator use the same approach as shown in Equation 1. Specifically, PG&E proposes that the evaluator determine the electric demand impacts of measures using the average kWh reduction over a 9-hour window. The nine-hour window is from 2 p.m. to 5 p.m. over a three-day “heat wave” that is determined for each climate zone. The three-day demand periods for the new weather data were chosen based on these criteria:

- Occurs between June 1st and September 30th,
- Does not include weekend days or holidays (based on 2009),
- Has the highest value for:
 - average temperature over the three-day period,
 - the average temperature from noon to 6 p.m. over the three-day period,
 - the peak temperature over the three-day period.

The regression model will focus on comparing participants and matched non-participants with respect to changes in the average kWh reduction over the 9-hour window.

4.3 Limitations and Alternative Methods Considered

Because Approach A is a non-equivalent comparison group design, there will be a threat to internal validity from self-selection bias. PG&E provides a discussion of this threat and recommendations for addressing this challenge in Section 9, Major Threats to Internal Validity. PG&E also provides a discussion of alternative methods we considered for estimating net savings – and why we rejected them – in Section 10, Alternative Methods Considered. These considered methods include randomized control trials and two different versions of the random encouragement design.

4.4 Other Potential Comparisons

If evaluation resources allow, an additional comparison could be made between pre/post energy use of customers that participated in the main OBF Program versus those that participated in the OBF_AP during the evaluation timeframe. Similar to the estimation methods outlined above, a “difference-of-

differences” approach would be used to calculate incremental savings relative to a matched group of the main OBF participants. This comparison will be used to assess whether the OBF_AP, on average, produces savings greater than the main OBF program, which includes incentives or rebates.¹⁶ Outside of the regression framework, the OBF_AP will be compared to the main OBF program (as well as other incentive or rebate programs) on factors including average energy savings per site, number and types of measures installed, program costs, customer costs, levelized costs (\$/kWh) and benefit-costs calculations such as the Total Resources Cost (TRC) test.

5. Approach B: Self-Report Approach to Estimating Net Impacts

As stated in the Overview, PG&E proposes that two methods be used for estimating net impacts. Approach A is the regression model in which the energy use of participants is compared to the energy use of a matched comparison group, or using engineering analysis. Here we propose Approach B, in which the gross savings are first estimated either of two ways:

1. For customers for whom the existing baseline is appropriate, use a regression approach that uses future participants as a comparison group to control for exogenous changes.
2. For customers for which code baselines (or a mix of code baselines and existing baselines) are appropriate, use an engineering approach (IPMVP)

The resulting estimates of gross savings are then multiplied using a self-report net-to-gross ratio (NTGR) to yield an estimate of the net first-year savings. The self-report NTGR is discussed first, followed by a discussion of the gross savings comparison group and gross savings regression model.

5.1 Approach B.1: Regression Estimation of Gross Savings

For those customers for whom the existing baseline is appropriate, PG&E proposes to estimate gross savings using regression models based on weather-normalized changes in energy use from the pre to the post period. Additional exogenous changes will be controlled for using future participants in the OBF_AP as a comparison group. In addition, PG&E proposes to include future participants in the main OBF program, because we anticipate that the OBF_AP will attract many of the same types of customers as the main OBF program, and allowing future participants in the main OBF program to serve as controls for the OBF_AP program will help ensure that there is a large and diverse pool of customers for the comparison group.

These future participants are expected to resemble current participants since they also self-selected into one of the two OBF pathways, only at a later date, and they are less likely to have install energy-using equipment during the pre-intervention period of evaluation timeframe (i.e., before their participation). There are three assumptions that must be met in order to justify the use of future participants for estimating gross savings that are outlined below.

1. First, it is assumed that these future participants did not participate in any PG&E energy efficiency program, did not adopt any major energy-savings behaviors, or install any major energy efficient measures outside of a PG&E program during the evaluation timeframe. PG&E

¹⁶ A representative from the Office of Ratepayer Advocates (ORA) recommended this comparison of the OBF_AP with the incentive energy efficiency program(s) at the public hearing on HOPPs, and PG&E agrees it would be a valuable comparison.

proposes to verify this assumption by adding questions to the applications for both OBF pathways – both main OBF and OBF_AP. These questions will ask OBF program applicants if they had installed energy-saving equipment or conducted other significant energy-savings activities (e.g., retro-commissioning, installation of controls) in the prior 2-3 years. If they respond that they had not, they are eligible for inclusion in the comparison group, because any change in their energy use is assumed to be a function of exogenous factors, such as changes in the larger economy.¹⁷

2. The key design elements and implementation of the OBF_AP and the main OBF program must remain stable.
3. The types of customers who choose to join the OBF_AP and main OBF must remain stable over the evaluation timeframe.

5.1.1 Gross Energy Savings

If these three assumptions are met, PG&E proposes the following approach to estimate gross energy savings, using data from OBF_AP participants and future OBF participants in the comparison group. PG&E and participating contractors will collect 12 months of pre-implementation and 12 months of post-implementation energy use data for all current OBF_AP and future OBF participants. This meter data will be used for evaluation purposes, and also will be used by the program to ensure that the customer’s bill is projected to be neutral – i.e., that projected energy savings will be sufficient to cover the monthly payments for the financing (so that the total monthly charge on utility bills is less than or equal to the pre-implementation amount). Under the Program Framework, customers will give authorization to share utility bill energy data with the Contractor and their Service Providers leveraging the PG&E Share My Data functionality. PG&E will make these data available for evaluation purposes. Additionally, the Project Framework will include requirements regarding Asset and Operational Data, which will be available for the evaluation.

Gross savings will be estimated in a manner consistent with AB802 and IPMVP¹⁸ Option C which allow for an existing conditions baseline in estimating gross savings. The method recommended is based on the two-stage approach described in Chapter 8 of the Uniform Methods Project¹⁹.

Stage 1. Individual Premise Analysis

A third-party selected by PG&E and approved by Commission Staff will perform the following activities:

1. Fit a premise-specific degree-day regression model (as described in Step 1, below) separately for the pre- and post-periods.
2. For each period (pre- and post-) use the coefficients of the fitted model with normal-year degree days to calculate the normalized annual consumption (NAC) (defined below) for that period.
3. Calculate the difference between the pre- and post-period NAC for the premise (i.e., ΔNAC).

Step 1. Fit the Basic Stage 1 Model

$$E_m = \mu + \beta_H H_m + \beta_C C_m + \varepsilon_m \quad (2)$$

¹⁷ “Near participants” in the main OBF and OBF_AP that complete an application but ultimately do not participate in the OBF program could be used for the comparison group as well.

¹⁸ International Performance Measurement and Verification Protocol (IPMVP) available from the Efficiency Valuation Organization at <http://evo-world.org/en/>

¹⁹ Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures (<http://energy.gov/eere/about-us/ump-protocols>)

| | |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $E_m =$ | Average consumption per day during interval m |
| $H_m =$ | Specifically, $H_m(\tau H)$, average daily heating degree days at the base temperature(τH) during meter read interval m, based on daily average temperatures on those dates |
| $C_m =$ | Specifically, $C_m(\tau C)$, average daily cooling degree days at the base temperature(τC) during meter read interval m, based on daily average temperatures on those dates |
| $\mu =$ | Average daily baseload consumption estimated by the regression |
| $\beta_H, \beta_C =$ | Heating and cooling coefficients estimated by the regression |
| $\varepsilon_m =$ | Regression residual. |

Step 2. Apply the Stage 1 Model

To calculate NAC for the pre- and post-installation periods for each premise and timeframe, we combine the estimated coefficients μ , β_H , and β_C with the annual normal-year or typical meteorological year (TMY) degree days H_0 and C_0 calculated at the site-specific degree-day base(s), τH and τC . Thus, for each pre- and post-period at each individual site, we use the coefficients from Equation 7 for that site and period to calculate the weather-normalized annual consumption (NAC) (see Equation 3). This example puts all premises and periods on an annual and normalized basis.

$$NAC = \mu * 365 + \beta_H H_0 + \beta_C C_0 \quad (3)$$

The same approach can be used to put all premises on a monthly basis and/or on an actual weather basis.

Step 3. Calculate the Change in NAC

For each site, the difference between pre- and post-program NAC values (ΔNAC) represents the change in consumption under normal weather conditions. For *future participants* who are used as a comparison group to current participants, these same three steps are followed.

Stage 2. Cross-Sectional Analysis

Next, the cross-sectional model in Equation 4 is estimated incorporating both current and future participants.

$$\Delta NAC_j = \beta + \gamma I_j + \varepsilon_j \quad (4)$$

$I_j =$ 0/1 dummy variable, equal to 1 if customer j is a (current-year) participant, 0 if customer j is in the comparison group composed of future year participants.

$\beta, \gamma =$ Coefficients determined by the regression model

$\varepsilon_j =$ Regression residual.

From the fitted equation:

- The estimated coefficient γ is the estimate of mean savings.
- The estimated coefficient β is the estimate of mean change or trend unrelated to the program.

The coefficient β corresponds to the average change among the comparison group, while the coefficient γ is the difference between the comparison group change and the participant group change. That is, this regression is essentially a difference-of-differences formulation and can be accomplished outside of a regression framework as a difference of the two mean differences. More complex models that include other available premise characteristics can be included that can improve the extrapolation of the billing analysis to the full population. Total OBF_AP first-year annual savings are calculated by multiplying the difference between the comparison group change and the participant group change by the number of participating customers.

5.1.2 Gross Demand Savings

The two-stage approach used for estimating gross energy savings will also be used to estimate the gross demand savings. PG&E proposes that the evaluator determine the electric demand impacts of measures using the average kWh reduction over a 9-hour window. The nine-hour window is from 2 p.m. to 5 p.m. over a three-day “heat wave” that is determined for each climate zone. The three-day demand periods for the new weather data were chosen based on these criteria:

- Occurs between June 1st and September 30th,
- Does not include weekend days or holidays (based on 2009),
- Has the highest value for:
 - average temperature over the three-day period,
 - the average temperature from noon to 6 p.m. over the three-day period,
 - the peak temperature over the three-day period.

In each climate zone for each current and future participant, a pre and post participant regression model will be estimated over the 9-hour window incorporating cooling degree hours (CDHs) into the model. For each group, the weather-normalized difference between pre-period and the post-period will be calculated. Finally, a cross-sectional model will be estimated incorporating both current and future participants to estimate the average gross kWh reduction over the 9-hour period.

If any of the above three assumptions needed to justify the use of future participants for estimating gross savings are false, a pooled fixed-effects approach will be used, which is discussed in Chapter 8 of the Uniform Methods Project (UMP). This approach addresses exogenous change without the inclusion of a separate comparison group. In this model, participants who received a measure installation during a certain time interval serve as a steady-state comparison for other participants in each other time interval. Almost all observations include premises that are still in their pre-installation period *and* premises that are in their post-installation period, so the effect of post- versus pre- is estimated to control for exogenous trends.

The basic structures of the site-level and the second-stage consumption data model are effectively combined in the pooled approach. All monthly participant consumption data (both pre- and post-installation) are included in a single model. This model has:

- A site-level fixed-effect component (analogous to the site-level baseload component) and average overall heating and cooling components
- A post-installation indicator variable capturing the change in the post-installation period, i.e., the gross savings from the installed equipment.

The recommended pooled model is illustrated in Equation 5.

$$ADC_{it} = \alpha_i + \delta_m + \beta_1 Post_t + \beta_2 HDD_{it} + \beta_3 CDD_{it} + \sum \beta_k X_i + \varepsilon_{it} \quad (5)$$

Where:

ADC_{it} = Average daily consumption (kWh or therms) for household i at time t

α_i = Household-specific intercept

δ_m = 0/1 Indicator for each time interval m , time series component that track systematic change over time

β_1 = Coefficient for the change in consumption between pre and post periods

β_2 = Coefficient for HDD

β_3 = Coefficient for CDD

Post = dummy variable for pre (Post=0) and post (Post=1) participation in OBF_AP

HDD_{it} = Sum of heating degree-days (e.g., base 65 degrees Fahrenheit)

CDD_{it} = Sum of cooling degree-days (e.g., base 75 degrees Fahrenheit)

β_k = A vector of k coefficients that reflect the energy change associated with a one unit change in the k^{th} explanatory variable

X_i = A vector of explanatory variables (i.e., covariates), such as changes in occupancy or square footage, for the i^{th} factor

ε_{it} = Error

An additional set of variables could be included to explain variation in consumption over time for reasons other than the central installation variable. That is, these variables will attempt to capture the effects of economic, historical, social, and weather conditions, that could not be explicitly modeled. Examples of variables that could be included are:

- Real per capita personal income provided quarterly by MSA
- California unemployment rate
- California consumer price index
- Aggregate residential consumption: It is reasoned that electricity consumption over all PG&E residential premises would vary with economic and other historical conditions. During recessions, consumption will decrease, and when the economy is good, electricity use will increase. Aggregate monthly consumption for all members of the eligible OBF_AP population will be calculated and incorporated into the regression model.
- Monthly dummies

For gross peak demand savings estimates, the pooled fixed-effects model can be used to estimate the electric demand impacts of measures using the average kWh reduction over the same 9-hour window described earlier.

5.2 Approach B.2: Engineering Estimation of Gross Savings

As described in Section 3, PG&E has designed the program to increase the number of projects for which an existing conditions baseline is appropriate. But for some project types, an existing conditions baseline may not be appropriate and an engineering approach (rather than regression analysis) should be used. Such project types include the addition of new equipment, the replacement of failed equipment, or a mix of measures requiring an existing conditions baseline or a code baseline. In addition, regression analysis may not be feasible for certain groups of customers (as determined by power analysis to test for sufficient statistical power) and engineering analysis should be used.

For projects where engineering analysis is needed, PG&E proposes that the evaluator use a disproportionate, stratified random sample of such projects, so that participants with the largest estimated savings are sampled at a higher rate to achieve greater statistical precision with fewer project reviews. Projects will be ranked into multiple strata in terms of savings, with more projects sampled from the larger strata. Savings estimates for projects in the lowest savings strata will be sampled at a lower rate or passed through.

PG&E proposes that the evaluator then follow IPMVP Option A for estimating both energy and peak demand savings from the sampled projects. IPMVP Option A calls for estimating savings only from the system(s) affected by the measure(s) installed through the project, through engineering calculations or on-site metering. The evaluator should compare energy and demand savings from the installed measure(s) to the energy used if code-compliant equipment had been installed. If code does not govern the equipment installed, the evaluator should use industry standard practice as a baseline.

5.3 Dual Baseline

For project types where the participant replaced equipment before the end of its useful life – i.e., for early retirement projects where existing conditions should be assumed for the initial baseline, but not for the entire lifetime of the project, the evaluators will need to develop methods to adjust for dual baselines. However, PG&E recognizes that it can be challenging to cost-effectively adjust gross lifecycle savings for early retirement. One possibility is to adapt the approach developed for the New York State Department of Public Service by Ridge, Jacobs, Tress and Hall (2011). Their approach is one that is based on the DEER database and could be easily implemented by the ex post evaluators.

5.4 Load Shapes

In the OBF_AP Program, a wide variety of possible measures could be installed in any give site covering the full array of end uses. For the purpose of calculating the Total Resource Cost (TRC) test, we propose calculating a program-level load shape and EUL based on the collection of measures installed in the program. The load shape and EUL will be based on the DEER load shapes and EULs for each measure installed through the program weighted by estimated ex post gross savings for each measure. More details of this approach will be provided as the types of the measures installed through OBF_AP become clearer.

5.5 Self-Report Estimate of the NTGR

As an overview for the NTGR self-report, PG&E proposes to start with recognized methods and instruments, but will:

- Customize these methods and instruments to meet the needs of the OBF_AP, including the specific project types and delivery method of this program,
- Administer the participant NTGR survey on a quarterly basis, so that the decision making is recent in the respondent's memory, and
- Include in the participant survey both questions regarding NTGR and process evaluation type questions, so that program feedback can be collected early and regularly to inform mid-course corrections.

PG&E proposes that the Self-Report Approach (SRA) method for estimating the NTGR follow the *Guidelines for Estimating Net-To-Gross Ratios Using the Self Report Approach* (Ridge, Keating and Megdal, 1997), and that the methods and NTGR instrument use as a starting point the *Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers* (Nonresidential Net-To-Gross Ratio Working Group, 2008). A disproportionate, stratified random sample will be used so that participants with the largest estimated savings have a higher representation in the sample than participants with low estimated savings.

However, the NTGR instrument will need to be customized to address the unique characteristics of OBF_AP. For example, the instrument may need to include more questions regarding timing for projects that appear to be early retirement, and questions to ascertain what the participant would have done (if anything) in the absence of the program (including information from the vendor).

PG&E proposes that the survey instrument:

- Include process-evaluation type questions for program improvement. For example, the survey should collect feedback on contractor performance and satisfaction with the contractor, overall program satisfaction, barriers that the program helped the participant address, and whether there were additional barriers that potentially could be addressed through program design improvements;
- Be administered by an evaluation firm under contract to PG&E and approved by Commission Staff, because it will include process-evaluation type questions
- Include NTGR questions;
- Be conducted on a quarterly basis to capture decision making information as soon as possible after the customer made the decision to implement the project – when the decision maker is more likely to remain in their position at the participating company and their decision-making process is fresh on their mind

For these surveys, PG&E has targeted the 90% level of confidence with a relative precision of 10% (i.e., 90/10).

PG&E provides example participant survey questions – including those for the process evaluation and to capture NTGR data – in Section 6. We anticipate that these questions will be modified depending on the precise characteristics of the program at launch.

6. Project-Level Measurement and Verification

Project-level Measurement and Verification (M&V) and monitoring will be conducted by participating contractors, as well as directly by PG&E, as described in this section.

6.1 M&V Requirements and Program Framework

Participating contractors will generate projected energy savings based on metered data and engineering calculations, and submit them in the Project Documentation that is provided to both the customer and PG&E. These projected energy savings are used to generate the OBF loan.

Participating contractors will then be required to provide project monitoring to the customer, and to PG&E, over the life of the loan. The Program Framework will set criteria for monitoring, including requirements to ensure that it is based on metered energy use, and that it provides the customer with information to better understand how their energy efficiency project performed. The Program Framework will leverage the Investor Confidence Project Energy Performance Protocol, but will provide different monitoring requirements based on project size, to align with the economics of implementation. For example, monitoring requirements for a \$20,000 project will be different than a \$2M project. PG&E will provide results of the project monitoring for use in the program evaluation.

As part of the program, PG&E will provide aggregate program data to the Data Manager (vendor to the California Alternative Energy and Advanced Transportation Financing Authority - CAEATFA as the California Hub for Energy Efficiency Financing). The Project Framework will include requirements regarding Asset and Operational Data. All of these data will be available for the evaluation.

Additionally, the Program Framework will require that contractors provide the customer with an Operations, Maintenance and Monitoring (OM&M) plan and a Measurement and Verification (M&V) plan. The OM&M plan will help to ensure that the customer gets the maximized performance over the life of the assets installed. The M&V plan will create an agreement between the customer and contractor regarding the expected outcomes for the project, and how to identify and evaluate variances between actual and expected energy performance. Again, these requirements will be reflective of the project size, but PG&E believes that including these requirements in the Program Framework will result in better projects for customers that result in better savings results. Also, the enhanced offering should drive customer adoption, by addressing the customer's concern that the savings will not materialize (since they still have to repay the loan) or that the contractors will not be providing support over the life of the loan. Finally, enhancing their business model in this way will allow the contractors to grow their business and partner with third-party financial institutions, especially those that offer "efficiency as a service" financing.

In addition to the monitoring provided by the contractor, PG&E will monitor post-implementation consumption data for each participating customer (using information provided by the Contractors) to determine if the observed ex post savings match ex ante estimates. If aggregated savings are less than expected, PG&E can explore possible causes and take corrective action. For example, if a particular contractor is not installing quality projects or is consistently overestimating energy savings, PG&E could remove them from the program. Early monitoring may also identify issues in the calculations used by contractors to predict energy savings.

6.2 Program Performance Metrics (PPMs)

Table 1 shows metrics that will be monitored on a regular basis.

Table 1. Proposed Program Performance Metrics for the Alternative OBF Program

| Goal | Metric | Target |
|---------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------|
| Develop Scalable Business Models | Participating contractors | 10 in year 1 of operation |
| | Participating service providers | 2 service providers |
| Remove Customer Barriers to EE Investments | Number of loans | 10% of OBF loans during year 1 of operation, ramping up to 25% in subsequent years |
| Achieve substantial energy savings at the project level | Median energy savings as a fraction of total energy use | Savings comprise at least 10% of energy use (on average) |

7. Process Evaluation and Net-to-Gross Survey

PG&E proposes to conduct a process evaluation of the 2016-2019 OBF_AP using a third-party evaluation firm of its choosing upon approval by Commission Staff. The overall goals of the process evaluation are to assess the customer experience, their level of satisfaction, and ideas for improving program design and delivery, as well as to identify opportunities for expanding the reach of the OBF_AP. Because this is a new program, it will be important to gather feedback from participants early in the implementation.

In addition, PG&E proposes to use the survey as an opportunity to collect participant self-report information to estimate the NTGR. As part of program design, PG&E will work with Commission Staff to develop a NTG battery that is customized to the OBF_AP and acceptable to Commission Staff. PG&E proposes to administer this survey and that the Commission use the data to estimate the ex post NTGR.

PG&E proposes that the survey include topics that may include, but not be limited to, the following:

- a. Why the customer participated in the program
- b. Barriers that the customers may have faced that the program helped address
- c. What the customer had planned on doing (if anything) prior to learning about the program or being approached by the contractor. Specific questions may vary depending on the project type.

As examples:

- i. For equipment installations: What level of efficiency the customer would have selected for installed equipment in the absence of the program, and when the equipment would have been installed
- ii. For maintenance and RCx projects: What maintenance (both done in-house and by service contractors) and RCx would have been done in the absence of the program

- iii. For early retirement projects: What type of equipment the customer would have installed (if any), the timing of those replacements, and the scope of the project in the absence of the program (e.g., efficiency levels, number of equipment replaced, whether controls would have been included)
- d. Questions regarding changes that would have affected energy use, including:
 - a. Have the operating hours of the facility changed significantly since the project was installed?
 - b. Has the facility removed, installed, or replaced large equipment since the project was installed?
- e. Feedback on the overall program, including feedback on the contractor's performance, the application process, and overall satisfaction with the program
- f. Whether the participant would consider participating again and/or recommend the program to another business owner

The goal of this survey will be to collect on-going feedback to the program and for the evaluation. Questions based on topics shown in survey section (c) will be used to calculate NTGR, which can be multiplied by the gross savings to yield an estimate of net savings. Responses to questions in survey section (c) can also guide the evaluators in identifying the appropriate mix of nonparticipating customers for the comparison group, for developing the regression model to calculate net savings.

7.1 Research Objectives

The process evaluation will collect data based on the program database and from the survey results to provide insights into the following draft research topics:

- Identify the types of measures or projects installed (categorized by project type and energy savings), the types of customers participating in the program (categorized by market sector and size), and compare these to program goals
- Identify participation of market actors and potential to increase participation, including types of contractors and financial institutions that are, and are not, participating; and reasons for participation and non-participation
- Document current program processes, and identify areas of improvement for increasing the efficiency of program processes

Based on these results, the process evaluation will:

- Identify strengths and weaknesses of the program and provide specific recommendations for improving program design and implementation
- Identify program achievements
- Compare strengths, weaknesses, market segments served, and cost effectiveness for the OBF_AP program to the main (traditional) OBF program
- Identify recommendations for program improvement, primarily for the OBF_AP program, but also for the main (traditional) OBF program.

7.2 Primary Data Collection

PG&E proposes to conduct interviews or surveys with the following stakeholders to explore these research objectives:

- Participating and nonparticipating contractors
- Participating customers (based on questions in the quarterly survey)
- Interested customers who elected not to participate in the program
- Participating and nonparticipating energy service providers

- OBF staff

In addition, the process evaluator would review program databases, project files, and other documentation to develop analyses regarding energy savings, costs, and program participation.

PG&E will use the results of the process evaluation, as well as that of the early M&V evaluation, to compare key indicators (e.g., kWh savings per project, kWh savings / total site energy use, number of participating contractors) between the OBF_AP and the main OBF program to identify possible improvements to the OBF_AP and/or the main OBF program. In addition, PG&E will identify if the OBF_AP appeals to a specific segment of the market – in terms of customers, contractors, or both – compared to other PG&E offerings, which will inform future marketing strategies.

8. Establishing Evaluation Data Requirements

PG&E proposes to collect the following data for each participant for both the impact and process evaluations its OBF_AP. Participating contractors will collect much of this information through the documentation required in the Program Framework for projects participating in the OBF_AP:

- Unique identifier, such as unique site ID, customer ID, account number, or premise ID
- Consumption amounts, corresponding read dates, and read type (actual vs. estimated) for pre and post project implementation
- Additional variables required to merge consumption information with program tracking data
- North American Industry Classification System (NAICS) code or business type
- Total project cost, if available
- Amount of financing borrowed for the project
- Project contractor
- Energy efficiency measures installed
- Expected energy savings
- Project Location information (zip code) or other link to weather stations
- Documentation of installation condition
- Other premise characteristics available in the utility customer information system, including building type, rate class and heating or water heating fuel indicators
- Weather data (some combination of CZ2010 and PG&E-maintained weather stations)
- If available, if PV was installed during the EM&V timeframe, size (output) of PV array, and what date the solar PV was installed

Some of these data will not be direct inputs in the regression model for estimating gross savings described below – e.g., project cost and contractor. However, these parameters could be useful for interpreting results and identifying trends, such as average savings by project type. In addition, these data will have already been collected for project documentation.

In addition to these EM&V data requirements, PG&E will provide evaluators with results of project-level measurement and verification (M&V).

9. Major Threats to Internal Validity

Because we propose that the quasi-experimental design (the non-equivalent comparison group design) as one method for estimating net savings, we discuss limitations of this approach and possible strategies for reducing the impact of these biases on the results.

In a non-equivalent comparison group design, the main threat to internal validity²⁰ is self-selection bias. Self-selection bias occurs when groups exposed to treatments non-randomly may differ in ways that mimic what the treatment might achieve (Shadish, Cook and Leviton, 1991). There is considerable evidence that nonrandom assignment often (*but not always*) yields different results than random assignment does (Chalmers et al., 1983; Colditz, Miller and Mosteller, 1988; Lipsey and Wilson, 1993; Mosteller, Gilbert and McPeck, 1980; Wortman, 1992), more so when participants self-select into conditions than when others make the decision (Heinsman and Shadish, 1996; Shadish, Matt, Navarro and Phillips, 2000; Shadish and Ragsdale, 1996) – so self-selection should be avoided if possible. But if such a situation cannot be avoided for reasons such as those given in Section 3, econometricians and statisticians over the years have devoted an enormous amount of effort to developing strategies to mitigate self-selection.

We digress here to note that self-selection has been given considerable attention over the last 30 years in the evaluation of energy efficiency programs in California due to the fact that, with the exception of evaluations of neighbor comparison (“OPower”)-type programs, nearly all the evaluations that relied on billing analysis to estimate net impacts have been based on quasi-experimental designs. Since the early 1980s, most billing analyses aimed at estimating net savings used some form of analysis of covariance (Huitema, 2011) to control for the *observed* differences between the treatment and comparison groups. Efforts to address the biasing effects of *unobserved* differences using inverse Mills ratios began at least as early as the late 1980s. Since then, Train (1993) and Goldberg and Train (1995), using simulated datasets, demonstrated that failing to correct for self-selection can overestimate net savings, but that there are effective strategies to reduce this bias substantially. Finally, the use of quasi-experimental designs has been allowed in both sets of California EM&V protocols (PG&E et al., 1996; The TecMarket Works Team, 2006) as long as evaluators make methodologically-sound efforts to address self-selection.

Below, based on a relatively limited review of the literature, we provide a series of strategies to improve internal validity primarily by addressing self-selection. Before finalizing this evaluation plan, PG&E proposes that a more comprehensive review of the more recent literature regarding strategies for addressing self-selection be conducted.

Use of Internal Controls. Assignment can often be controlled in other ways than by random methods. Nonrandom comparisons to an internal rather than external control can sometimes yield more accurate results (Aiken et al., 1998; Bell et al., 1995; Heinsman and Shadish, 1996; Shadish and Ragsdale, 1996). Internal controls are drawn from the same pool of participants (i.e., from students in the same school or class or from all program applicants). External controls are drawn from patently different pools (e.g., patients in different treatment settings) and are presumed to have less in common. Drawing on members of the OBF-AP-eligible population will serve as our internal controls.

Joint Use of a Pretest and a Comparison Group. The joint use of a pretest and a comparison group makes it easier to examine certain threats to validity. Because the groups are nonequivalent by definition, selection bias is presumed to be present. The pretest allows exploration of the possible size and direction

²⁰ Internal validity is the basic minimum without which any experiment is uninterpretable: did in fact the experimental treatments make a difference in this specific experimental instance? (Campbell and Stanley, 1963, p.5)

of that bias. For example, we will match treatment and comparison group customers on historical monthly kWh consumption. Note that while adding a pretest to a design helps assess selection biases and attrition as sources of observed effects, adding repeated pretests of the same construct on consecutive occasions prior to treatment helps reveal maturational trends and detect regression artifacts. However, the extent to which the pretest can render self-selection implausible depends on the size of any selection bias and the role of any *unmeasured* variables that cause selection and are correlated with the outcome. The absence of pretest differences in a quasi-experiment is never proof that selection bias is absent.

Modeling Approaches. As noted earlier, attempting to correct for self-selection bias is essential in any observational study. To the extent that the differences between the two groups can be observed, variables that represent those differences can be addressed by first by using internal controls to form a comparison group and then matching the two groups on an observed characteristic. For example, we could match treatment and comparison group customers on monthly kWh consumption. But matching on a single variable such as pre-monthly kWh consumption is no guarantee the selection bias has been adequately addressed (Shadish, Cook and Campbell, 2002) since there might be more than one variable that plays a role in explaining why customers chose to self-select into the program. In such a case, treatment and comparison group customers can be matched on propensity scores, the predicted probability of being in the treatment (versus comparison) group derived from a logistic regression equation. The logistic regression reduces each customer's set of covariates to a single propensity score, thus making it feasible to match or stratify on what are essentially multiple variables simultaneously. Another approach is to enter the propensity score as an additional covariate into the regression model. Of course, the most difficult issue to address is any differences between participants and non-participants that are unobserved and unobservable. To mitigate both overt and hidden bias, a variety of approaches that attempt to take advantage of recent developments in statistics and econometrics will be explored:

1. Sample selection models (e.g., Heckman's two-step estimator (1978, 1979); treatment effect model (Green, 2003); instrumental variables estimator (Wooldridge, 2002)
2. The propensity score matching model (Rosenbaum and Rubin, 1983, 1985; Hansen and Klopfer, 2006; Guo and Fraser, 2014)²¹
3. Matching estimators and synthetic controls (Abadie and Imbens (2002, 2006)
4. Propensity score analysis with nonparametric regression (Heckman et al., 1997, 1998)

Other Strategies. In addition, the very nature of billing analysis allows evaluators to avoid a host of other problems that plague any experiment. Two of these are listed below.

- **Clearly Defined Post Period.** The major reason for assessing any post-test after the treatment is to eliminate the ambiguity about the temporal precedence of cause and effect. In conducting a billing analysis, we have participation dates and create dead bands around these participation dates to clearly separate the pre from the post period (i.e., the monthly post kWh measurements clearly comes after the treatment).
- **Lack of Reactivity.** The very nature of measuring kWh consumption using electricity meters means that customers cannot react to the fact that they (i.e., their businesses) are being measured (Rosnow and Rosenthal, 1997).

²¹ Note that propensity scores cannot remove hidden biases except to the extent that unmeasured variables are correlated with the measured covariates used to compute the propensity score

Again, before finalizing this evaluation plan, PG&E proposes that a more comprehensive review of the more recent literature regarding strategies for addressing self-selection be conducted.

10. Alternative Methods Considered

Before recommending the quasi-experimental design approach, we also considered the use of a randomized control trial (RCT) design and two different versions of the random encouragement design (RED) (Cappers, 2014). Here, we summarize those methods and our rationale for rejecting them.

- 1) **Randomize Control Trial (RCT).** This design involves randomly assigning eligible PG&E customers to participate in the OBF_AP (treatment) and randomly assigning eligible PG&E customers to not participate in the OBF_AP (control).
- 2) **Full Eligible Population Random Encouragement Design (RED).** This design involves randomly assigning all eligible PG&E non-residential customers to one of two groups. The *treatment* group is encouraged to participate in the OBF_AP. The *control* group is not allowed to participate in the pilot for two years.²²
- 3) **Partial Eligible Population Random Encouragement Design.** This RED is a variation on the full approach described above in #2 but is less invasive to the operation of the program, because a portion of eligible customers is untouched by the experiment (the “business as usual” group). The remaining customers are enrolled in the experiment and will be assigned to either the *treatment* or to the *control* group as outlined in the full design described above in #2.

In the course of the development of this evaluation plan, we realized that RCT and RED designs might not be feasible *or* desirable for OBF_AP. The key limitations of these two designs are listed below:

1. **Feasibility.** In a RCT design, to randomly assign eligible customers to the OBF_AP would mean that PG&E customers would be mandated to participate in the OBF_AP. This is not possible for a nonresidential program such as OBF_AP, because it would essentially require customers to take out a loan. Such a design is only feasible for “opt-out” programs such as energy use comparison reports, in which participation is limited to receiving a monthly report and reports are provided to all customers assigned to a treatment condition.
2. **External validity.** RCT designs that involve random assignment to treatment and control groups are at a slight disadvantage when it comes to external validity²³. Mohr (1995) concludes: “Because they demand enough control to be able to assign subjects to treatments at random, they make it more difficult to employ typical subjects and natural or representative setting; the randomization often upsets natural groupings and setting and leads to the selection of atypical subjects simply because they are easy or convenient or at least possible to randomize” (p. 97). External validity for this evaluation is critical since a key component of the underlying theory of the OBF_AP is that the market actors should be allowed the flexibility to implement the program using their best professional judgement. A fair test of this program design component would be to give control of the marketing and targeting of the program to the aggregators (i.e., contractors) who are supposed to implement the program. For PG&E program staff to impose their definition

²² A true experimental design isn’t possible since PG&E cannot mandate that a random sample of eligible customers actually participate in the OBF_AP and that a random sample of eligible customer cannot participate in the OBF_AP.

²³ The issue of external validity concerns the extent to which one may safely generalize the conclusions derived from an evaluation.

of the eligible market means that the results of this evaluation will be less generalizable to a scaled-up future program in which the aggregators have full control of the marketing and targeting of the program.

3. **Customer equity and legality.** In both RCT and RED designs, a significant portion of eligible customers would be denied any benefits of participating in the program for two years. In addition, a Project Coordination Group (PCG) meeting that discussed financing program evaluation methodologies found that “withholding the availability of credit enhancements in designated zip codes (or any other geographical locations) was viewed as likely to discourage already hesitant financial institutions from participating in the pilots”²⁴. In addition, PG&E is concerned that withholding financial products from certain customers, especially for a contractor-driven offering, could be operationally and potentially legally challenging.
4. **Ability to manage aggregator marketing behavior.** In RED designs, a given aggregator might not agree that the PG&E list of eligible customers assigned to the treatment group is optimal. As a result, they might supplement this list with customers that they believe have greater savings potential and higher probability of participating. This of course would compromise the randomness of our design, effectively turning it into a quasi-experimental design.
5. **Ability to attract aggregators.** In RED designs, aggregators might be too risk averse to sign a contract that requires them to market only to PG&E-identified customers that they believe are a sub-optimal group of customers, or that limits their ability to use the targeting approaches they see as being the most effective (such as geographic targeting approaches that may be incompatible with assignment approaches used in a RED design).
6. **Statistical power requirements.** In RED designs, sample size requirements are greater than the sample size requirements for a true experimental design. The power analysis²⁵ used to estimate the sample size must take into consideration that the number of customers required to obtain a given level of statistical power in a RED increases by a factor of $1/c^2$ where c is defined as the share of treatment group customers that participate in the program (Cappers, 2014). Such a large sample size might not be possible for a pilot program in which few customers might be expected to participate.
7. **Maintaining the integrity of the design.** In RED designs, the implementation can be challenging. PG&E, in close collaboration with the aggregators, would need to agree on the definition of the eligible population in order to improve the external validity of the design. This definition would probably be broader than the eligible population defined by any one aggregator since it must include unique customer types that each of the aggregators might prefer to target.²⁶ Aggregators would then be instructed to encourage only those assigned by PG&E to the treatment group and to create a database of all these encouraged customers. Aggregators would be supplied on an on-going basis with random samples of the eligible population which they must approach since *all* members of the eligible population must be encouraged by aggregators not just a subset

²⁴ Nexant, March 6, 2014: Memo summarizing PCG meeting findings on “Using a Randomized Encouragement Design to Evaluate the Statewide EE financing pilots”.

²⁵ The statistical power of a study translates into the probability that the study will lead to the correct conclusion (i.e., that it will detect the effects of treatments (Murphy and Myors, 1998).

²⁶ Note that agreement among PG&E and the aggregators regarding the definition of the eligible population could help to mitigate (not eliminate) the first concern.

of those that they might prefer to target. Only when each sample is exhausted, could an aggregator request another sample. Those assigned to the control group would not be allowed to participate in the OBF_AP program for two years. Maintaining the integrity of this design requires clear communication among all parties, effective management of samples of those eligible for treatment, and discipline on the part of 1) the aggregators to market only to those assigned to the treatment group and 2) PG&E to deny or delay treatment to those control group customers that might seek to participate.

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