

PUBLIC UTILITIES COMMISSION

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REVISED

July 12, 2016

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

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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,

A handwritten signature in cursive script that reads "Edward Randolph".

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.
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 style="color: red;">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 style="color: red;">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>
Savings Calculation Methods (p.25)	<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.
					<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.
					<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.

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.
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.
	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 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.
	2 Models, methods, and tools must use recognized engineering, economic or statistical approaches to normalization.		Yes	Inconsistent with policy	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. PG&E: PG&E will calculate demand savings to align with the CPUC definition of peak demand.
	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	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. PG&E: OBF Loans are assigned to the customer premise. The Baseline requirements specify that the meters have to be accounted for. 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. Has PG&E considered the issue of how to deal methodologically with meters that do not equal the whole building or site?

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.
					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.
					<p>\$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.</p>
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	<p>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.</p> <p>PG&E: Addressed above in "4. Strategy for tracking persistence" section.</p>
	2. Literature or field performance data demonstrating the expected impact and expected certainty of estimates.		Yes	More information needed	<p>Please refer to prior comments.</p>
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	<p>Clarify whether measure-specific baseline type will be assigned and recorded.</p> <p>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.</p>
	2. Description of how normalization methods capture (or not) baseline assumptions		Yes	More information needed	<p>It may not, in a control group design. Confirm that project-specific data required to use IPMVP approaches will be maintained.</p> <p>PG&E: Project level data will be maintained. Project monitoring will be done in accordance with Program Framework.</p>
	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	<p>It is unclear who will collect data periodically on non-routine adjustments and where it is being used in modeling.</p> <p>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.</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.
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.
					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					



March 25, 2016

Advice 3697-G/4812-E

(Pacific Gas and Electric Company ID U 39 M)

Public Utilities Commission of the State of California

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

Purpose

The purpose of this Advice Letter (AL) is to submit a proposal to the California Public Utilities Commission (CPUC or Commission) to operate High Opportunity Projects and Programs (HOPPs) in compliance with 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 High Opportunity Programs to the Commission for expedited review, specifically, to the Commission’s Energy Division via Tier 1 Advice Letters. (ACR, Paragraphs 1 and 2.)

PG&E requests approval to launch the On-Bill Financing Alternative Pathway sub-program as a HOPP offering under the existing On-Bill Financing (OBF) Program. As explained below, the P4P program meets all of the requirements for HOPPs set forth in the ACR. PG&E requests approval to be effective no later than April 15, 2016.

Background

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 requirement 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 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.

Program Proposal

The program proposal is summarized in the Table 1 below. The detailed proposal is in Attachment A.

Table 1

Program Name:	On-Bill Financing (OBF) Alternative Pathway
Proposal Type:	High Opportunity Program
Sector:	Non-Residential
Brief Description:	<p>The On-Bill Financing (OBF) Alternative Pathway HOPPs Program will create an alternative pathway for customers and contractors to participate in the OBF program. The Program will leverage metered energy data to test the theory that OBF on its own is an incentive that can support customers high quality investments in Energy Efficiency (EE) to deliver incremental EE savings. The Program will also test the theory that metered energy data can be leveraged by Program Administrators to develop a scalable streamlined program delivery model that is attractive to contractors and customers.</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.
Incentive Design:	<p>The OBF loan is sized based on projected meter-based energy savings at the customers 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</p>

	repaid in full by the participating customer, with the threat of utility disconnection for non-payment. ¹
Measure Treatment:	<p>Primarily lighting, refrigeration, and controls, as well as other energy efficiency and some conservation measures.</p> <p>Behavioral, retrocommissioning, and operational measures are eligible, however their effect on savings and project costs is expected to be relatively small as the program is designed to support capital investments and does not directly encourage these activities.</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>
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 based on a quasi-experimental design using a “difference of differences” approach using a comparison group selected to estimate net savings.</p> <p>To increase confidence in the savings estimate, PG&E also proposes a gross savings calculation method using quasi-experimental design using a “difference of differences” approach that will be coupled with customized NTG surveys to understand what participants would have done in the absence of the program.</p> <p>A detailed EM&V Proposal is included in Attachment B.</p>
Proposed Budget:	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.
Budget source(s):	PG&E OBF Program
PG&E contact(s):	<p>Primary Contact and Policy Lead: Halley Fitzpatrick (hdf2@pge.com)</p> <p>Program and Transaction Services Lead: Alfred Gaspari (a3g1@pge.com)</p> <p>EM&V Lead: Brian Smith (B2SG@pge.com)</p>

¹ See PG&E OBF Loan Agreement – Section 13
http://www.pge.com/tariffs/tm2/pdf/ELEC_FORMS_79-1118.pdf

Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, facsimile or E-mail, no later than April 14, 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).

Effective Date

PG&E requests that this Tier 1 advice filing become effective on April 15, 2016 which is 21 days after the date of this filing.²

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

cc: Service List R.13-11-005

² 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

(Date Filed/ Received Stamp by CPUC)

ELC = Electric

GAS = Gas

PLC = Pipeline

HEAT = Heat

WATER = Water

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

Tier: 1

Subject of AL: **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: **April 15, 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 Pathway¹ High Opportunity Projects or Programs (HOPPs) program (“the Program”) will create an alternative means for customers and contractors to participate in the OBF program. The Program will leverage metered energy data to test the theory that OBF on its own is an ‘incentive’ that can support customers’ high-quality investments in Energy Efficiency (EE) to deliver incremental EE savings. The Program will also test the theory that metered energy data can be leveraged by Program Administrators (PAs) to develop a scalable, streamlined program delivery model that is attractive to contractors and customers.

Pacific Gas and Electric Company (PG&E) will continue to offer its current iteration of OBF in conjunction with rebate/incentive programs.

Section 1: Program Description

What is the intent of the Program?

PG&E recognizes the need for innovative program design to ensure that finite ratepayer funds are leveraged to generate incremental energy savings as Assembly Bill 802 (AB 802) is implemented. The OBF Alternative Pathway Program will leverage the opportunity presented by Assembly Bill (AB) 802 for PG&E to create a mechanism to allow non-residential customers to participate in OBF, without necessarily participating in another incentive/rebate program.

This will enable incremental energy savings to be generated without payment of a rebate or incentive. In addition, the Program will facilitate data gathering on a large number of projects that utilize metered energy savings. This will provide PG&E, the California Public Utilities Commission (CPUC), and other PAs with early metered energy savings project data that can further enhance program design– both for the OBF Alternative Pathway and for other non-residential programs.

How will the Program achieve these goals?

The OBF Alternative Pathway will allow customers and contractors to utilize the PG&E OBF Revolving Loan Fund (RLF) without necessarily also participating in another PG&E EE program. Under this model, the customer will forgo eligible rebates, or install energy savings measures

¹ In parallel with the current OBF offering, Investor-Owned Utilities (IOUs) are launching an On-Bill Repayment (OBR) program, which differs only in that loans are provided by third-party financiers rather than the IOUs’ Revolving Loan Fund (RLF). Lessons-learned through the OBF Alternative Pathway HOPPs are expected to inform designs of nascent OBR programs.

that are not eligible for existing programs. This high-opportunity Program will offer the OBF loan as the sole incentive² for customers and contractors to complete high-quality EE projects.

OBF is a RLF of ratepayer EE funds that PG&E administers on behalf of its customers³. OBF is funded through the EE program budget and has historically been offered in conjunction with other EE programs. 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 loans are based on projected energy savings and the balance is repaid on the customer's bill. The OBF program is designated as a resource program; however, it has historically been offered in conjunction with other PG&E programs due to the lack of an approved mechanism to measure savings from OBF loans. In light of this, PG&E had not created a project Quality Assurance/Quality Control (QA/QC) process for OBF separate from these programs.

Customers utilizing this OBF Alternative Pathway will be eligible to receive an OBF loan equivalent to their entire eligible project costs, in accordance with existing OBF funding rules.⁴ OBF is administered on the customers 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.

Contractor participation in this Program is encouraged through the creation of an alternative Quality Assurance/Quality Control (QA/QC) process that will leverage a third-party project certification process. This will allow contractors to offer broad-based EE opportunities to customers through a project process that they will control.

The Program Framework will define project requirements, contractor requirements, service providers, project certification, and project certifier requirements.⁵ Under the Program, PG&E will engage a Transactional Advice Consultant to assist in creating the Program Framework. PG&E will leverage the Environmental Defense Fund's (EDF's) Investor Confidence Project⁶ (ICP) Targeted Commercial Protocols for the Program Framework. PG&E will solicit stakeholder input to ensure that the Program framework is appropriate for the contractors and service providers serving projects included in the OBF Alternative Pathway. This is particularly relevant given that the OBF Alternative Pathway Program supports much smaller loans (as low as \$5,000) than are typically targeted by firms offering these services.

Contractors will be able to apply to offer the Program to PG&E customers in accordance with the Program Framework. Service providers will offer contractors the services [project Measurement and Verification (M&V), project certification, meter-based energy monitoring] that will allow them to participate in the Program. These service providers are integral to the Program, namely because PG&E has found that most of the contractors providing EE services to the Small Business market do not have the capacity to deliver the OBF Alternative Pathway

² 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.

³ OBF is a statewide program, however, the administration and source of the loan funds vary by IOU.

⁴ www.pge.com/eef

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

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

Program requirements on their own. As such, engaging these service providers allows PG&E to design a high-quality program that will benefit participating customers and ratepayers.

Projects submitted under the OBF Alternative Pathway will be documented in a standardized format. The approval process for third parties will leverage the ICP certification process for Investor Ready Energy Efficiency™ projects adapted for the PG&E OBF Alternative Pathway.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 the OBF Alternative Pathway, 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.

Participating customers will benefit from the creation of a standard Program Framework that will enable them to confidently invest in EE projects, including some measures that may not be otherwise eligible for a rebate or incentive. Ratepayers will benefit from incremental energy savings that are generated both from projects that would not have originated without the Program and from higher levels of energy savings made possible through the high-quality Program Framework.

To facilitate easy entry into the Program for all customers, PG&E will solicit input from market actors (contractors, service providers) both during the finalization of the Program Framework and throughout the Program. PG&E has engaged a vendor with significant experience working with energy project investors to ensure that the Program Framework protects participating customers and ratepayers, while still enticing contractors and service providers to leverage the Program.

It is critical that the Program design include an effective market-based QA/QC process that is appropriate for OBF loans, which average \$26,000 for PG&E Small and Medium Business (SMB) customers. PG&E will continue to engage market actors (contractors and service providers) to ensure that the Program is attractive and leverages ongoing innovations in the marketplace.

PG&E expects the OBF Alternative Pathway to include projects similar to those being installed under its existing OBF program. These include a majority of lighting⁸, refrigeration, and controls projects. At the same time, the Program aspires to move away from a widget-based approach and include behavioral and Operations and Maintenance (O&M) savings (leveraged over the lifetime of the loan to support customers' bill neutrality, not used in initial calculations), measuring all energy savings at the meter. The Alternative Pathway is designed to leverage market actors such that contractors can develop energy savings interventions that align with businesses' and customers' needs.

⁷ ICP Certification <http://www.eepformance.org/how-to-certify-a-project.html>

⁸ Note that non-advanced– i.e. non-Light Emitting Diode (LED)– lighting measures are limited to 20% of project cost for OBF loans.

OBF Alternative Pathway will use the estimated energy savings calculated by a contractor to determine the loan repayment amount for a given customer. The Program customer must then agree to fully repay the loan based upon these projected energy savings. PG&E will evaluate such savings against a control group for the gross savings claim. PG&E will then collaborate with the CPUC Energy Division (ED) to further assess the project results ex post in order to inform this and other programs.

A logic model and program theory table for the OBF Alternative Pathway Program is provided in Appendix A.

Section 2: Background

Existing Barriers to Entry

The current OBF program, combined with traditional rebates and incentives, has successfully supported a host of customer projects to date. The OBF Alternative Pathway, however, seeks to overcome certain barriers to entry inherent in the current OBF program design, including:

- **Contractors:**
 - **Cash Flow:** Contractors that implement projects under OBF for small businesses are often small and poorly 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.
 - **Project Control:** Rebate and incentive programs may require inspections by PA staff or other 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 for customers, even in instances in which it would allow customers to engage in more comprehensive projects.
 - **Business Models:** 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.
- **Customers:**
 - **EE Investment Framework:** EE projects carry risk for customers, given that they require an up-front investment with the expectation of future energy utility bill savings. 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. Customers also bear the risk of new equipment underperforming due to sub-par manufacturing, installation, or O&M.
 - **EE Opportunities:** 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.

- **PG&E/ PAs:**
 - **Ambitious State Policy Goals:** Meeting the increased EE goals set forth in SB 350 calls for scalable, sustainable models for PAs to support customer investments. The OBF Alternative Pathway creates a scalable model that allows PAs to generate energy savings leveraging OBF RLF rather than relying on traditional incentives and rebates which reduces program incentive costs. The OBF Alternative Pathway reduces administrative costs by requiring the customer and contractor to fund the QA/QC process.
 - **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 government agencies⁹. 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, the OBF Alternative Pathway will ensure better results for participating customers.
 - **Customer Reach:** PG&E has over 400,000 small business customers, each with unique facilities and energy needs. While PG&E’s EE rebate and incentive programs are appropriate for some, the OBF Alternative Pathway allows PG&E to serve a broader customer base, focused on whole-facility reduced energy usage.
 - **OBF Program Delivery Costs:** PG&E averaged roughly 400 originated OBF loans per year in 2014 and 2015. As PG&E seeks to scale the program and serve more customers, it will be important to identify opportunities to drive operational effectiveness for all OBF stakeholders– including PG&E’s program team and account representatives, as well as participating contractors and implementers.

Building Capacity for Market-Based Solutions

The OBF Alternative Pathways Program is designed to advance market-based EE financing solutions and thereby accelerate the adoption of EE. Notable, the Program will build contractor capacity and expand service provider deployment models.

Contractor Capacity: Third-party financial institutions are developing innovative EE offerings such as those allowing customers to purchase EE as a service. A soon-to-be released report¹⁰ indicates that these financial institutions are unable to identify qualified

⁹ www.pge.com/eef

¹⁰ A soon-to-be released UC Berkeley Law Report 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;
- 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

contractors that can provide the services needed by these financial institutions. Contractors that participate in the OBF Alternative Pathway will be viable candidates to work with these financial institutions, especially for larger or integrated projects ineligible for support through OBF.

Service Provider Deployment Models: Service providers may include a variety of entities that provide services that enable contractors to participate in the OBF Alternative Pathway. These could include loan origination (documentation services), third-party certifications, information technology (IT) monitoring providers, and other offerings. The OBF Alternative Pathway will create an opportunity for these service providers to create deployment models for their technology that will benefit this Program 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 ensuring that the costs of their tools are eligible for the OBF Alternative Pathway. For example, monitoring costs for the lifetime of the loan can be capitalized and included in the OBF loan.

Program Operations

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. The OBF Alternative Pathway is designed to fully leverage the existing OBF operational infrastructure including the existing CPUC-approved rate schedules and forms.

OBF Alternative Pathway will use the estimated energy savings calculated by a contractor to determine the loan repayment amount for a given customer. The OBF Alternative Pathway customer then agrees to fully repay the loan based on these projected energy savings. Per the December 30, 2015 HOPPs Ruling, PG&E does not intend to claim gross savings for this HOPPs program; however, PG&E will track gross savings for internal program and/or account executive goals. PG&E will then work in conjunction with the CPUC ED to further assess the project results ex post for savings claims and in order to inform this and other programs.

Program Sequence and Timing

Under the OBF Alternative Pathway, PG&E has engaged a Transactional Advice Consultant to assist in developing a streamlined framework to allow contractors and their partners to apply for the Program. The framework will be based on the ICP Targeted Commercial Protocol¹¹, 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 the Program. 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.

PG&E and the Transactional Advice Consultant 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 will include the following project requirements, including standard documentation requirements:

-
- 4) **Lack of an energy efficiency workforce to execute and market retrofit projects** once measurement technologies and financing programs achieve the promise of scale.

¹¹ <http://www.eepformance.org/>

- 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

Strategic Integration

The Alternative Pathway Program closely aligns with the Strategic Plan, Market Transformation, and other key state objectives as follows:

AB 802: The Alternative Pathway Program 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.

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: The OBF Alternative Pathway 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.

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 will help SMB customers overcome the cost barrier to adopting EMT measures.

AB 758: This Program supports California's Existing Buildings Energy Efficiency Action Plan¹², developed under AB 758. The Program 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.

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,¹³ 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.

¹² www.energy.ca.gov/ab758/documents/

¹³ R13-11-015 – Page 52

Stakeholder Engagement:

To refine OBF Alternative Pathway 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 leverage the OBF Alternative Pathway 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 leverage the program.
- **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 the program 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 the program.

Implementation Team:

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

Manager – Alfred Gaspari (A3G1@pge.com)

Policy – Halley Fitzpatrick (HDF2@pge.com)

EM&V – Brian Smith (B2SG@pge.com)

Section 3: Program Metrics

Program Goals and Objectives

Through OBF Alternative Pathway, PG&E proposes two key solutions to 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. The OBF Alternative Pathway Program addresses these challenges by minimizing ratepayer investment through the use of the RLF 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, the Program 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 RLF 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 RLF 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 the OBF Alternative Pathway 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 RLF incremental to what was planned for 2016 to support the new OBF Alternative Pathway offering.

It is imperative that the OBF loan pool demonstrates an effective solution for finance providers, contractors, and customers. The Program 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 RLF in conjunction with the statewide team.

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 2016 OBF loans

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 approves 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	CPUC approval
April 22, 2016	Review OBF loan agreements; update OBF Handbook (www.pge.com/eef) and other program requirements	CPUC approval
April 25, 2016	Application criteria for contractors published, and contractors approved to start submitting projects	CPUC approval
May 1, 2016	Program full launch	CPUC approval; contractor and service provider outreach and support
May 2016-December 2016	Program implementation and initial feedback provided	CPUC approval: contractor and service provider outreach and support

Program Budget

The OBF Alternative Pathway will leverage existing OBF functionality, budget, and RLF. PG&E will not request additional budget for this program, and will only report costs that are directly related to this offering. The Program will leverage existing OBF infrastructure to support OBF loan origination and awareness.

The offering will result in incremental costs to customers for project certification. 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 the program 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.

Savings Targets

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

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 the program, shown in the table above as 20% annual growth.

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

Savings and Budget Assumptions

While there is no defined site-specific savings requirement for OBF loans, it is expected that most future loans issued under the Alternative Pathway will achieve 10-15% site-specific energy savings, as has been the case with past OBF loans. However, many customers experience more or less significant savings depending on the size of a facility and relative scope of a project. 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 the program.

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. The OBF Alternative Pathway will provide a mechanism for contractors to reach more of these small and medium customers with EE investment opportunities.

Cost-Effectiveness Calculation

While finance programs are considered resource programs per D.12-11-015¹⁴, 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, which was rejected by the ED, 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 effort (between the CPUC and IOUs) is ongoing and was leveraged in the development of this Program as well as the evaluation.

The OBF Alternative Pathways Program 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

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

calculator. PG&E estimates that the program 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 the OBF Alternative Pathway evaluation.

This Program is notable in that it will provide incremental data for IOUs to work with CPUC staff to study the project data that is created in order to further study the impact of AB 802 on the types of projects that are generated. Since the OBF Alternative Pathway will likely result in reduced ratepayer funds for customer projects as compared to other interventions, the study is less of a risk to ratepayers.

In the absence of a methodology specific to financing programs, PG&E proposes using the methodology currently in place for other EE programs, as appropriate. 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. For this Program, PG&E proposes adjusting the baseline relative to a comparison group (see Attachment B). When energy savings baseline adjustments are made, corresponding cost adjustments should also be applied to maintain the integrity of cost-effectiveness calculations.

Section 4: Measure Treatment

The Program will accept any Energy Efficiency or conservation measure (EMC) 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 1.0¹⁵

Per ICP specifications the results of an energy audit must provide a list of ECMs that can include low-cost and no-cost measures, O&M improvements, and capital-cost improvements. 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.

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.

¹⁵ Savings-to-investment ratio = (Annual Energy Savings * Average Cost of Electricity * Estimated Useful Life) / OBF loan amount

Section 5: Saving 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 OBF Alternative Pathway, 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 the Alternative OBF Program strategies are novel, 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 the OBF Alternative Pathway Program will be to develop a robust evaluation method for this type of program, and to ensure that a rigorous methodology is in place once the Program grows or scales over time.

PG&E proposes a savings calculation method based on a quasi-experimental design using a “difference of differences” approach, using a comparison group selected to estimate net savings. To increase confidence in the savings estimate, PG&E also proposes 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.

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.

To note, 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.

Section 6: Incentive Design

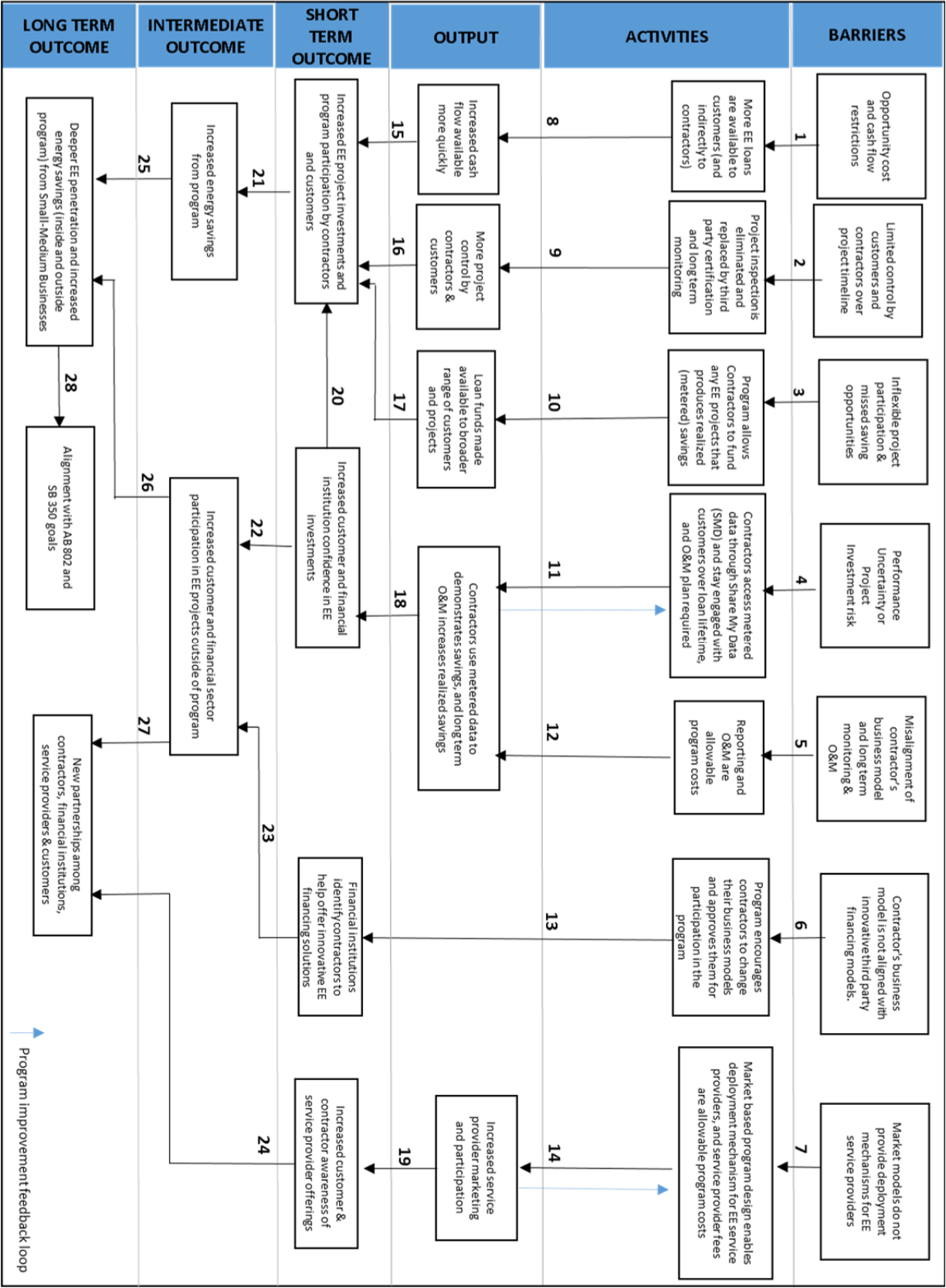
The OBF Alternative Pathway Program will provide customers with an OBF loan for the full cost of the EE project, including M&V costs, as required. The customer will not receive a traditional one-way rebate or incentive. PG&E will utilize the existing OBF RLF that is funded by ratepayers. While the loan functions as an incentive, it differs from traditional incentives in that participating customers are required to repay the entire loan amount with the threat of service interruption in the event of default.

Risks to the ratepayer are reduced relative to traditional one-way incentive payments. The two notable risks include customer default and financing projects that would have materialized in the absence of EE programs. The EE Finance EM&V team is considering methods to calculate the

cost of different financing programs as compared to incentive programs. The OBF Alternative Pathway expects to leverage that consistent determination in accordance with other programs.

The risk associated with projects that would have materialized without EE programs is reduced compared to traditional one-way incentive payment models. In most EE programs, customers implementing such projects would still retain their one-way, ratepayer-funded incentive payment. In the OBF Alternative Pathway model, however, all ratepayer funds are returned to the loan pool, regardless of whether savings were achieved or if a project would have otherwise materialized.

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 the Program 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 Alternative Pathway, 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	Contractors will be able to apply to the PG&E Alternative Pathway to be able to utilize the Program to serve customers.
Service Providers	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 the Program to customers.
Project Certification	Project certification is the process by which a project is approved by an authorized third-party project certifier. The project certification will include verification that the project was installed
Project Certifiers	<p>PG&E will approve project certifiers to be a service provider in the Program. 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 the OBF Alternative Pathway.</p> <p>Project certifiers are a key QA/QC function in the pilot design. These service providers will be able to allow contractors to offer the Program 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>PG&E will closely monitor their performance and ability to participate in the Program.</p>
Transactional Advice Consultant	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 certifiers. 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 the OBF Alternative Pathway Program 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.
Investor Confidence Project (ICP)	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.
ICP Protocols	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.
Investor Ready Energy Efficiency (IREE)	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.

Table B-2

	Existing OBF Workflow	Proposed OBF Alternative Workflow
Customer Eligibility Determination	Based on customer bill payment history	No change
Project Origination	PG&E account managers, PG&E program managers, third-party program managers, PG&E trade professionals	PG&E account managers and approved contractors
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
Project Installation	Conducted by eligible contractor (as specified by rebate/incentive programs)	Conducted by a contractor eligible for OBF Alternative Pathway
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
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 allows 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 is 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 Alternative Pathway savings, and benchmarking data

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

March 25, 2016

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

The EM&V plan for the On-Bill Financing Alternative Pathway Program (OBF_AP) presented in this document is the result of substantial collaboration with professionals with years of experience in the field of energy efficiency program evaluation. It has been reviewed by program administrators and other stakeholders. We believe that the result is a workable plan that balances the competing desires for accurate estimates of net program savings, generalizability of the results, and efficient program administration. For now, Pacific Gas and Electric Company (PG&E) recommends that this EM&V plan serve as a general framework until a detailed EM&V plan can be developed based on the types of customers who actually join OBF_AP and the measures and projects they implement. PG&E also recognizes that this general EM&V framework, the more detailed EM&V plan, and an evaluation budget must be approved by the Energy Division (ED).

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) program, PG&E plans to *claim estimated net energy savings*.¹ Estimated net energy savings results is 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 traditional OBF offering in that it does not require non-residential customers to participate 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 existing OBF (main OBF) program, there is no precedent for an evaluation framework for estimating savings.² 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 first-year energy and demand impacts. **PG&E proposes to use two methods to calculate net savings:**

1. 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].)
2. A self-report NTGR (collected on a quarterly basis) that is multiplied by an estimated gross savings based on regression analysis using billing data.

¹ 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).

² PG&E’s research to identify impact evaluations for on-bill financing programs run outside of California was not successful.

The primary reason for calculating net savings using two approaches is to triangulate³ the estimate of net savings. The secondary reason 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). In the sections below, we provide more detail on each of the two proposed approaches.

In a separate analysis, we also propose to compare the savings from the OBF_AP to the savings from the main OBF Program. Finally, because of the unique qualities of OBF_AP, PG&E recommends that a process evaluation be conducted 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 recommends that process evaluation questions for participants be added to the NTGR interview; in other words, one participant survey would be conducted on a quarterly basis that captures both NTGR data and feedback to improve program design.

We conclude 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.

2. Quasi-Experimental Approach for Estimating Net Savings

To calculate net savings using this approach, members of the treatment group are defined as the eligible non-residential customers who chose to participate in the OBF_AP. To estimate net savings, we will match participants to a group of nonparticipants who were eligible to participate in the OBF_AP based on such variables as business segment (e.g., NAICS code), size (e.g., monthly kWh use), and other key parameters.⁴ The composition of the comparison group must also take into consideration the types of projects that participated in OBF_AP, as explained in more detail below.

2.1 Comparison Group

The appropriate comparison group for calculating net savings will depend on the project type, as described here.

A. Project types comparable to the eligible population: There are several types of eligible OBF_AP projects for which any customer in the nonparticipant population who has been matched on key variables could serve in the comparison group. These include participants who conducted retro-commissioning (RCx) projects, made shell improvements or installed measures which are non-energy using add-ons such as time clocks or insulation, Also included in this group would be any participant who conducted early retirement projects (i.e., replaced working equipment before the end of its effective useful life – EUL) and any participant whose savings are due to behavioral changes.

B. Project types comparable to non-participants that installed energy-using equipment: For program participants who installed energy-using equipment (e.g., central air conditioning) that

³ 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.

⁴ 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.

had failed or was at or beyond its EUL (i.e., replace on burn-out - ROB projects) the appropriate comparison group would be non-participants who also installed energy-using equipment. Consequently, if non-participants install equipment on a lower level of the efficiency continuum than participants, this will be reflected in the relative kWh consumption of the two. Comparison of program installers of energy-using equipment with a general population that includes non-installers would be inappropriate. This is because a general population may include businesses with no space cooling equipment and, who would, therefore, have no opportunity to decrease consumption due to cooling equipment changes. The issue in determining the net effect of the program is to observe the effect of the loan on the installation decisions of customers, and on the resulting energy consumption. Non-participant installers have the opportunity to choose efficient or inefficient versions of this equipment category; thus, they serve as the appropriate point of comparison for program participants who have installed energy-using equipment. The major challenge with this approach for these project types is that identifying comparison group members that installed energy-using equipment during the program period outside of a PG&E program will likely require a large screening survey. While PG&E envisions this survey to be a very short (e.g., 5 minute) phone and/or electronic survey, it still may not be feasible. In this case, another alternative would be to conduct engineering analysis, such as International Performance Measurement and Verification Protocol (IPMVP) Option D to estimate gross savings, and adjust to net savings using the self-report NTGR.

If participating projects fall neatly into these two general categories, then the appropriate comparison groups could be formed and the billing analysis, described in Section 1.1.2, would be conducted for each of these two categories that would yield estimates of first-year annual net savings. However, there may be projects that contain a mix of these two general project categories. For these projects, a regression-based analysis of participants and nonparticipants would not be the preferred method. The same back-up engineering methods suggested for net savings for ROB projects could be used for these combination projects – i.e., samples could be drawn and on-site verifications conducted to estimate *gross* energy savings using IPMVP methods. These gross savings would then be adjusted using a self-report NTGR.

2.2 Net Savings Regression Model

To estimate net savings, 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. Depending on the mix of participating projects the evaluator may develop two separate regression models:

- A. One model that uses a comparison group comprised of the eligible population for all project types where this is the appropriate comparison group (e.g., for RCx, energy saving add-ons, and early retirement projects); and
- B. A second model that uses a comparison group comprised of non-participants that installed energy-using equipment (e.g., for ROB equipment replacements).

Any *observed* differences in the composition of the treatment and comparison groups can be controlled statistically.⁵

⁵ 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.

Regression Model. 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

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 each model. For example, the evaluator would multiply:

- A. The β_2 calculated using the eligible population by the number of participants for which this is appropriate (e.g., all RCx, energy using add-on, and early retirement projects)
- B. The β_2 calculated using the non-participating customers that installed energy-using equipment by the number of participants for which this is appropriate (e.g., all ROB equipment replacement projects).

As described above, there may be some participants who do not fall into either category, for which an engineering approach should be used rather than a regression model.

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. For program 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 M&V, the contractor will track the energy use of each participant over the life of the loan, as discussed in the Section, Project-Level Measurement and Verification.

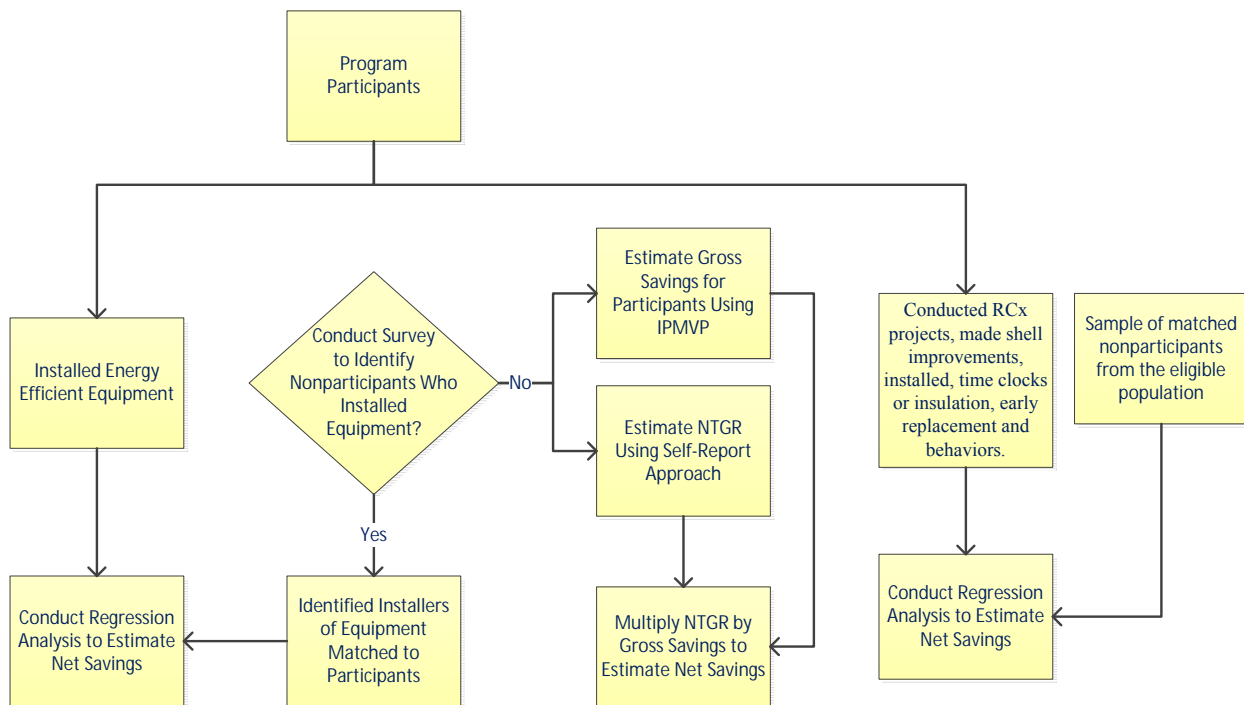
Limitations and Alternative Methods Considered: Because this will be a non-equivalent comparison group design, there will be a threat to internal validity from self-selection bias. PG&E provides a discussion of this threat and recommendations for addressing this challenge in the Section, Major Threats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

Net Savings: To calculate net demand savings, PG&E recommends that the evaluator use the same approach as shown in Equation 1.

2.3 Illustration of Net Savings using Quasi-Experimental Approach

Figure 1 illustrates the calculation of net savings using this quasi-experimental design.

Figure 1. Net Savings Calculations using the Quasi-Experimental Design Proposed



2.4 Other Possible 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 Alternative Pathway, on average, produces savings greater than the main OBF program, which includes incentives or rebates.⁶ 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 results such as the Total Resources Cost (TRC) test.

3. Self-Report Approach to Estimating Net Impacts

As stated in the Overview, PG&E proposes that two methods be used for estimating net impacts. The first is the regression model in which the energy use of participants is compared to the energy use of a matched comparison group – described in the Section, Net Savings Regression Model. Here we propose the second approach, in which the gross savings are calculated using a regression model and gross savings comparison group, and a self-report net-to-gross ratio (NTGR) is multiplied by the gross savings estimate 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.

3.1 Self-Report Estimate of the NTGR

As an overview for the NTGR self-report, we propose to start with recognized methods and instruments, but will:

- Customize these 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 questions regarding NTGR as well as 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 stratified sample will be designed so that customers with the largest estimated savings will be overrepresented.

⁶ 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.

However, the 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 what the participant would have done (if anything) in the absence of the program (including information from the vendor).

PG&E recommends that this survey be conducted on a quarterly basis to capture decision making information soon after the customer made the decision to implement the project – when the decision maker is likely still in their position at the participating company and their decision making process is fresh on their mind. Thus, at least some survey results should be available before completing of the billing analysis, since billing analysis will require at least 12 months of post-participation billing data.

In addition, PG&E recommends that the survey include process-evaluation type questions for program improvement. For example, the survey could 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 could potentially be addressed through program design improvements. PG&E provides example participant survey questions – including those for the process evaluation and to capture NTGR data – in Section 6.)

3.2 Gross Savings Estimate

To calculate gross savings, customers' energy use pre- and post-participation in OBF_AP will be compared with the energy use change over the same timeframe of non-participating customers that likely did not install an energy-using project, to control for exogenous changes. PG&E recommends that future participants in the OBF_AP be used for the comparison group. These future participants are expected to resemble current participants since they also self-selected into the OBF_AP, only at a later date, and they are less likely to install energy-using equipment during the 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.

1. First, it is assumed that these future participants did not participate in any PG&E energy efficiency program and did not adopt any energy savings behaviors or install any energy efficient measures outside of a PG&E program during the evaluation timeframe. This assumption could be verified based on interviews or surveys with a random sample of future participants. If this assumption is verified, any change in their energy use is therefore assumed to be a function of exogenous factors, such as changes in the larger economy.
2. The design and implementation of the OBF_AP must remain stable.
3. The types of customers who choose to join the OBF_AP must remain stable over time. If any one of these three assumptions cannot be met, then the evaluators could use customers from the broader eligible population who are matched on key characteristics to estimate “gross” savings. However, because the eligible population may include customers that installed energy-using equipment, this comparison to the broader eligible population will likely yield a result that is somewhere between gross and net savings. If a NTGR is applied, free ridership will be at least partially double-counted (i.e., the net savings will be biased downwards). In this case, the evaluators may choose to rely more on the regression model net savings estimate (described in the Section Net Savings Regression Model).

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_AP participants in the comparison group. PG&E and participating contractors will collect 12 months of pre-implementation and 12 months of post-implementation data for all current and future OBF_AP participants. This meter data will be used for evaluation purposes, and it will be used by the program to ensure that the customer's bill is projected to

be neutral – i.e., energy savings are 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.

Gross savings will be estimated in a manner consistent with AB802 and IPMVP⁷ 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 Project⁸.

Stage 1. Individual Premise Analysis

A third-party selected by PG&E and approved by the ED 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

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

- 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
- μ = Average daily baseload consumption estimated by the regression
- β_H, β_C = Heating and cooling coefficients estimated by the regression
- ε_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.

⁷ International Performance Measurement and Verification Protocol (IPMVP) available from the Efficiency Valuation Organization at <http://evo-world.org/en/>

⁸ Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures (<http://energy.gov/eere/about-us/ump-protocols>)

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.

For participants who conducted RCx projects, implemented shell improvements or installed measures which are non-energy using add-ons such as time clocks and insulation, or adopted energy conservation behaviors, the weather-normalized change in energy use from the pre period to the post period, adjusted for exogenous changes, would yield a reasonably accurate estimate of first-year annual gross savings. (As a reminder, the comparison group described in Section Net Savings Regression Model that is comprised of all eligible members of the population would yield *net* savings, since these customers are likely to have installed energy-using equipment during the program period. In contrast, the comparison group described here that is comprised of future participants would yield *gross* savings, since these customers would likely not have installed energy-using equipment during the program period.)

However, these simple regression models are not appropriate for other situations. For project types where the participant replaced some type of energy efficient equipment (e.g., central air conditioner) that had failed, the evaluators will need to develop methods to adjust the regression results to account for code baselines. If a single energy efficient measure was installed at a site, two approaches proposed by Agnew and Goldberg (2012) will be explored to adjust the gross savings to account for code. Both approaches use engineering equations to produce impact estimates relative to the appropriate standard installation baseline. For those sites at which the participant replaced more than one piece of failed equipment, one cannot adjust the regression-based estimated but instead must rely on IPMVP-based estimates that use data collected from an on-site sample to adjust for applicable code baselines for each piece of equipment.

In addition, for project types where the participant replaced equipment before the end of its useful life (e.g., central air conditioner), the evaluators will need to develop methods to adjust for dual baselines. For a sample of these early-replacement sites, the evaluators could use IPMVP-based approaches (e.g., IPMVP Option D) to model the measures to adjust for dual baselines.

Finally, there might be customers who add energy using equipment at their site – e.g., a store owner who previously did not have air conditioning might install a central air conditioner through the OBF_AP. For such customers, a regression analysis will only reflect an increase in energy use. The appropriate baseline for such situations is the code baseline central air conditioner, a situation that can only be addressed using one of the engineering methods in IPMVP.

Which of these methods for estimating gross savings will be used and the associated sample sizes cannot be determined until we see the types of measures and behaviors and the types of installation conditions (replacement on burnout and early replacement) that are actually installed. It is very likely that the mix of measures and behaviors and installation conditions will require that all of these methods will be used to some extent with sample sizes calculated to support each approach.

We will also explore the use of the method described in Equation 5 to estimate gross peak demand reductions:

$$\text{Net Peak Demand Reduction} = \frac{CF \times kWh_{net}}{Hours_{Peak}} \quad (5)$$

where

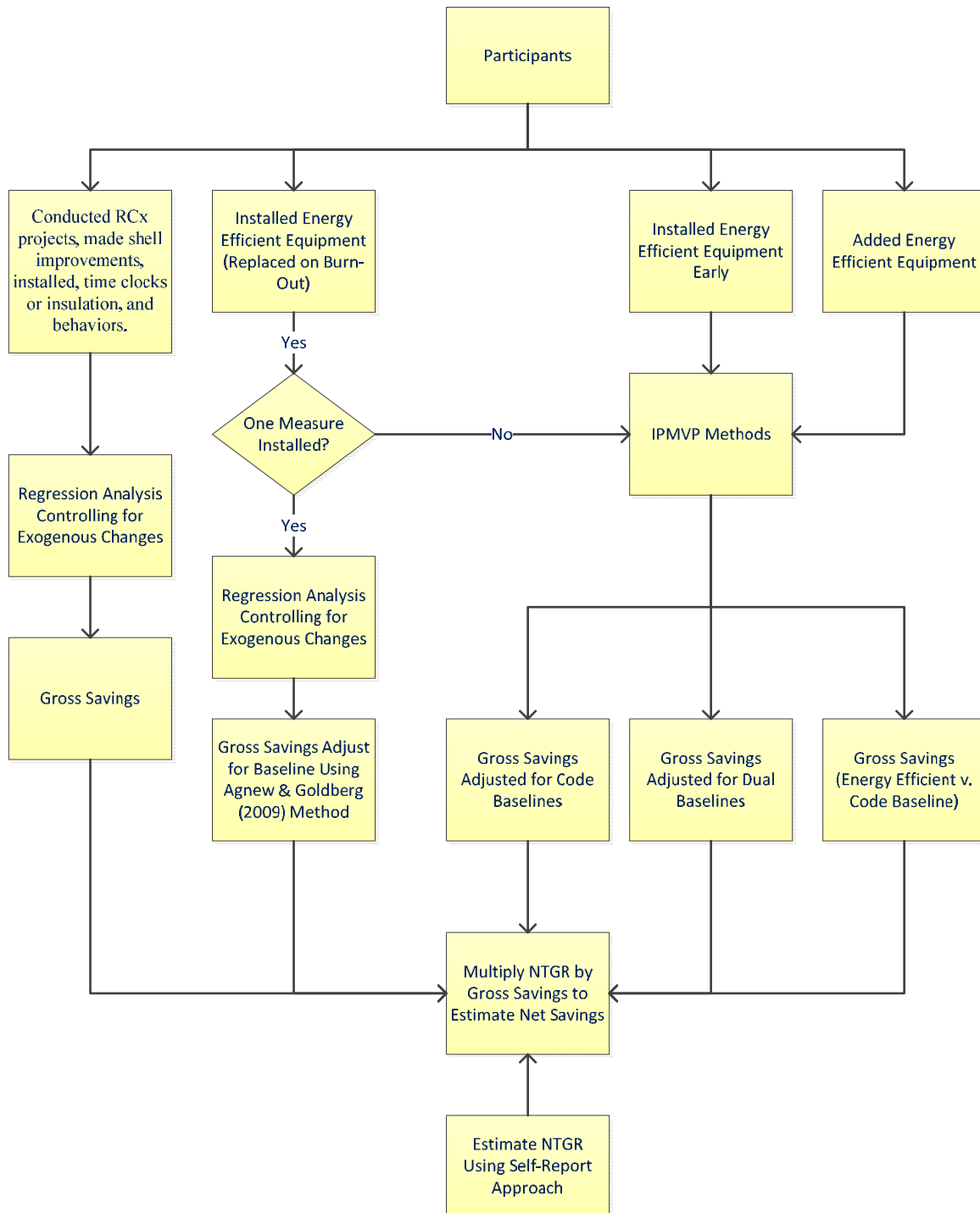
- CF= Coincidence Factor – i.e., the fraction of the peak demand of a population that is in operation at the time of system peak⁹.
- kWh_{net} = the average net kWh savings per customer
- Hours_{Peak}= The number of hours in the summer on peak period

⁹ Northeast Energy Efficiency Partnerships (NEEP) defines it as, “The ratio of the average hourly demand during a specified period of time of a group of electrical appliances or consumers to the sum of their individual maximum demands (or connected loads) within the same period.” (NEEP 2011).

3.3 Illustration of Net Savings Approach Based on Self-report NTGR and Gross Savings

Figure 2 illustrates the approach of calculating net savings from the self-reported NTGR multiplied by gross savings.

Figure 2. Net Savings Estimate Using Self-Report NTGR Multiplied by Gross Savings



4. 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.

4.1 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, participants will agree to allow their monthly energy usage (in aggregate form) to be provided to the Data Manager (vendor to the California Alternative Energy and Advanced Transportation Financing Authority - CAEATFA as the California Hub for Energy Efficiency Financing).

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 project 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 dashboards) to determine if the observed ex post savings match ex ante estimates. If 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 for his/her projects; they could be removed from the program. Early monitoring may also identify issues in the calculations used by contractors to estimate predicted energy savings.

4.2 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
Increase number and type of contractors participating in financing programs	Number of participating contractors – total and by type (e.g., lighting, HVAC, etc.)	TBD
Increase number of customers participating in financing programs	Number of participating customers - total and by customer type	TBD
Enable greater flexibility for projects that can be financed	Number of projects - total, and by end use (e.g., lighting, HVAC, etc.), and percent of multiple end-use projects	TBD
Increase participation by service providers in energy efficiency projects	Number of service providers participating	TBD
Enable a range of energy savings	Minimum, maximum, and median energy savings (kWh and therms) per project	TBD
Offer a range of loan sizes to serve various market needs	Average and median loan size (\$) – overall and by customer type	TBD
Allow a range of customers to participate, particularly Small-Medium Businesses	Average and median customer size (annual kW use)	TBD
Provide high savings per dollar spent	Average and median savings per loan amount (kWh savings/\$ loan)	TBD
Enable a range of projects relative to customers' energy use	Minimum, maximum, and median savings per participant's annual usage (kWh saved / total kWh pre-project)	TBD
Customers repay all loans by end of loan period	Repayments (% of loans)	TBD
Repayment of OBF loans to fund future projects	Default rate (% of loans)	TBD

5. Process Evaluation

PG&E proposes to conduct a process evaluation of the 2016-2019 OBF_AP. 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 NTG ratio. As part of program design, PG&E will work with the ED to develop a NTG battery that is customized to the OBF_AP, as described in Section Self-Report Estimate of the NTGR.

PG&E proposes that the survey ask attribution-related questions regarding issues that will 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 vendor. Specific questions may vary depending on the project type. As examples:
 - i. For equipment installations: What level of efficiency the customer would have installed 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 lighting replacement projects: What type of lighting 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 lamps replaced, whether controls would have been included)
- d. Feedback on the overall program, including feedback on the contractor's performance, the application process, and overall satisfaction with the program
- e. 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 such as those shown in survey question (c) will be used to calculate NTGR which can be multiplied by the gross savings to yield a separate estimate of net savings which can be compared to the net savings produced by the quasi-experimental design. Survey question *c* and the supporting questions can also guide the evaluators in identifying the appropriate mix of customers for the regression model method of calculating net savings.

5.1 Research Objectives

The process evaluation will collect data 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
- Identify program achievements
- Compare strengths, weaknesses, market segments served, and cost effectiveness for the Alternative OBF program to the existing (traditional) OBF program
- Identify recommendations for program improvement, primarily for the Alternative OBF program, but also for the existing (traditional) OBF program.

5.2 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 and nonparticipating financial institutions.
- Participating customers (questions could be added to the quarterly survey,) and nonparticipating customers
- Nonparticipating energy service providers
- OBF staff

Nonparticipants may be interviewed as part of larger surveys – i.e., asked questions regarding the Alternative OBF as well as other programs, or as part of the screening survey to gather information on their energy-using projects for identifying them as a possible comparison group member (see the section, “Net Savings Regression Model”).

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 Alternative OBF Pathway and the main OBF program to identify possible improvements to the Alternative OBF Pathway and/or the main OBF program. In addition, PG&E will identify if the Alternative OBF 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.

5.3 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 site ID, customer ID, and Financing Pilot Program Identifier
- North American Industry Classification System (NAICS) code
- Consumption amounts, corresponding read dates, and read type (actual, vs. estimated and other non-actual reads) for pre and post project implementation
- Total project cost
- Amount of financing borrowed for the project
- Project contractor

- Energy efficiency measures installed
- Expected energy savings and source / methodology of energy savings projections
- Variables required to merge consumption data with program tracking data, such as account number and premise ID.
- Location information or other link to weather stations
- Customer tenancy information (the tenancy starting and ending dates)
- Information on whether site has solar PV, size (output) of PV array, and what date the solar PV was installed if it was installed during the EM&V timeframe

Some of these data will not be direct inputs in the regression model for estimating gross savings described below – e.g., project cost, contractor, and energy efficiency measures installed. 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).

6. Major Threats to Internal Validity

Because we propose that the quasi-experimental design for estimating net savings use a non-equivalent comparison group, 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 validity¹⁰ 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 also 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

¹⁰ 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)

been allowed in both sets of California EM&V protocols (PG&E et al., 1996; The TecMarket Works Team, 2006) as long as evaluators made 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 should 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 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 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 the 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)¹¹
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).

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 should be conducted.

7. Alternative Methods Considered

Before recommending the quasi-experimental design approach, we also considered the use of a randomized control treatment (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 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.¹²
- 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 are 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.

¹¹ 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

¹² 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.

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 a program such as OPower, in which participation is limited to receiving a monthly report.
2. **External validity.** RCT designs that involve random assignment to treatment and control groups are at a slight disadvantage when it comes to external validity¹³. 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 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”¹⁴. 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).

¹³ The issue of external validity concerns the extent to which one may safely generalize the conclusions derived from an evaluation.

¹⁴ Nexant, March 6, 2014: Memo summarizing PCG meeting findings on “Using a Randomized Encouragement Design to Evaluate the Statewide EE financing pilots”.

6. **Statistical power requirements.** In RED designs, sample size requirements are greater than the sample size requirements for a true experimental design. The power analysis¹⁵ 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.¹⁶ 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 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 opt into the OBF_AP 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 treatment to those control group customers that might seek to participate.

¹⁵ 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).

¹⁶ 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.

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California Cotton Ginners & Growers Assn	Green Power Institute	Seattle City Light
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California Public Utilities Commission	International Power Technology	Sempra Utilities
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