PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

June 27, 2016 Advice Letter, SCG 4948/ 4948-A

Ronald van der Leeden
Director of Regulatory Affairs
Southern California Gas
555 West Fifth Street
Los Angeles, CA 90013-1011

Subject: Disposition approving Advice Letter 4948/4948-A, SCG's Commercial High Opportunity Projects and Programs (HOPPs)- Commercial Restaurant Retrofit (CRR) Program

Dear Ronald,

The Commission Staff in Energy Division (ED) has determined that Southern California Company's Advice Letter 4948/4948-A is approved as supplemented on June 20, 2016. The Tier 1 Advice Letter is effective on the date SCG timely filed it, June 20, 2016.

Commission Staff in Energy Division reviewed the proposal using the Review Sheet provided in Attachment 2. On April 26, 2016, The Utility Reform Network (TURN), 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 SCGresponses.

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

Sincerely,

Ed Randolph
Director, Energy Division
California Public Utilities Commission

Cc:
Service list R.13-11-005
Pete Skala, Energy Division
Mona Dzvova, Energy Division

ATTACHMENT 1 Background, Discussion, and Conclusions

I. Background

On April 6, 2016, Southern California Gas (SoCalGas) 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 Program or Projects" (HOPP). SoCalGas proposed a commercial pay for performance program in the food service segment utilizing a whole building approach – the *Commercial Restaurant Retrofit (CRR)* program - which will provide incentives and support to SoCalGas commercial customers to increase the energy efficiency of existing food service buildings. The SoCalGas CRR Program is a whole building retrofit program that will provide incentives for upgrades applicable to the whole building, which include kitchen equipment, building envelope, lighting, water heating and HVAC measures. The whole building approach is designed to capture stranded energy savings not generally obtained in a measure by measure approach. The CRR program targets building owners or lessors of existing standalone commercial food service buildings in both cold and high-heat climates. This program will be implemented in collaboration with Metropolitan Water District (MWD), and an electric utility (yet to be determined), allowing for the CRR program to be evaluated by monitoring two key metrics: energy savings (therms and kWh) and water savings (gallons). This program is designed to incentivize projects from an existing condition baseline to or above code in order to encourage customers to implement retrofits that would not have otherwise occurred. Customers will receive pre- and post-measurement incentives. SoCalGas estimates that the CRR program will achieve at least a 15% reduction in both energy and water consumption for each project. The program will be implemented and evaluated (external) simultaneously. The program will also offer facility audits, technical assistance and energy efficiency education. SoCalGas will work with a program implementer, hired through a competitive solicitation process, to facilitate services such as marketing, audits and measure installation.

On April 26, 2016, TURN, filed a RESPONSE (comments) to SoCalGas's Advice Letter 4948. TURN indicated that it supports the proposal and requested that the CPUC approve it with additional guidance. TURN had specific recommendations for the Commission and stated that the Commission should require SoCal Gas to:

- Provide the Metropolitan Water District (MWD) proposed budget and financial contributions to the program
- Provide additional information about the budget, incentives, administration and marketing for the unidentified electric provider partnering with SoCalGas
- Provide a breakdown of program costs within the SoCal Gas budget
- Consult with stakeholders and submit a final incentive proposal in a PIP addendum

SoCalGas did provide written responses to TURN's Response to Commission staff on April 28, 2016. On April 28, 2016, SoCalGas responded to TURN's Response and provided comments to TURN's four recommendations to the Commission. SoCalGas included additional information in its response relating to the proposed partnership with the Metropolitan Water District. SoCalGas revised its CRR final proposal and included additional information about the pre and post incentives, and other substantive issues raised in TURN's Response.

In order to determine if the proposal was consistent with the requirements in the December Ruling, the Commission staff worked with its consultants and completed a Review Process Sheet that was shared with the Service List to R.13-11.005 on April 29, 2016. Commission staff initially reviewed the proposal April 13 but responded with a request for additional information from SoCalGas on April 18. SoCalGas responded on April 27 with responses to the 48 comments and questions submitted by Commission staff.

SoCalGas and Commission staff also had a meeting with SoCalGas on April 27 to review the feedback from Commission staff. The Commission staff submitted a final Review Sheet to SoCalGas on May 3 with additional direction and comments, and requested an "interim" redlined version of the revised proposal incorporating comments of the Commission staff. On May 3, SoCalGas submitted a redlined draft of the Advice Letter and Attachment A and B. The Commission staff responded with a few more comments and questions.

The proposal was suspended on May 5 (30 days after initial filing). The Commission staff requested that SoCalGas provide additional information and provide a detailed budget for the program. SoCalGas agreed to revise the proposal and submit an interim proposal before filing a supplemental proposal with the Commission. The interim proposal was submitted to Commission staff on June 8. After a thorough review of the interim proposal, the Commission staff informed SoCalGas that they could file the supplemental proposal with the Commission. The supplemental was filed with the Commission on June 20, 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.

SoCalGas proposes a core Commercial Restaurant Retrofit (CRR) Program within the food service sector that will apply a whole building retrofit approach to identify and address stranded opportunities within the commercial food service sector. The program will target owners and/or lessors of standalone buildings. The program will provide incentives for upgrades applicable to the whole building, including but are not limited to kitchen equipment, building envelope, HVAC, lighting and water heating measures, thus capturing a whole building approach and stranded energy savings that would have been otherwise overlooked. The CRR program is designed to incentivize projects to go from an existing condition baseline to or above code. There will be a pre and post incentive strategy which will be informed by analysis of data from energy and water meters. The program will be implemented and evaluated simultaneously.

The CRR Program will be a core offering and will not look to form a co-fund agreement between its electric and water partners. SoCalGas will work to identify an electric utility partner to implement all possible whole building electric measures. Once the electric utility partner is identified, the program implementation plan will be updated to reflect partnership roles and responsibilities. All possible whole building electric measures incentives will be paid by the electric partner once identified.

Electricity and water savings are anticipated from the proposed whole building intervention approach, although this program is offered by SoCalGas. SoCalGas has stated the program will target at least 15% savings in metered energy consumption. Staff expects this savings threshold will be targeted for gas measures, and encourages SCG to target similar levels of savings for electricity and water savings through the whole building audit process.

The revised advice letter states that customers in cold climate regions will be targeted. Commission Staff expressed concern that the focus on cold climates and space heating measures is misplaced in the restaurant sector. SoCalGas replied in their May 2, 2016 response to

comments[1] with additional detail that customers in both high heating and high cooling climates will be targeted initially, and provided a list of targeted cities. Staff expects that the targeting strategy outlined in the May 2, 2016 response will be followed.

Removed kitchen equipment may be resold in the used equipment market, which presents a problem with continued use of inefficient equipment on the grid. SoCalGas plans to investigate this issue in the customer surveys. Staff expects that SoCalGas will take the necessary action to remedy this issue if the customer surveys indicate that resale of removed equipment is a widespread problem.

2. Measure Treatment

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

SoCalGas supplemental filing adequately addresses outstanding concerns and meets the requirements of the December Ruling. Remaining concerns are itemized in the review sheet attached to this disposition letter. SoCalGas provided adequate information about the energy efficiency retrofit measures at a high level.

3. Savings Calculation Methods

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

The calculation methods for gross savings and net savings are included in the proposal and supplemental filing. SoCalGas will use a whole building approach compliant with IPMVP[2] Option C Whole Facility to determine gas and electric savings. This method determines the collective energy savings from all measures implemented in the treated facility. Regression-based energy models based on selected independent parameters will be used to estimate savings. The analysis method qualifies as a normalized metered energy consumption approach. Two types of whole facility data are expected in the targeted restaurants; monthly billing data from utility natural gas and electric bills, and short time interval natural gas and electric data from advanced metering infrastructure (AMI) or 'smart' meters. At least one year of continuous monthly data water consumption data will be collected from the MWD and a minimum of 12 months of both monthly and AMI data will be collected for the periods prior to and after the installation of the program measures for gas and electricity.

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.

In its comments TURN noted that SoCalGas did not provide a basis or justification for the incentive levels. TURN requested that SoCalGas create an opportunity to share its justification with stakeholders, as well as allow stakeholders to provide input for the utility to consider.

[1] Attachment D - Additional Information - ED Review Questions and SoCalGas Responses - (05022016)
[2] International Performance Measurement and Verification Protocol (IPMVP)

SoCalGas provided additional detail in the incentives proposed in the supplemental. They will use with a pre-measurement, upfront rebate for all kitchen equipment and whole building measures. The post-measurement incentive is $1.50 per therm and $0.40 cents/1000 gallons of water saved after 12 months of metered normalized data. The SoCalGas proposed incentive levels will use a hybrid incentive approach designed to capture deep savings and to leverage a metered approach to collect data. Total incentive levels for each project should not equal more that 50% of the total project cost.

SoCalGas assumes that the program can serve at least 50 customer participants per year with an average annual gas consumption of 50ktherms. The budget includes both pre and post incentives, administrative, marketing, implementation and M&V costs.

TURN commented on the proposed incentive structure and advised the Commission to "…neither approve nor deny SoCalGas's incentive proposal at this time." The Commission staff Requested additional information from SoCalGas about the incentive structure and is satisfied that SoCalGas clarified and detailed the approach. The proposal also includes annual reporting which will support transparency and comment on effectiveness of incentives and other program components.

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.

SoCalGas' Commercial Restaurant Retrofit (CRR) Program is a whole building retrofit program. The CRR Program utilizes a hybrid incentive approach which uses pre/post metered data to provide incentive payments. Upfront incentives are provided as seed capital to start the retrofit activities, and a pay-for-performance approach is utilized to provide additional incentives based on energy savings achieved.

The pay for performance component of the program will utilize a normalized metered approach compliant with IPMVP Option C – Whole Building and ASHRAE Guideline 14 – Measurement of Energy, Demand, and Water Savings. Attachment B to the Advice Letter describes the normalized metering approach. The program will target standalone projects with single gas, electric and water meters. Additional criteria include targeting facilities where no significant change to the facility is expected before or after program intervention and there is a reasonable correlation between energy consumption and routine (independent) variables utilized to normalize the pre/post energy consumption. Non-routine adjustments will be made to account for unexpected changes, as necessary. Independent variables expected to best explain energy consumption include outdoor temperature and restaurant operations and production data (such as number of meals served). The program expects to achieve at least a 15% reduction in energy and water consumption.

Two types of whole facility data are expected in the targeted restaurants; monthly billing data from utility natural gas and electric bills, and short time interval natural gas and electric data from advanced metering infrastructure (AMI) or 'smart' meters as available. Note, not all participants are expected to have interval AMI gas meters. A minimum of 12 months of both monthly data and AMI data will be collected for the period prior to the installation of the program measures

(the baseline period). The same data will be collected for the 12-month period following confirmation of measure installation and commissioning (the reporting period). For restaurants served by the Metropolitan Water District (MWD), at least one year of continuous monthly water consumption data will be collected from MWD during the baseline and reporting periods. For restaurants served by other water municipalities or districts, the restaurant owners will be required to provide at least one year of continuous monthly water consumption data during the baseline and reporting periods.

Staff notes that obtaining production data from restaurant owners can be difficult, especially during the baseline period. SoCalGas stated the availability of adequate production data is a condition of program participation. Staff also notes that the sufficient energy and water savings are required for successful implementation of the normalized metering approach. SoCalGas will conduct whole facility audits of each customer and recommend a package of measures that are expected to produce at least 15% reduction in consumption. The audit savings will be based on engineering calculations conducted by the program implementer. Staff requests review of the engineering calculations once the program implementer has been hired. Since this is a gas-centric program, staff notes that electricity or water savings may not meet the 15% threshold. SoCalGas states that it will estimate savings for measures not expected to meet the 15% threshold using alternative approaches, such as IPMVP Option A – retrofit isolation; or a deemed savings approach. Only savings estimated from the normalized billing analysis will be claimed for this program. Savings not estimated from the normalized billing approach may be claimed under other programs, but documentation of activities will be necessary for follow up evaluation.

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.

SoCalGas's supplemental filing adequately addresses outstanding concerns and meets the requirements of the December Ruling but Energy Division will work with the SoCalGas to reduce savings uncertainty to acceptable levels. Of note, the threshold for savings depends upon multiple factors and therefore creates uncertainty for each project. With the proposed gross savings approach, SoCalGas should be able to establish acceptable levels of uncertainty at the project level. Once an implementer is selected, SoCal Gas will work with Energy Division staff to review the identified audit procedures and energy savings calculations.

Based on market potential estimates and savings targets per customer, SoCalGas estimates this program to achieve 1.64 MMtherms savings over the next four years

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.

SoCalGas's supplemental filing adequately addresses outstanding concerns and meets the requirements of the December Ruling.

With this proposed program, there a number of influential parameters, which include weather conditions, production rate and operating schedule. An IPMVP-compliant whole building

pre/post metering approach is used to estimate savings. The approach will normalize energy savings for pre/post changes in weather, production and operating hours as appropriate.

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

This proposal does not address the application of Behavioral, Operational and Retro-commissioning activities (BROs).

Conclusion

For the reasons stated above, and the details and caveats outlined in the review sheet and supplemental filing this proposal is approved. Commission staff expects to continue collaboration with SoCalGas and the review team in resolving ongoing issues in the RFP and M&V stages of the program.

Ronald van der Leeden
Director
Regulatory Affairs

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June 20, 2016

Advice No. 4948-A
(U 904 G)

Public Utilities Commission of the State of California

Subject: Supplement: Southern California Gas Company High Opportunity Projects and Programs (HOPPs) - Commercial Restaurant Retrofit (CRR) Program

Southern California Gas Company (SoCalGas) hereby requests California Public Utilities Commission (Commission) approval of its proposed Commercial Restaurant Retrofit Program, consistent with Ordering Paragraph (OP) 2 in the *Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs or Projects* (Ruling), issued on December 30, 2015.

Purpose

This supplemental filing replaces in its entirety Advice No. 4948, filed on April 6, 2016. Advice No. 4948-A includes clarifications to the CRR Program as a result of the Energy Division Review Team's assessment.

Background

On October 8, 2015, the Governor enacted Assembly Bill (AB) 802, which amended Section 381.2 of the Public Utilities Code (Pub. Util. Code). Subsection (b) directed the Commission, by September 1, 2016, to authorize electrical corporations and gas corporations to provide incentives, rebates, technical assistance, and support to their customers to increase the energy efficiency of existing buildings.[1] In addition, subsection (c) authorized, effective January 1, 2016, electrical corporations and gas corporations to implement the provisions for high opportunity projects or programs and that the Commission shall provide expedited authorization for high opportunity projects and programs.[2]

[1] Pub Util. Code § 381.2(b)
[2] Pub Util. Code § 381.2(c)

In response to AB 802's directives, the Ruling outlines the necessary framework and guidance for the development and implementation of HOPPs. Additionally, the Ruling included an expedited review and approval process in which Program Administrators (PAs) shall submit program proposals as Tier 1 Advice Letters (AL).[3] Furthermore, the Ruling directed that each AL include the information specified in the Ruling, including the requirements set forth in Attachment A.[4]

Program Overview

The SoCalGas CRR Program is a whole building retrofit program that proposes to address stranded opportunities within the commercial food service sector. Specifically, the program will provide incentives for upgrades applicable to the whole building; these upgrades include but are not limited to kitchen equipment and building envelope measures thus capturing a whole building approach and stranded energy savings that would have been otherwise overlooked. The CRR Program will target owners or lessors of existing standalone commercial food service buildings in both cold and high-heat weather climate zones to guarantee a high impact of energy savings through space and water heating. The CRR Program will be implemented in collaboration among SoCalGas, Metropolitan Water District (MWD), and an electric utility, allowing for the CRR Program to be evaluated by monitoring two key metrics, energy savings (natural gas and electric) and water savings (gallons).[5]

The CRR Program is designed to incentivize projects to go from an existing condition baseline to or above code in order to encourage customers to implement retrofits that they would not have completed without the program incentive. These incentives would be provided both on a pre- and post-measurement of energy savings which is further described in Attachment A. This pre- and post-measurement incentive strategy which will be facilitated by metered data. This will also help serve to collect the necessary information needed for accurate saving evaluation. Additionally, in support of participants employing a whole building retrofit, this program will offer facility audits, technical assistance, and energy efficiency education.

Given that the program will be providing incentives calculated based on existing conditions, the program will need to be implemented and evaluated simultaneously. The evaluation will be conducted by an external evaluation, measurement, and verification (EM&V) contractor, as described in Attachment B. The evaluation will deliver preliminary results one year after the start of the data collection and will deliver annual reports at the

[3] The Ruling, OPs 1 and 2, page 36.
[4] OP 4, p. 37.
[5] The CRR Program will be a core offering and will not look to form a co-fund agreement between its electric and water partners. SoCalGas will work to identify an electric utility partner to implement all possible whole building electric measures. Once the electric utility partner is identified, the program implementation plan will be updated to reflect partnership roles and responsibilities. All possible whole building electric measures incentives will be paid the electric partner once identified.

end of each program year.[6] Further details on the EM&V contractor responsibilities are provided in Attachment A, Table 2.

The CRR Program will aspire to achieve at least 15% reduction in both energy and water consumption for each project. Upon approval by the Commission, SoCalGas anticipates the full implementation of the CRR Program in July 2016. To facilitate consistency, coordination, and communication, SoCalGas will work with a program implementer for services such as marketing, auditing, and installation of the retrofits. The program implementer will be hired by SoCalGas through a targeted competitive solicitation process.

Once the CRR Program is implemented, SoCalGas will evaluate the effectiveness of the CRR Program in achieving cost-effective savings in the food service segment. Should the approach be determined viable, the data could inform an expansion of the CRR Program to add more high gas usage segments, such as the health care and lodging customer segments.

On March 3, 2016 Energy Division provided parties to Rulemaking (R.) 13-11-005 with a review sheet that will be used by Energy Division Review Teams to assess each PA proposal. In an effort to assist in the review process, SoCalGas provides a reference to each PA proposal requirement as it relates to SoCalGas' CRR Program in Attachment C.

Clarifications to the CRR Program

Modifications have been made to Attachment A to:

- Revise the proposal to also target owners and lessors existing standalone commercial food service buildings in high heating climate zones.
- Clarify the program's applicable upgrades to whole building, the possible partnerships with other electric utilities, the customer eligibility requirements, and the program's incentive structure.
- Provide additional clarification on program implementation by adding a program process chart under the CRR Program Implementation Sequence Section.
- Clarify all possible measures incented by adding a Measure Treatment by Measure Category Table (Table 3).
- Provide annual budget detail on the CRR Program's estimated budget requirements.

Modifications have been made to Attachment B to:

- Include the collaborative efforts SoCalGas will take once an implementer is selected to review the audit procedures and energy savings calculations with Energy Division.
- Clarify the Net-to-Gross Adjustment for Net Energy Savings.

[6] SoCalGas will provide annual reports at the end of each program year in the SoCalGas Energy Efficiency Annual Report filed in May of each program year.

Protests

Anyone may protest this Advice Letter to the Commission. The protest must state the grounds upon which it is based, including such items as financial and service impact, and should be submitted expeditiously. The protest must be made in writing and received within 20 days of the date of this Advice Letter, which is July 10, 2016. There is no restriction on who may file a protest. The address for mailing or delivering a protest to the Commission is:

CPUC Energy Division
Attn: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102

Copies of the protest should also be sent via e-mail to the Energy Division Tariff Unit (EDTariffUnit@cpuc.ca.gov). A copy of the protest should also be sent via both e-mail and facsimile to the address shown below on the same date it is mailed or delivered to the Commission.

Attn: Sid Newsom
Tariff Manager - GT14D6
555 West Fifth Street
Los Angeles, CA 90013-1011
Facsimile No. (213) 244-4957
E-mail: snewsom@SempraUtilities.com

Effective Date

SoCalGas believes this Advice Letter is subject to Energy Division disposition and should be classified as Tier 1 (effective pending disposition) pursuant to General Order (GO) 96-B. It is in compliance with OP 2 of R.13-11-005. Therefore, SoCalGas respectfully requests that this Advice Letter be made effective on June 20, 2016, which is the date filed.

Notice

A copy of this Advice Letter is being sent to SoCalGas' GO 96-B service list and the Commission's service lists for R.13-11-005. Address change requests to the GO 96-B should be directed by electronic mail to tariffs@socalgas.com or call 213 244 3387. For changes to all other service lists, please contact the Commission's Process Office at 415-703-2021 or by electronic mail at process_office@cpuc.ca.gov.

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Ronald van der Leeden
Director – Regulatory Affairs

Attachments

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. **SOUTHERN CALIFORNIA GAS COMPANY (U 9O4G)**

Utility type:
☐ ELC ☒ GAS
☐ PLC ☐ HEAT ☐ WATER

Contact Person: Sid Newsom
Phone #: (213) 244-2846
E-mail: SNewsom@semprautilities.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas
PLC = Pipeline HEAT = Heat WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: 4948-A

Subject of AL: Supplement: Southern California Gas Company High Opportunity Projects and Programs (HOPPs) - Commercial Restaurant Retrofit (CRR) Program

Keywords (choose from CPUC listing): Energy Efficiency

AL filing type: ☐ Monthly ☐ Quarterly ☐ Annual ☒ One-Time ☐ Other

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

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[1]: N/A

Does AL request confidential treatment? If so, provide explanation: No

Resolution Required? ☐ Yes ☒ No

Tier Designation: ☒ 1 ☐ 2 ☐ 3

Requested effective date: 6/20/16

No. of tariff sheets: 0

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[1]: N/A

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

Protests 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:

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Ave.,
San Francisco, CA 94102
mas@cpuc.ca.gov and jnj@cpuc.ca.gov

Southern California Gas Company
Attention: Sid Newsom
555 West 5th Street, GT14D6
Los Angeles, CA 90013-1011
SNewsom@semprautilities.com

[1] Discuss in AL if more space is needed.

ATTACHMENT A

Advice No. 4948-A

Detailed High Opportunity Projects and Programs (HOPPs) Proposal for SoCalGas' Commercial Restaurant Retrofit (CRR) Program

Attachment A

Detailed High Opportunity Projects and Programs (HOPPs) Proposal for SoCalGas' Commercial Restaurant Retrofit (CRR) Program

A. HOPPs Principles and Program Rationale

The foundation for the SoCalGas HOPPs CRR Program resides under four overarching principles, as outlined in Assembly Bill (AB) 802: (1) the proposal addresses high opportunity; (2) greatly increases savings in existing buildings; (3) reaches stranded savings potential by utilizing new approaches; and (4) enlists interventions that could not be previously done.

The U.S. buildings sector consists of over 85 million existing residential and commercial buildings, and accounts for approximately 40% of the U.S.' primary energy consumption and 39% of U.S. carbon dioxide emissions.[1] Due to the expected gross addition of over 1 million buildings each year, the number of buildings in the United States is projected to grow to over 100 million by 2035.[2] However, existing buildings are projected to continue to dominate the market through that time. Efforts to reduce energy use in U.S. buildings will directly impact both residential homes and commercial businesses by saving money for both homeowners and business owners. The environmental impacts of energy use are also an important long-term economic consideration for businesses and homeowners. In particular, lower operating costs for businesses will translate to more competitive U.S. products and more jobs.

Existing buildings offer great potential for energy savings through the implementation of energy efficiency building retrofits. In 2010, 1.193 million new buildings were constructed in the U.S. compared to 82.7 million existing buildings. Similarly, in 2035, 1.114 million are projected to be built while the existing buildings count is expected to reach 104.85 million. This data clearly shows that the market, and therefore the energy savings opportunity for retrofitting existing buildings, is far greater than savings that can be realized in new construction.[3]

In addition, the existing commercial building sector is characterized by many diverse categories which includes, but not limited to offices, warehouses, lodging, healthcare, and food service. Specifically, the commercial food service sector segment accounts for some of the most resource-intensive commercial buildings, especially in terms of energy consumption and water use. The average energy use per square foot for a restaurant is approximately 258 kBtu, compared to the average commercial building where average energy use is 91 kBtu/sf.[4] Restaurants are high energy users primarily because of the large cooking loads associated with

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[1] U.S. Department of Energy. Windows and Building Envelope Research and Development Roadmap for Emerging Technologies. 2014. http://energy.gov/sites/prod/files/2014/02/f8/BTO_windows_and_envelope_report_3.pdf

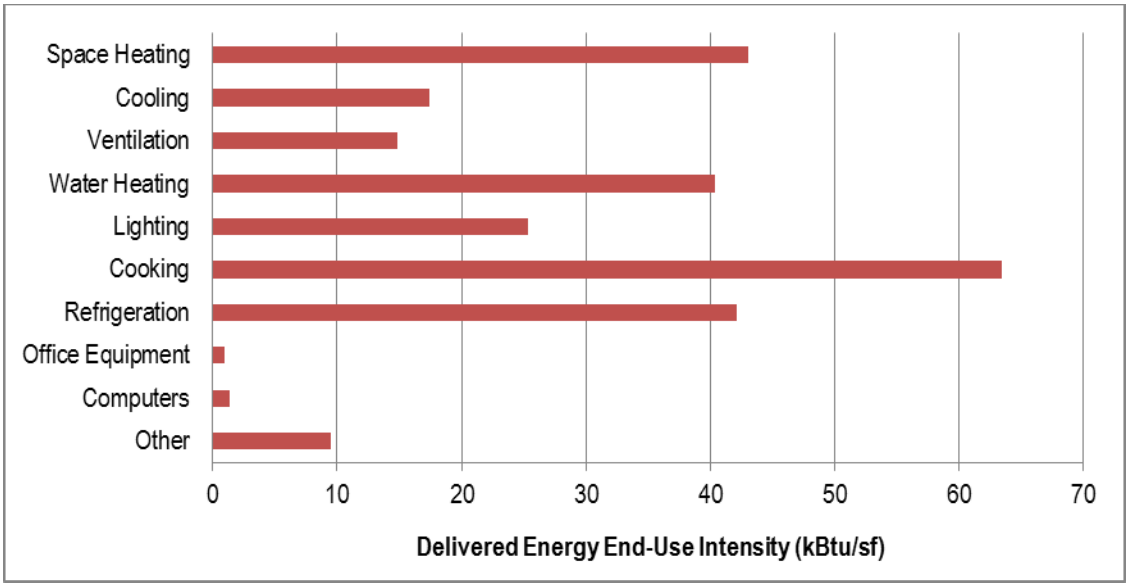
[2] *i.d.*

[3] *i.d.*

[4] U.S. Department of Energy. *Buildings Energy Data Book*. 2011. http://buildingsdatabook.eren.doe.gov/.

the commercial kitchens. If restaurant energy use is disaggregated between end uses, as illustrated below in Figure 1, cooking is the largest end use, followed by space heating, lighting, refrigeration, ventilation, cooling, and water heating. Escalating energy and other operating costs in the past few years has resulted in food service operators focusing more attention on their utility bills and seeking ways to reduce costs.

Figure 1 – Restaurant Energy End-Use Intensities (kBtu/sf) by Building Activity[5]



Based on the latest published California Commercial End Use Survey (CEUS 2009), Restaurants within SoCalEdison/SoCalGas territory consume 30.8% of the gas consumption and account for 9.7% of the electricity consumed within their territory.[6] For restaurants statewide in the LA Basin of the SoCalEdison/SoCalGas territory, cooking, water and space heating amount to their largest end use gas consumption. In the SoCalEdison/SoCalGas territory restaurants consume 153.50 Mtherms, 71% of this is utilized for cooking alone, 24% is used for water heating and the last 5% is used for space heating.[7]

Currently the commercial food sector does not employ an integrated retrofit approach in implementing energy efficiency in their establishments. Commercial food service building types, such as restaurants, typically only upgrade kitchen equipment and fail to observe the energy savings to be had from the whole building such as the building envelope[8], or savings from

[5] *I.d.*

[6] California Commercial End Use Survey (CEUS 2009). p. 219

[7] California Commercial End Use Survey (CEUS 2009). p. 223

[8] The building envelope is all of the elements of the outer shell that maintain a dry, heated, or cooled indoor environment and facilitate its climate control. Building envelope design is a specialized area of architectural and engineering practice that draws from all areas of building science and indoor climate control. The physical components of the envelope include the foundation, roof, walls, doors, windows,

space heating, cooling, ventilation, lighting, and water heating. Additionally, a substantial amount of water savings can be achieved by upgrading kitchen and irrigation equipment.

Currently there are approximately 35,000 commercial food service sector SoCalGas customers and only 5% of this segment of customers has actively participated in an Energy Efficiency SoCalGas program. SoCalGas' CRR Program specifically targets existing commercial food sector buildings and provides incentives for a whole building retrofit upgrade. Based on the recognition of the facts previously mentioned, the CRR Program focuses on a portfolio of whole building energy efficiency measures that capture a large potential of stranded energy savings and will provide new flexible incentive options that have not been done before. In addition, the retrofit approach is ideally suited to assist SoCalGas and its partners in transforming the commercial food service market in becoming a more energy efficient sector.

B. General Program Description

The CRR Program is a whole building retrofit program that addresses stranded opportunities within the commercial food sector. Specifically, the program will provide incentives for upgrade applicable to the whole building, these upgrades include but are not limited to both kitchen equipment and building envelope measures, thus capturing a whole building approach and stranded energy savings that would have been otherwise overlooked. The CRR Program will target owners or lessors of existing standalone commercial food service buildings in cold and high heat weather climate zones to guarantee a high impact of energy savings through space and water heating. The CRR program will be implemented in collaboration between SoCalGas, Metropolitan Water District (MWD), and an electric utility, thus allowing for the CRR Program to be evaluated by monitoring two key metrics, energy savings (natural gas and electric) and water savings (gallons).[9]

The CRR Program is designed to incentivize projects to go from an existing condition baseline to or above code in order to encourage customers to implement retrofits that they would not have completed absent the program incentive. These incentives would be provided both on a pre- and post-measurement of energy savings. This pre- and post-measurement incentive strategy which will be facilitated by metered data which will also help to collect the necessary information needed for energy savings evaluation. Additionally, in support of participants employing a whole building retrofit, this program will offer facility audits, technical assistance, and energy efficiency retrofit education.

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ceiling, and their related barriers and insulation. Common measures of the effectiveness of a building envelope include physical protection from weather and climate (comfort), indoor air quality (hygiene and public health), durability, and energy efficiency.

[9] SoCalGas will work with an electric utility partner to implement all possible whole building electric measures. Once identified, the program implementation plan will be updated to reflect partnership roles and responsibilities.

Given that the program will be providing incentives calculated based on existing conditions, the program will be implemented and evaluated simultaneously. The evaluation will be conducted by an external evaluation, measurement, and verification (EM&V) contractor, as described in Attachment B. The evaluation will deliver preliminary results one year after the start of the data collection and will deliver annual reports at the end of each program year. Further details on the EM&V contractor responsibilities can be found below in Table 2.

The CRR Program will aspire to achieve at least 15% reduction in both energy and water consumption for each project.

Full implementation of the CRR Program is anticipated in July 2016. To facilitate consistency, coordination, and communication, SoCalGas will work with a program implementer for services such as marketing, auditing, and installation of the retrofits. The program implementer will be hired by SoCalGas through a competitive solicitation process.

C. Intervention Strategy and Market Barriers Addressed

Once the CRR Program is implemented, SoCalGas will evaluate the effectiveness of the CRR Program in achieving cost-effective energy savings in the food service segment. Should the approach be determined viable, the data could inform an expansion of the CRR Program to add more high gas usage segments, such as the health care and lodging customer segments. The commercial food service sector represents a large unserved segment to program administrators attempting to promote and implement energy and water efficiency. Opportunities for addressing energy and water savings in the commercial food service segment fall into two main categories: kitchen equipment and whole building retrofit. Unfortunately, whole building retrofit is often the most overlooked opportunity in achieving the maximum amount of energy and water efficiency in commercial food service buildings. Restaurant owners and operators identify areas of cost reduction in their daily activities but primarily focus on kitchen equipment upgrades, ignoring the energy savings that can come about from building systems in which they conduct business in.

SoCalGas believes that the following intervention strategies are the key approaches to address specific market barriers in order to increase adoption of targeted energy efficiency improvements. Table 1 below provides examples of common barriers faced by the restaurant segment in regards to energy efficiency improvements and the intervention strategies that the CRR Program will utilize to overcome those barriers.

Table 1. Restaurant Segment Barriers and the CRR Intervention Strategies

Restaurant Segment Barriers In Implementing Energy Efficiency (EE)	Documentation of Barriers	How the SoCalGas Commercial Restaurant Retrofit Program Is More Effective than Existing Programs
Energy efficient upgrades are often more costly than standard equipment	***Incremental Costs:*** ENERGY STAR certified CFSS equipment is generally more expensive than standard equipment and can cost significantly more than refurbished models sold in the used equipment market.[10]	The CRR program will offer an upfront rebate (i.e., "pre-measurement" incentive) to the customer for a portion of the installed upgrade measures.
EE projects often compete with other investments and are viewed as to costly	***Lack of knowledge on cost benefits:*** Equipment suppliers and end users might not be aware of energy-efficient products, might have misperceptions about tradeoffs between energy efficiency and performance, or both.[11]	The CRR program will offer audits which will reveal the added long term cost reduction benefits and will provide "post-measurement" incentives to ensure a persistence of energy savings.
Lack of technical knowledge to incorporate key EE measures/retrofits	***Knowledge gap:*** According to a report in the 2010 ACEEE Summer Study on Energy Efficiency in Buildings, the lack of knowledge and understanding by both manufacturers and purchasers of CFS equipment is possibly the largest hurdle to improving the efficiency of equipment overall.[12] Very few suppliers or buyers understand the magnitude of the energy cost savings associated with ENERGY STAR qualified equipment and that these appliances could also be the best performers in their equipment class.[13]	The CRR program offers audit, modeling, and technical assistance.

[10] Department of Energy. *Energy Star for Commercial Kitchens: Helping Customers Manage Costs Through Energy Savings*. July 2013.
[11] *I.d.*
[12] 2010 ACEEE Summer Study on Energy Efficiency in Buildings. *Why Are Commercial Food Service Utility Incentives so Tasty? Best Practices and Technologies for Utilities to Create Energy- and Water-Efficient Restaurants.* http://aceee.org/files/proceedings/2010/data/papers/2058.pdf.
[13] *I.d.*

Conflict between landlords and tenants stemming from "split incentives" to install upgrades	Under most net leases, energy costs are paid directly by tenants and building owners aren't driven to invest in efficient building systems. Conversely, in many gross leases, building owners pay energy expenses and tenants have little incentive to save energy in their leased space. This dynamic is commonly referred to as the "split incentive" barrier to energy efficiency.[14]	The CRR program will offer deep energy retrofits and will drive much larger energy savings which in turn will create value for both the owner and the tenant. In addition, the CRR will allow incentive structure that benefits both parties.
No current intervention strategies that target whole building in the restaurant sector	Currently there are no existing Programs in the State of California that utilize a Whole Building Intervention Strategy for the Restaurant Sector.	The CRR program utilizes a new an integrated retrofit multi-measures approach that is allowed by the HOPPs framework.

D. Program Structure

To successfully implement the CRR Program, SoCalGas will work with a third party implementer to perform the initial market assessment and provide a list of targeted customers. The implementer will provide the necessary marketing and outreach materials that will help guide program participants. These materials will be designed to build customer awareness of whole building approach to commercial food service building retrofits and the many corresponding benefits of improving the energy savings potential and comfort of the entire facility. In collaboration with the MWD, SoCalGas will advise the implementer about the whole building components to ensure program consistency. Lastly, the implementer will be responsible for conducting facility audits, offering technical assistance on whole building retrofits, and metering for the program (additional details on meter requirements can be found under incentive structure and Attachment B). SoCalGas will conduct an expedited targeted competitive solicitation process to hire a third party implementer. SoCalGas will also seek support for EM&V for the roles listed in the following table as well as the work detailed in Attachment B. Table 2 below provides a summary of program responsibilities. SoCalGas, in collaboration with the MWD, will be responsible for the overall program design and any modifications needed for the program.

[14] US Dept. of Energy. Energy Efficiency and Renewable Energy Website. Better Buildings Alliance Home Page. https://www4.eere.energy.gov/alliance/activities/market-solutions-teams/leasing-split-incentive.

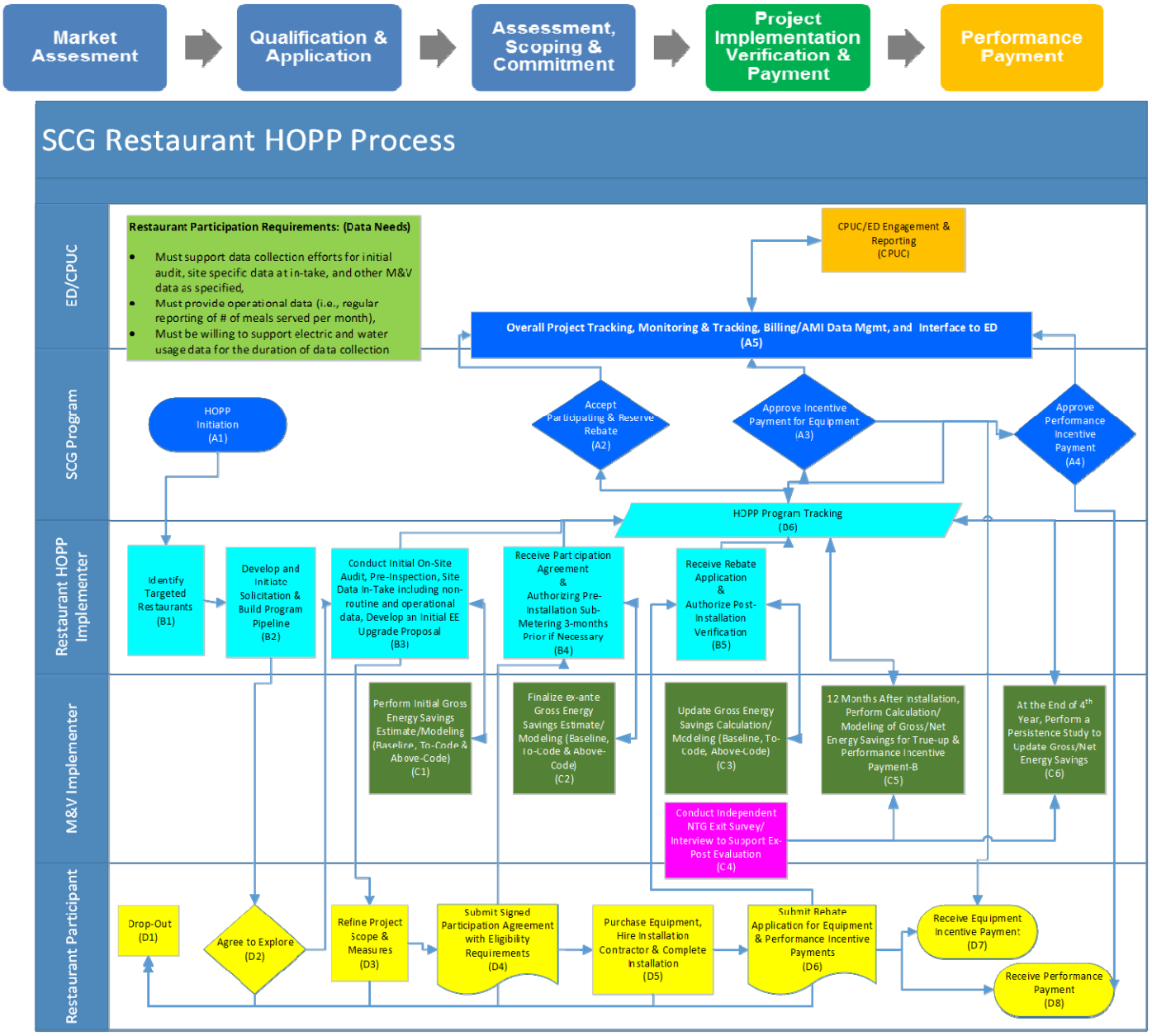
Table 2. Summary of Program Responsibilities

SoCalGas Responsibilities	MWD Responsibilities	Implementer Responsibilities	EM&V Contractor Responsibilities
Program design and project management	Program design and project management	Conduct outreach and marketing	Analyze billing/AMI, independent variables (routine), and non-routine variables
Maintain application procedures and materials	Maintain application procedures and materials	Conduct facility audits	Establish baseline energy performance
Advise on Whole Building components	Advise on Whole Building components	Offer technical Assistance for whole Building	Normalization
Track program data and provide usage/AMI data to M&E as applicable		Metering	Calculated energy savings and persistent
Monitor M&E analysis		Track all program data	Net-to-Gross adjustment for net energy savings
CPUC and ED Staff Coordination			

1. Program Sequence

The CRR program will follow a standard program sequence in order to provide a simple engagement process for both the implementer and the customer. Figure 2 below provides a descriptive schematic of the program sequence and the key milestones.

Figure 2. CRR Program Implementation Sequence and Process Flowchart



2. Customer Eligibility

Commercial Food Service customers with an active SoCalGas account or owners of commercial food service buildings that are served by an active SoCalGas account and have at least 12 months of historical billing data will be eligible to participate in the CRR Program. In addition, customers may participate in the CRR program provided they utilize a participating contractor per program guidelines.[15]

Participating contractors will work with the contracted implementer and will serve as a point of contact for customers and are responsible for submission of all program requirements. Participating contractors will install or ensure installation of all measures in accordance with Quality Assurance/Quality Controls and Measures Installation Standards guidelines in accordance with applicable contractor agreements.

All CRR Program participants must install a minimum of three unique kitchen equipment measures and whole building savings measures (i.e. building envelope, lighting) as applicable to the building facility. SoCalGas will not require that all kitchen equipment be upgraded nor all of one end use be upgraded (i.e all fryers).[16] Customers will be encouraged to upgrade as much as feasible to their business.

3. Incentive Structure

The CRR Program will utilize a hybrid incentive approach designed to encourage customers to capture deep energy savings and to leverage a metered approach to collect data. Upon completion of an audit, customers that agree to the retrofits after education and outreach will be informed of their eligible incentives:

i. Pre-Measurement Incentive
Customers who participate in the CRR program are eligible to receive standard up front rebates for all kitchen equipment and whole building measures installed.[17]

[15] Restaurant owner/program participant can hire any contractors for the retrofits, however, participants must allow SoCalGas to verify measures/equipment post installation. In addition, verification for quality installation and permitting within the city to ensure compliance with Title 24 requirements. Furthermore, periodic inspections of equipment and/or facility during the reporting period may be needed to identify non-routine adjustments. On-site inspections may also be conducted as needed to review equipment setting and restaurant business volume.

[16] All cooking equipment upgrades will remain in the same fuel category of their original equipment so as not to allow for any fuel substitution. For example if the original cooking equipment is all electric than the upgrades must also be electric. If the original cooking equipment is all gas than the upgrades must be all gas. No fuel substitution in measure upgrades will be allowed.

[17] https://www.socalgas.com/1443738381924/13069_SCG_EERB_Update2016.02R_web.PDF.

ii. Post-Measurement Incentive[18]

Program participants who comply with all program requirements are eligible to receive a post-measurement incentive of $1.50/therm after 12 months of main metered normalized data on energy saved and $0.40 cents per 1,000 gallon for reduction in water use.

iii. Sub-Meter Incentive

For customers with annual therm consumption greater than 50,000 and who agree to have their kitchen equipment sub-metered will be eligible to receive an additional $0.50 cents per therm after 12 months of metered normalized data on energy saved. All sub-metering costs would be paid by SoCalGas and will assist in providing detailed savings per measure based on actual savings achieved. Further detail on this methodology can be found in Attachment B.

iv. Lessor Occupied Buildings Incentive

In addition to the incentive levels described above and in an effort to utilize a new innovative incentive approach, SoCalGas will be offering a dual incentive for lessee occupied buildings. Owners of existing commercial food service buildings whose lessees participate in the CRR program will be eligible to receive a post measurement incentive equal to 20% of the post measurement incentive received by the lessee based on energy and water savings achieved.

This performance based approach will assist property owners and lessees with making informed decisions, identify measures for energy savings, and to maximize energy and water reductions for each commercial food service sector building.

Furthermore, total incentive levels[19] for each project should not equal more than 50% of the total project cost. SoCalGas intends to conduct a mid-point verification,[20] and if needed, an amendment for all incentive levels offered in this program to ensure the success of the program.

Funding Sources

Program applicants will be responsible to cover the costs of all installed measures. These encumbrances may include and are not limited to the estimated capital costs as well as identifying the sources of for funding the project. However, incentives will be provided through the program, and program implementers will provide program-related services, as shown in Table 2.

[18] Post measurement incentive payment will be based on the weather normalized required reporting period data as described in Attachment B.

[19] Total incentive levels equal the sum of both the pre and post incentives.

[20] SoCalGas will aim to conduct a mid-point verification after 15 projects have been completed and 12 months of weather normalized required reporting period data has been verified.

4. Measure Incented

The CRR Program objective is to promote long-term energy benefits through comprehensive whole building energy efficiency retrofit measures—including building shell upgrades, high-efficiency Heating, Ventilating, and Air Conditioning (HVAC) units, central heating and cooling systems, central hot water heating, and other deep energy reduction opportunities. These energy efficiency measures would be identified through the participants audit and a list of qualifying upgrades would be provided to the customer.

For ease of implementation and to leverage existing resources the CRR Program measures will mirror those provided in the *SoCalGas Energy Efficiency Rebates for Businesses: Rebate and Application Guide 2016*.[21] Table 3 below lists all of the possible measures applicable to the CRR program whole building retrofit approach. For more information on qualifying measures and treatment please refer to Attachment B.

Table 3. Measure Treatment by Measure Category

End Use	Measure	Intervention Strategy	Source Savings
Cooking	Commercial Cooking Equipment	Rebate and Post-Measurement Incentive	Deemed or Normalized Metered Based
Water Heating	Commercial Hot Water Boilers	Rebate and Post-Measurement Incentive	Normalized Metered Based
Space Heating	HVAC – Efficient Gas FurnaceInsulation	Rebate and Post-Measurement Incentive	Normalized Metered Based
Space Cooling	HVAC – Packaged Air Conditioner Insulation	Rebate and Post-Measurement Incentive	Normalized Metered Based
Water	Low-Flow Pre Rinse Spray Valve	Rebate and Post-Measurement Incentive	Normalized Metered Based
Lighting	Lighting controls LED Skylight Daylighting	Rebate and Post-Measurement Incentive	Normalized Metered Based
Ventilation	Commercial kitchen ventilation control	Rebate and Post-Measurement Incentive	Normalized Metered Based

[21] *i.d.*

E. Program Savings Potential and Program Objectives

1. Program Objectives

The program objectives for the CRR Program fall into two categories: performance objectives and process objectives. The performance objectives of the CRR Program are objectives that will be used to assess the performance of the HOPPs program to ensure it is meeting expectations and is on a path to succeed. The performance objectives will be carefully tracked and will be reported to the Commission so that SoCalGas can ensure that program progress can be conveyed properly. The process objectives are aimed at ensuring that a strong infrastructure for program implementation and evaluation that could support the scaling up of the CRR Program in the future.

Program Goals and Objectives:

- Assess incentive levels to identify and promote strategies to align financial and energy benefits for both owners and Lessees**;**
- Determine whether this model (whole building retrofit) approach is effectively more enticing to segment candidates to participate in rate payer funded programs and achieve greater energy savings;
- Demonstrate an effective pay-for-performance method to determine savings using weather normalized meter consumption data in a underserved segment; and,
- Establish a scalable model for the commercial existing building sector by incentivizing market participants to achieve measureable energy savings.

2. CRR Forecasted Energy Efficiency Savings

Based on market potential, the program's aspirational goal and the objectives mentioned above, SoCalGas estimates this program to achieve 1.64 MMtherms over the next four years. The table below are the program's annual estimates of potential MMtherms savings for the next four years.

	2016[22]	2017	2018	2019
Gas Savings (MMTherms)	0	0.421	0.547	0.672

[22] Program requires 12 months of post measurement data so energy savings will not be reported in 2016.

F. CRR Program Budget

In the December 30, 2015 Ruling, the Commission has authorized Program Administrators (PAs) to draw down unspent funds, or utilize funds from existing programs or use funds authorized for PA EM&V studies. SoCalGas provides the estimated CRR program budget below.[23]

		2016	2017	2018	2019	Total
	Administrative Costs	55,000	50,000	50,000	50,000	**$205,000**
	Marketing Costs	**30,000**	**30,000**	**30,000**	**30,000**	**$120,000**
Direct Implementation	**Incentive Costs**[24]	150,000	200,000	350,000	300,000	**$1,000,000**
	Implementer Costs[25]	200,000	200,000	200,000	150,000	**$750,000**
	Savings Measurement	50,000	50,000	50,000	50,000	**200,000**
	Total Initial Program Budget	485,000	530,000	680,000	580,000	**$2,275,000**

[23] Does not include incentive funds provided by MWD.

[24] Assumes 50 customer participants with an average annual consumption of 50K; Includes incentive both pre measure payments (assumes a $5K in upfront rebates per participant) and a post measure payment per participant with 15% of reductions on therm consumption. These incentive budgets only reflect gas measure savings payments.

[25] Includes external implementer fees, meter and meter installation costs.

ATTACHMENT B

Advice No. 4948-A

Evaluation, Measurement & Verification (EM&V) Plan

Attachment B

Evaluation, Measurement & Verification (EM&V) Plan

A. General Program Description

SoCalGas' Commercial Restaurant Retrofit (CRR) Program is a whole building retrofit program that addresses stranded opportunities within the commercial food sector. Specifically, the program provides incentives for the upgrade of both kitchen equipment and the building envelope thus capturing a whole building approach and the stranded energy savings that would have been otherwise missed. The program will target owners and/or lessors of existing standalone buildings in colder weather climate zones to achieve greater levels of energy savings through space heating.

The key underlying element of the CRR Program is its hybrid incentive approach which uses metered data, post-installation, to provide incentive payments. Through this pay-for-performance approach, SoCalGas can encourage program participants to strive for deeper energy savings. The CRR Program is one of the first programs of its type aimed at a near-term market transformation in the commercial food service sector and beyond through an intervention strategy with a retrofit emphasis. As such, the evaluation plan proposed herein is targeted at evaluating the performance of such a program. Evaluating programs that utilize baseline condition and pay-for- performance incentive strategies, as proposed in the CRR Program, is a challenging effort. While there are no predefined standards or procedures for evaluating this type of program, the EM&V plan below proposes to align with recent efforts in California to better conceptualize this area of evaluation methodology, specifically normalized metered energy consumption which is the current Commission requirement of HOPPs proposals including SoCalGas' proposed CRR Program.

B. Measure Treatment

The CRR Program objective is to promote long-term energy benefits through comprehensive whole building energy efficiency retrofit measures—including building shell upgrades, high-efficiency heating, ventilation and air conditioning (HVAC) units, central heating and cooling systems, central hot water heating, and other deep energy reduction opportunities. These energy efficiency opportunities would be identified through energy audits and a list of qualifying upgrades would be provided to the customer. Table 1 below lists in high-level detail the category of measures by end-use and the treatment of each qualifying measure category.

Table 1. Measure Treatment by Measure Category

End Use	Measure	Intervention Strategy	Source Savings
Cooking	Commercial Cooking Equipment	Rebate and Post-Measurement Incentive	Deemed or Normalized Metered Based
Water Heating	Commercial Hot Water Boilers	Rebate and Post-Measurement Incentive	Normalized Metered Based
Space Heating	HVAC – Efficient Gas Furnace Insulation	Rebate and Post-Measurement Incentive	Normalized Metered Based
Space Cooling	HVAC – Packaged Air Conditioner Insulation	Rebate and Post-Measurement Incentive	Normalized Metered Based
Water	Low-Flow Pre Rinse Spray Valve	Rebate and Post-Measurement Incentive	Normalized Metered Based
Lighting	Lighting controls LED Skylight Daylighting	Rebate and Post-Measurement Incentive	Normalized Metered Based
Ventilation	Commercial kitchen ventilation control	Rebate and Post-Measurement Incentive	Normalized Metered Based

C. Savings Calculations General Method

A whole building approach, described as Option C Whole Facility of the industry-standard IPMVP,[1] will be employed to determine the natural gas and electric energy savings for each participant, and for the program. Under Option C, a measurement boundary is drawn around the whole facility, and data from all of the facility's energy meters are used to determine the energy savings. Option C determines the collective energy savings from all measures implemented in the treated facility, and is most appropriate given the characteristics of the target market and Measurement & Verification (M&V) protocol of this program where:

- Baseline utility data is available to establish a facility's baseline energy performance
- The expected savings could exceed 10% and is large in comparison with the random or unexplained variation in the energy use data
- No significant change to the facility is expected before or after program intervention
- There is a reasonable correlation between energy consumption and routine (independent) variables
- Non-routine adjustments can be made to account for unexpected changes, as necessary

[1] International Performance Measurement and Verification Protocol (IPMVP), 2012, or IPMVP Core Concepts, 2014, available from the Efficiency Valuation Organization (EVO), at www.evo-world.org.

Regression-based energy models may be used to describe how selected parameters, such as weather and restaurant production rate, 'explain' the change in baseline period energy use. Typically, the parameters with the most explanatory power for energy use in a facility are used. While these models do not explain all energy use variations, if the savings are large in comparison, then the determination of savings is more reliable.

Two types of whole facility data are expected in the targeted restaurants: monthly billing data from utility natural gas and electric bills, and short time interval natural gas and electric data from advanced metering infrastructure (AMI) or 'smart' meters. We will refer to the monthly billing data as 'monthly data' and the short-time interval data as 'AMI data.' Both types of data may be used in the whole building approach; in general monthly data may be used with linear ordinary least squares regressions, while AMI data is used with advanced regression techniques that generally exhibit a degree of serial correlation. The differences in M&V analyses of data using different measurement frequencies is discussed in ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) Guideline 14 Measurement of Energy, Demand, and Water Savings, 2014.[2] ASHRAE Guideline 14 is a more technically detailed guideline than IPMVP. Therefore, concepts and formulas from ASHRAE Guideline 14 will be used in the estimation of savings and uncertainties for this program.

D. Data Collection Strategy

Required Energy Data[3]

The required energy data to be used in the whole building approach includes monthly utility bills of natural gas therms, electric kilowatt-hours (kWh) consumed in the billing period. Billing period dates are required so that the duration (in days) of the billing period may be determined. If AMI meters are present, then continuous readings of the natural gas therms and electric kWh consumed over the measurement interval are required. Typically, natural gas AMI data is recorded in daily time intervals, while electric kWh AMI data is recorded in 15-minute intervals.

To ensure there is sufficient baseline data for developing a baseline regression model, participating restaurants should have:

- At least one active gas meter and one active electricity meter serving the entire facility at the service address
- At least one year of continuous gas and electric energy data prior to program intervention

A minimum of 12 months of both monthly data and AMI data will be collected for the period prior to the installation of the program measures; this is referred to as the baseline period. The same data will be collected for the 12-month period following confirmation of measure installation and

[2] American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) Guideline 14, Measurement of Energy, Demand, and Water Savings, 2014. Available at www.ashrae.org.

[3] This is also known as the required reporting data needed which will be utilized for the post measurement incentive payment.

commissioning; this is referred to as the reporting period. It is often the case that less than 12 months of AMI data will be available for participating buildings. In such cases, we will evaluate the accuracy of AMI models on a case-by-case basis.

Required Water Data

For restaurants served by the Metropolitan Water District (MWD), at least one year of continuous monthly water consumption data will be collected from MWD during the baseline and reporting period. For restaurants served by other water municipalities or districts, the restaurant owners will be required to provide at least one year of continuous monthly water consumption data during the baseline and reporting period. Prior experience indicates that many water agencies are unable to provide these records. For such cases we will request the water bills from participating customers. We will evaluate water savings depending on availability of data on a case-by-case basis.

Data Quality

The quality of collected data will be evaluated to ensure data collected, either through manual reads or AMI, is continuous. The collected data will be reviewed to assure there are enough acceptable continuous data to complete the defined analysis procedures. Facilities with billing data gaps, estimated billing data, and missing data will be flagged, and may require additional data collection to meet the 12 months of continuous data requirement during the baseline and reporting period.

Independent Variables

Restaurants are expected to maintain comfortable indoor environment conditions through their HVAC and lighting systems, as well as provide prepared meals to their paying customers. For this program, electric and gas tariffs are assumed to have minimal impact on energy consumption. The influencing parameters expected to explain energy use are therefore ambient weather conditions and a production rate parameter, such as the number of meals prepared and served, which is expected to correlate to energy use that is consumed by the meal preparation equipment.

Weather

Ambient dry-bulb temperatures will be collected for each participant from a local government weather station in the building's climate zone for the period coincident with the energy use data (baseline and reporting period).

Production Volume/Occupancy

A suitable restaurant production rate parameter will be investigated. The parameter may be the number of meals served during the month or day, or the number of customers per day, or another parameter. The parameter may vary depending on the availability of data from participating restaurants. Data for this parameter will be collected for the period coincident with the energy use data (baseline and reporting period). From discussions with each restaurant, a normal year of production rate will be identified. If no normal year production rate can be identified, the reporting period production rate will be used in normalized savings calculations, described below.

E. Calculations, Regression Models and Description of Normalization

Monthly Data

The following methodology description is the same for the determination of natural gas therm and electric kWh normalized metered energy consumption and savings.

To estimate gross savings for each customer, a regression model using 12 months of energy use data, and corresponding heating degree-days (HDD), cooling degree days (CDD), and production rate (PR) will be developed. This model, and its variables are checked for explanatory power and accuracy, and the process is repeated until a valid regression model is achieved. After 12 months of reporting period data is collected, the normalized metered energy use and savings is determined. Program gross savings are determined from the cumulative sum of savings from all participants. The following provides a detailed step-by-step procedure of this analysis.

Step 1. Fit a degree-day regression model using the baseline period energy, weather, and production rate variables for each HOPPs customer. The model is shown in equation (1).

$$E_n = \alpha_n + \beta_H HDD_n + \beta_C CDD_n + PR_n + \varepsilon_n \quad (1)$$

Where:

$E_n =$	Energy consumption per day for baseline period n
$\alpha_n =$	Baseload energy consumption per day for baseline period n, estimated by the regression
$\beta_H =$	Heating coefficient estimated by the regression
$T_{amb} =$	Ambient temperature
$HDD_n =$	Heating degree days per day at the base temperature (τ_H) during baseline period n, based on daily average ambient temperatures on those dates, where $HDD_n = \sum_{i=0}^{n}(\bar{T}_{amb,i} - \tau_H)$
$\beta_C =$	Cooling coefficient estimated by the regression
$CDD_n =$	Cooling degree days per day at the base temperature (τ_C) during baseline period n, based on daily average ambient temperatures on those dates, where $CDD_n = \sum_{i=0}^{n}(\bar{T}_{amb,i} - \tau_C)$
$PR_n =$	Production rate per day for baseline period n
$\varepsilon_n =$	Regression residual

Examine the statistical significance of each independent variable (t-statistic for each coefficient should be greater than 2). Adjust the heating and cooling balance point temperatures and repeat the regression. Eliminate the extraneous variables. Calculate the model goodness-of-fit and accuracy metrics CV(RMSE) and mean bias error (MBE) to determine whether the model can be improved.

$$CV(RMSE) = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(E_i - \hat{E}_i)^2}}{\hat{E}} \quad (2)$$

$$MBE = \frac{1}{n}\sum_{i=1}^{n}\left(E_i - \hat{E}_i\right) \quad (3)$$

Where:

n = number of points used to develop the model,
E_i and $\hat{E}_i$ are the actual and predicted energy use values at time i.

Record the goodness-of-fit metrics CV(RMSE) and the mean bias error (MBE) and the selected heating and cooling balance point temperatures.

Step 2. After 12 months of reporting period data has been collected, fit a degree-day regression model using the reporting period energy, weather, and production rate variables for each HOPPs customer.

$$E_m = \alpha_m + \beta_H HDD_m + \beta_C CDD_m + PR_m + \varepsilon_m \quad (4)$$

Where:

E_m = Energy consumption per day for reporting period m
α_m = Baseload energy consumption per day for reporting period n, estimated by the regression
β_H = Heating coefficient estimated by the regression
HDD_m = Heating degree days per day at the base temperature (τ_H) during reporting period m, based on daily average ambient temperatures on those dates, where $HDD_m = \sum_{i=0}^{n}(T_{amb,i} - \tau_H)$
β_C = Cooling coefficient estimated by the regression
CDD_m = Cooling degree days per day at the base temperature (τ_C) during in reporting period m, based on daily average ambient temperatures on those dates, where $CDD_m = \sum_{i=0}^{n}(T_{amb,i} - \tau_C)$
PR_m = Production rate per day reporting period m (i.e., number of meals served or number of customers)
ε_m = Regression residual

Step 3. Normalize the baseline period and reporting period energy use models to typical meteorological year (TMY) weather and production rate data. Use the TMY data set for the restaurant's climate zone. This is accomplished by inputting the TMY and production rate data from the reporting period year into the baseline and the reporting period models.

Step 4. Calculate the savings by subtracting the normalized reporting period energy use from the normalized baseline period energy use. Calculate the savings uncertainty using equation (5) below, which is from ASHRAE Guideline 14-2014 for weather dependent models with uncorrelated residuals.

$$\Delta E_{base,norm} = 1.26 t_{(1-\alpha/2),n-p} \frac{\bar{E}_{b,g}}{\bar{E}_{base,n}} \sqrt{MSE \left(1 + \frac{2}{n}\right) g} \quad (5)$$

Where:

n =	number of points in baseline period
g =	number of points in typical year
p =	number of parameters in the baseline or reporting period regression models
$t_{(1-\alpha)/2,n-p}$ =	100(1-α)/2 percentage point of a t-distribution with n-p degrees of freedom (see table below, this specifies the confidence interval)
MSE =	$\frac{1}{n-p}\sum_{i=1}^{n}\left(E_i - \hat{E}_i\right)^2$, the mean squared error of the regression model
$\bar{E}_{b,n}$ =	mean energy use per period in the baseline period
$\bar{E}_{b,g}$ =	mean of the predicted normalized baseline energy use in the typical year, i.e. $\hat{E}_{b,g}/g$

Selected values of student's t-statistic are shown in Table 1 for various confidence intervals and values of n – p (degrees of freedom). Note that for monthly models and a year of baseline data, n = 12. The number of parameters in the monthly model will be on the order of 9 (n = 12, p = 3).

Table 1. Selected t-statistics.

	Confidence			
n - p	68%	80%	90%	95%
5	1.00	1.48	2.02	2.57
10	1.00	1.37	1.81	2.23
15	1.00	1.34	1.75	2.13
20	1.00	1.33	1.73	2.09
25	1.00	1.32	1.71	2.06
Infinite	1.00	1.28	1.65	1.96

To be discernable for each restaurant, the savings uncertainty should not exceed half of the estimated savings amount, expressed as a percentage of annual energy use. This means that the savings uncertainty should not be more than 50% of the estimated savings, a large value which we anticipate the projects will not approach. We will record the savings uncertainty for each HOPPs customer.

AMI Data

The following methodology describes the use of short time interval data when developing whole building energy models. While natural gas use is available in daily time intervals, and electric energy use is available in 15-minute intervals, the procedure for developing the models, assessing their goodness of fit and accuracy, and using them for determining savings under normalized conditions is very similar as that for energy models based on monthly data.

To estimate gross savings for each customer using their AMI data, a regression model using up to 12 months of energy use data, and corresponding ambient dry-bulb temperature (T) and production rate (PR) data will be developed. The model and its variables will be checked for explanatory power and accuracy. Should the model be unsatisfactory, the input parameters will be adjusted and the regression process repeated until a valid regression model is achieved. After 12 months of reporting period data is collected, the normalized metered energy use and savings is determined. Program gross savings are determined from the cumulative sum of savings from all participants. The following provides a detailed step-by-step procedure of this analysis.

An advanced regression modeling algorithm developed by Lawrence Berkeley National Laboratory will be used to develop energy models for this program. A detailed description of this model is provided in Appendix 1.

Step 1. Fit a time-of-week and temperature model that includes a production rate variable, using the baseline period energy, dry-bulb temperature, and production rate variables for each HOPPs customer. The model is shown in equation (6).

$\hat{E}_{o,b}(t_i, T(t_i), PR(t_i)) = \alpha_i + \sum_{j=1}^{n} \beta_j T_{c,j}(t_i) + \sum_{j=1}^{n} \gamma_j PR_j$, and

$\hat{E}_{u,b}(t_i, T(t_i)) = \alpha_i + \beta_u T(t_i) + \gamma_u PR_j$, and

$$\hat{E}_b = \sum_{i=1}^{n} (\hat{E}_{o,b} - \hat{E}_{u,b}) \quad (6)$$

Where:

The coefficients, α_i, β_i, and γ_i, are the regression coefficients for the time indicator, temperature, and production rate variables t, T, and PR respectively, and

$\hat{E}_{o,b}$, $\hat{E}_{u,b}$, and $\hat{E}_b$ are the occupied, unoccupied, and total baseline energy use, respectively.

The model coefficients may be determined using the Python or R programs or the M&V analysis module in PG&E's Universal Translator, version 3, as described in Appendix 1. Due to their extensive number of components, it is impractical to provide these models in spreadsheets.

Calculate the model goodness-of-fit and accuracy metrics CV(RMSE) and mean bias error (MBE) using equations (2) and (3) to determine whether the model can be improved.

Good values of CV(RMSE) and MBE are as low as possible. For daily gas models, good values of CV(RMSE) are about 10%, and for MBE less than 1%. If the values are too high and not acceptable, repeat the regression after adjusting input parameters or by eliminating the extraneous variables. Record the metrics CV(RMSE) and MBE.

Step 2. After 12 months of reporting period data has been collected, fit a time-of-week and temperature model that includes a production rate variable, using the reporting period energy, dry-bulb temperature, and production rate variables from the reporting period for each HOPPs customer.

$\hat{E}_{o,r}(t_i, T(t_i), PR(t_i)) = \alpha_i + \sum_{j=1}^{n} \beta_j T_{c,j}(t_i) + \sum_{j=1}^{n} \gamma_j PR_j$, and

$\hat{E}_{u,r}(t_i, T(t_i)) = \alpha_i + \beta_u T(t_i) + \gamma_u PR_j$, and

$$\hat{E}_r = \sum_{i=1}^{n} (\hat{E}_{o,r} - \hat{E}_{u,r}) \quad (7)$$

Where:

The coefficients, α_i, β_i, and γ_i, are the regression coefficients for the time indicator, temperature, and production rate variables t, T, and PR respectively, and

$\hat{E}_{o,r}$, $\hat{E}_{u,r}$, and $\hat{E}_r$ are the occupied, unoccupied, and total reporting period energy use, respectively.

Step 3. Normalize the baseline period and reporting period energy use models to typical meteorological year (TMY) weather and production rate data. Use the TMY data set for the restaurant's climate zone. This is accomplished by inputting the TMY and production rate data from the reporting period year into the baseline and the reporting period models.

Step 4. Calculate the savings by subtracting the normalized reporting period energy use from the normalized baseline period energy use. Calculate the savings uncertainty using equation (5) below, which is from ASHRAE Guideline 14-2014 for weather-dependent models with correlated residuals.

$\Delta E_{save} = \sqrt{(\Delta \hat{E}_{b,norm})^2 + (\Delta \hat{E}_{r,norm})^2}$, where

$\Delta \hat{E}_{b,norm} = 1.26 t_{(1-\alpha)/2, n'-p} \frac{\bar{E}_{b,g}}{\bar{E}_{b,n}} \sqrt{MSE \left(1 + \frac{2}{n'}\right) g}$, and

$$\Delta \hat{E}_{r,norm} = 1.26 t_{(1-\alpha)/2, m'-r} \frac{\bar{E}_{r,g}}{\bar{E}_{r,m}} \sqrt{MSE \left(1 + \frac{2}{m'}\right) g} \quad (8)$$

Where:

n = number of points in baseline period
m = number of points in reporting period
g = number of points in typical year
n' = n × (1-ρ)/(1+ρ), m' = m × (1-ρ)/(1+ρ)
ρ = autocorrelation coefficient, see ASHRAE Guideline 14-2014.
p = number of parameters in the baseline or reporting period regression models
$t_{(1-\alpha)/2,n-p}$ = 100(1-α)/2 percentage point of a t-distribution with n-p degrees of freedom (see Table 1, this specifies the confidence interval)
$MSE = \frac{1}{n-p}\sum_{i=1}^{n}\left(E_i - \hat{E}_i\right)^2$, the mean squared error of the regression model
$\bar{E}_{b,n}$= mean energy use per period in the baseline period
$\bar{E}_{b,g}$ = mean of the predicted normalized baseline energy use in the typical year, i.e., $\hat{E}_{b,g}/g$

Selected values of student's t-statistic are shown in Table 1 for various confidence intervals and values of n – p (degrees of freedom). Note that for hourly models and a year of baseline data, n = 8760. The number of parameters in the TTOW model will be on the order of 168 (hours of week) + 10 (temperature segments) + 1 (PR segments) ≈ 190. For daily models, this r is much smaller, ≈ 20, while the number of data points is 365. This means in both cases, n – p is still very large. We use the n – p = ∞ row below by convention.

To be discernable for each restaurant, the savings uncertainty should not exceed half of the estimated savings amount, expressed as a percentage of annual energy use. This means that the savings uncertainty should not be more than 50% of the estimated savings, a large value which we anticipate the projects will not approach. We will record the savings uncertainty for each HOPPs customer.

Submetered Data

In some cases submeters will be installed to monitor and record the natural gas use in the restaurant's space heating or meal preparation systems. While the meter's measurement interval is unknown, we anticipate that we will receive data in hourly or daily intervals. We will re-sample the data to daily intervals to correspond with the measurement interval of the natural gas AMI data.

The presence of submetered gas use enables the space heating and meal preparation end uses to be analyzed separately. The amount of savings as a percentage of annual gas use in each subsystem will be higher, and therefore more discernable above the model accuracy.

When natural gas submeter data is available, we will disaggregate the space heating use from the meal preparation use by subtracting the submeter data from the whole building AMI data for concurrent days. We will follow the same procedure to develop baseline and reporting period energy models and calculate normalized savings as described above in the AMI data section.

Program Savings

Program savings will be reported as the total gross savings achieved from each participating restaurant's first 12-month reporting period. That is, only the savings from the restaurants that have completed one year of metering after the measures have been installed will be included in the program savings total. The total savings achieved for that year will be reported with an estimate of the total savings uncertainty. The following equations will be used.

$$E_{tot} = \sum_{i=1}^{PY} E_{sav,i}$$

$$\Delta E_{sav,tot} = \sqrt{\sum_{i=1}^{PY} \Delta E_{sav,i}{}^2}$$

Where:

$E_{sav,i}$ = annual normalized energy savings for customer i

$\Delta E_{sav,i}$ = annual normalized savings uncertainty for customer i

PY = total number of completed projects in current reporting year

Absolute Changes Expressed with a Common Denominator

For each restaurant, the baseline period annual energy use for both natural gas and electricity will be summed to determine the total annual use without adjustments. Energy use intensities (EUIs) will be determined by dividing by the restaurant's square footage. This process will be repeated using the annual reporting period energy use to determine the post-installation energy use intensity for natural gas and electricity separately. The differences between baseline energy use and energy use intensity with reporting period energy use and energy use intensity will be determined. All values will be recorded and used in the program evaluation.

Non-Routine Adjustments

When unexpected or one-time changes occur during the reporting period, non-routine adjustments to the energy savings must be made. Unexpected changes include static factors which are not usually expected to change, examples include:

- Changes to facility size
- Changes to amount of conditioned space
- Types of products being produced
- Restaurant operating hours and number of production shifts per day
- Operation of installed equipment

The baseline conditions of these static factors need to be fully documented during the baseline period, and continually monitored for change throughout the reporting period, so that changes can be identified and proper non-routine adjustments made. The tracking of conditions may be performed by the restaurant owner, a project implementer, or a third-party verifier. Engineering

calculations will be used to quantify the energy impact from such changes using Option A, retrofit isolation techniques, and used in adjusting the energy savings. To the degree possible, energy impact from non-routine events will be calculated based on actual measurements.

Optional: Validating Models for a Population Sample

An optional task to validate our assumptions that accurate models may be developed and used to quantify the savings and uncertainty for the amount of savings expected for each customer may be explored. This activity would include collecting a sample of annual monthly billing data for restaurants in SCG service territory. The data would need to be from restaurants where no known energy efficiency measures have been implemented during the year of data collected.

Using this data, monthly energy models would be developed as described above in the Monthly Data section. For each model, its goodness of fit and accuracy metrics CV(RMSE) and MBE would be logged. In addition, using the formulation for calculating annual savings uncertainty, as described by equation (5), would be used to estimate the savings uncertainty that would be expected for different levels of savings.

Results of these runs as well as restaurant location, size, and other parameters of interest would be stored in a spreadsheet or database. These results could be queried to determine where this whole building approach would work well (good model fit, low uncertainties) and where it would not work well. The results may be able to determine how well small, medium, and large restaurants are suited to this approach, or whether there are more favorable climate zones. In addition, the results may enable screening criteria to be developed that helps assure future similar AB 802 projects and programs are successful. These methods are documented in the PG&E-sponsored Emerging Technology Report completed in 2013.[4]

Persistence

Energy savings can be tracked at 6 months, 12 months and 24 months into the reporting period to ensure savings persist throughout and beyond the reporting period. At each time interval, calculate the energy savings and evaluate its pattern with the following steps:

1. Calculate the Adjusted Baseline Energy Use with equation (1) for monthly data analysis, or equation (6) for AMI data analysis, using ambient temperatures and production rates from the reporting period.
2. Calculate the Actual Reporting Period Energy Use over the six, 12, or 24 month reporting period directly from billing data.
3. Energy savings at the specific time interval is the difference between the Adjusted Baseline Energy Use and the Actual Reporting Period Energy Use.
4. Chart the Adjusted Baseline Energy Use and the Actual Energy Use to determine if savings are accruing properly or whether non-routine events (NRE) have taken place.

[4] "Commercial Building Energy Baseline Modeling Software: Performance Metrics and Method Testing with Open Source Models and Implications for Proprietary Software Testing," Project number ET12PGE5312, available at: http://www.etcc-ca.com/reports/commercial-building-energy-baseline-modeling-software-performance-metrics-and-method-testing.

5. If evidence exists that an NRE has occurred, alert the program team to investigate. See the Non-Routine Adjustment section for procedures to calculate the impact of the non-routine event.

Modeling Transparency
Once an implementer is selected SoCalGas will work with Energy Division staff to review the identified audit procedures and energy savings calculations.

Strategy for Tracking Persistence
SoCalGas intends to track energy savings persistence at 12th and 24th months, post installation. This may be done by leverage existing billing infrastructure or AMI metered data depending on which is most accessible.

F. Threshold for Expected Savings

As described in the Savings Calculation section above, the threshold for savings depends upon multiple factors: the amount of anticipated savings expected from the project, the accuracy of the baseline and post-installation models used to calculate savings, the number of monitoring points in the baseline and reporting periods, and the confidence level at which savings uncertainty is reported. These factors combine to provide an estimate of the savings uncertainty for each project. Discernable savings requires that the maximum allowable savings uncertainty be 50% of the reported savings; however, this level of uncertainty is certainly too high for stakeholders. The lower the uncertainty, the better. With this proposed gross savings approach, we will be able to establish acceptable levels of uncertainty at the project level, as well as for the population of program participants.

This methodology will enable evaluation of typical rules of thumb that are used to establish a threshold for savings, such as a requiring a minimum of 10 to 15% savings on annual energy use when using Option C methods with monthly data. Once an implementer is selected SoCalGas will work with Energy Division staff to review the identified audit procedures and energy savings calculations.

G. Baseline Adjustments

Baseline adjustments are categorized as routine and non-routine. Routine adjustments to energy use are due to regular and expected changes in influential parameters. In many buildings, these parameters include ambient weather conditions, production rate, and operating schedule. Data for these parameters are collected and used to establish regression-based energy models that describe how baseline or reporting period energy use are adjusted so that savings may be calculated for a common set of conditions. This is the basis for the monthly and AMI data modeling approaches described in the savings calculation section.

Baseline Assumptions

The following is a list of the assumptions used to develop baseline energy models. Additional assumptions have been documented in Section C.

i) The data we collect and use in development of the monthly and AMI-based energy models will be appropriate and have sufficient influence on each building's energy use.
ii) Concurrent data for restaurant production rate (meals per day, customers per day, etc.) may be collected for the entire baseline and post-installation periods.
iii) Natural gas and electricity use in small, medium, and large restaurants may be accurately modeled using the monthly and AMI data methods described in Section C.

H. Net-to-Gross Adjustment for Net Energy Savings

The above energy savings calculation and methodology will derive the HOPP's gross energy savings. The proposed M&V protocol will go one step further to collect NTG data using a generally accepted NTG survey instrument at end of project installation. The benefit of this approach is timely free-ridership data collection before either memory or personnel changes. This survey instrument will be designed to look at the degree of free-ridership for each measure individually as well as in aggregate per project. The project will adopt generally applied survey design and methodology used by Energy Division and consultants. SoCalGas understands that CPUC is planning to conduct additional independent impact evaluation to verify the reported gross and net energy savings.

To minimize free-riders for the program, SoCalGas will conduct the following activities:

1. Conduct an initial customer eligibility assessment at the onset of the project. SoCalGas and the HOPP implementer will strive to eliminate burn-out measures and focus on early-replacement and building shell measures.
2. After the installation is completed, SoCalGas will engage an independent third- party M&E evaluator to conduct the NTG survey developed by the CPUC consultant who conducted the most recent commercial impact evaluation. The benefit of conducting an exit NTG survey is to capture timely response and feedback for the project.

By taking these actions, SoCalGas will be able to report both timely and meaningful gross and net savings for this HOPP. Separately, ED will be able to authorize additional ex-post impact evaluation for the CRR HOPP.

Appendix 1

Description of the LBNL Temperature and Time-of-Week Model

The following description includes paraphrased descriptions of the temperature and time-of-week model (TTOW model). For a more comprehensive description of the modeling algorithm, please consult the publication by Matthieu, et. al.[5].

- A facility's electric energy use is generally a function of ambient temperature and the time-of-week. In some cases, additional parameters influence energy use in buildings, such as humidity and a production variable. The TTOW model may include independent variables in addition to the time-of-week and temperature, if their data are provided in concurrent time intervals (such as hourly or daily time intervals). As the dominant influencing parameters for building energy use is the schedule of operation and ambient temperature, this model description focuses on the use of these parameters.
- The time-of-week parameter is modeled as an indicator variable. This allows some flexibility to define this parameter according to the time-interval of the data. Electric energy use data (kWh) from advanced metering systems is typically available in 15-minute intervals, ambient temperature data from weather stations are typically available in hourly intervals. Natural gas energy use data (therms) from advanced metering systems is typically available in daily time intervals. Therefore, the common time intervals used in the TTOW model are hourly and daily. The following description assumes hourly time intervals, but also applies for daily time intervals.
- Each week is divided into hourly intervals (indexed by i), with the first interval from midnight to 1 am Monday morning, the second from 1 am to 2 am, and so on for the 168 hours each week (7 for daily time intervals). A different regression coefficient for each time-of-week indicator variable, α_i allows each time-of-week to have a different predicted load.
- Energy response to temperature in a building is non-linear but may be modeled as continuous and piecewise linear. At low temperatures, electric energy use may increase as temperatures lower due to more use of heating system equipment such as pumps, fans, and electric heating elements. In moderate temperatures, the building does not require heating and cooling and therefore energy use is not sensitive to temperature. At warm temperatures, energy use increases with increasing temperature due to use of cooling system equipment. At the highest temperatures, energy use may again be insensitive to temperature as cooling equipment has reached its maximum load. There may be multiple regimes of energy response to temperature.
- The piecewise linear and continuous temperature at time *t*, $T(t_i)$ (which occurs at time-of-week interval *i*) is broken down into a number of component temperatures, $T_{c,j}(t_i)$, with j = 1

[5] Matthieu, J.L., P.N. Price, S. Kiliccote, and M.A. Piette, "Quantifying Changes in Building Electricity Use, With Application to Demand Response," IEEE Transactions on Smart Grid, 2:507-518, 2011.

to n_s (n_s being the number of line segments, usually no more than 10 to avoid overfitting). Each $T_{c,j}(t_i)$ is multiplied by β_j and then summed to determine the temperature dependent load.

- Boundary values of the temperature segments are defined by B_k (k = 1…n_s-1). And component temperatures are determined with the following algorithm (assuming n_s = 6):
    - If $T(t_i) > B_1$, then $T_{c,1}(t_i) = B_1$. Otherwise, $T_{c,1}(t_i) = T(t_i)$ and $T_{c,m}(t_i) = 0$ for m = 2 … 6 and algorithm is ended.
    - For n = 2 … 4, if $T(t_i) > B_n$, then $T_{c,n}(t_i) = B_n - B_{n-1}$. Otherwise, $T_{c,n}(t_i) = T(t_i) - B_{n-1}$ and $T_{c,m}(t_i) = 0$ for $m = (n + 1)$ … 6 and algorithm is ended.
    - If $T(t_i) > B_5$, then $T_{c,5}(t_i) = B_5 - B_4$ and $T_{c,6}(t_i) = T(t_i) - B_5$.
- The building is anticipated to have a different response to temperature in occupied periods versus unoccupied periods. The occupied load is estimated using the following equation:

$$\hat{E}_o(t_i, T(t_i)) = \alpha_i + \sum_{j=1}^{n} \beta_j T_{c,j}(t_i)$$

- Unoccupied loads are expected to have a single temperature parameter, since the building is expected to operate without sensitivity to temperature when systems are off during these periods. Unoccupied load is modeled with the following equation:

$$\hat{E}_u(t_i, T(t_i)) = \alpha_i + \beta_u T(t_i)$$

- The parameters α_i, for i = 1 to 168, β_j for j = 1 to n and β_u are estimated using the data from the baseline and post-installation periods with ordinary least squares.
- The total energy use estimated by the model is the sum of the occupied and unoccupied terms for each time interval.

$$\hat{E} = \sum_{i=1}^{n} (\hat{E}_o - \hat{E}_u)$$

- The model produces residuals that are auto-correlated and heteroscedastic, and the regression parameters α_i and β_j are correlated. This means that the standard errors associated with each regression parameter underestimates their level of uncertainty. However, uncertainty on the load predictions can be approximated with the standard error, which can be computed at each interval i.
- Two methods for implementing the TTOW model exist:
    1. This algorithm is available in Python programming language at the following link: https://pypi.python.org/pypi/loadshape/0.2.1. This includes an R program and a Python wrapper so that it can be called from within Python. The software allows the user to input streams of dates and time stamped energy use and ambient temperature data, manipulate parameters and develop linear regression models with

time-of-week indicators and ambient temperature as independent variables. The software calculates the α_i and β_j parameters according to the user-specified analysis time interval (e.g. hourly or daily) and number of line segments for the piecewise continuous temperature dependence. The Python and R programming environments are free to the public.

2. Under a California Energy Commission Public Energy Interest Research program grant, the TTOW model has been programmed as an analysis module in PG&E's Universal Translator version 3 software, available at no cost at the website www.utonline.org. The freely available software enables program administrators to prepare and develop M&V analysis, and allow technical reviewers to review the analysis for consistency, accuracy, and conformance with program and policy rules.

ATTACHMENT C

Advice No. 4948-A

Review Sheet Reference Matrix for SoCalGas Commercial Restaurant Retrofit Program

Attachment C

Review Sheet Reference Matrix for SoCalGas Commercial Restaurant Retrofit Program

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
Principles of HOPPs (p. 6)	1. Proposal will increase energy efficiency in existing buildings					Described in the Attachment A, Section "A. HOPPs Principles and Program Rationale"
	2. Proposal references studies, pilots, EM&V etc. that support the idea that this project/program is a high opportunity.					Described in the Attachment A, Section "A. HOPPs Principles and Program Rationale"
	3. 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 energy savings potential by utilizing the new approaches to value and measure savings.					Described in the Attachment A, Section "A. HOPPs Principles and Program Rationale"
	b) Focus on interventions that PAs could not previously do.					Described in the Attachment A, Section "A. HOPPs Principles and Program Rationale"
	c) If proposal is a modification to an existing program, then proposal should clearly identify the differences with the existing program and benefits of the proposal consistent with the HOPPs principals stated on p. 6.					Not Applicable; CRR program is a new approach to the Commercial Food Service Sector
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).					Described in the Attachment A, Section "B. General Program Description"
	2. Provides specifics on the terms of the program structure.					Described in the Attachment A, Section "D. Program Structure"

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
	3. Explains how the project/proposal addresses past challenges that have arisen with the business model being employed?					Described in the Attachment A, Section "C. Intervention Strategy and Market Barriers Addressed"
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).					Described in Attachment B, Section "B. Measure Treatment"
Savings Calculation Methods (p.25)	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.					Described in Attachment B, Section C., in the following sub-sections: (Section C does not list any sub-sections) • General Calculation Method • Calculations & Regression Models – Within the Monthly Data and AMI Data sections, Step 3 discusses normalized metered energy consumption and energy savings calculation, Step 4 addresses savings uncertainty.
	2. For deemed savings projects that are providing incentive payments based on ex ante values, standard custom project savings calculation methods apply.					Not Applicable; Not a deemed program for natural gas.
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 do not overrun the value of the realized savings.					Described in the Attachment A, Section D., Sub-Section "3. Incentive Structure"

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
p. 11-12)	2. Measure costs and capital burden—Identify the estimated capital costs, the sources of capital funding the project, and what portions of costs are to be borne by ratepayer and by implementer.					Described in the Attachment A, Section D., Sub-Section "3. Incentive Structure - Funding Sources"
	3. Partial or incremental payments with true-up over time-Describe the terms and schedule of the incentive payments.					Described in the Attachment A, Section D., Sub-Section "3. Incentive Structure"
	4. Strategy for tracking persistence—Describe the long term tracking and reporting strategy for sustained savings with ongoing feedback.					Described in the Attachment A, Section E., Sub-Section "1. Program Objectives"
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		Y			Described in Attachment B, Section C and E, in the following sub-sections: • Independent Variables – Discusses the variables included in the normalization process (weather, production volume/occupancy) • Calculations & Regression Models – Within the Monthly Data and AMI Data sections, Step 3 discusses normalization methodology
	b) Documentation of specific program actions that are intended to drive savings.					Described in the Attachment A, Section "C. Intervention Strategy and Market Barriers Addressed"
	2. Models, methods, and tools must use recognized engineering, economic, or statistical approaches to normalization.					Described in Attachment B, Section C and E, in the following sub-sections: • General Methodology & Background • Calculations & Regression Models – Monthly Data, AMI Data, Steps 3 & 4 • Appendix 1: Description of the LBNL Temperature and Time-of-Week Model
	3. Models, methods, and tools must be transparent, reviewable, and replicable by peer reviewers.					Described in Attachment B, Section C and E, in the following sub-sections: • General Methodology & Background • Calculations & Regression Models – Monthly Data,

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
						AMI Data, Steps 3 & 4 • Appendix 1: Description of the LBNL Temperature and Time-of-Week Model
	4. In addition to normalized savings as defined here, programs and projects shall also report absolute changes in consumption expressed with a common denominator.					Described in Attachment E, Step 4, in the "Absolute Changes Expressed with a Common Denominator" sub-section
	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.					Described in Attachment B, Section C, D, and E, in the following sub-sections: • General Methodology & Background • Required Energy Data • Required Water Data • Data Quality • Calculations & Regression Models *Behavior, Operational, Retro-commissioning not applicable to this program.
	6. Models, methods, tools must be transparent, reviewable and repeatable.					Described in Attachment B, Section C, in the following sub-sections: (Section C does not list any sub-sections) • General Methodology & Background • Calculations & Regression Models – Monthly Data, AMI Data, Steps 3 & 4 • Appendix 1: Description of the LBNL Temperature and Time-of-Week Model
	7. Meter does not necessarily equal whole building, so proposals must make clear the link between meter and building.					Described in Attachment B, Section B, Sub-Section "Meter and Measure treatment" (Section B does not list any sub-sections)
	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.					Described in the Attachment A, Section "C. Intervention Strategy and Market Barriers Addressed"
	9. If proposal deviates from Attachment A, PA must provide clear					Not Applicable

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
	rationale.					
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.					Described in the Attachment A, Section "B. General Program Description"
	2. Site level results will be discernable at building level for verification purposes.					Technical basis for discernibility described in Attachment B, in the following sections: • Section E, Calculation & Regression Models – Monthly Data, AMI Data, Step 4 • Section F, Threshold of Expected Savings
Threshold for Expected Savings (Attachment A p. 6-7)	1. Description of the expected saving from the proposed program or project intervention.					Described in the following: • Advice Letter, "Program Savings Potential", pp. 9-10 • Attachment A Section F, Threshold of Expected Savings
	2. Literature or field performance data demonstrating the expected impact and expected certainty of estimates.					Described in Attachment B, in the following sections: • Section E, Calculations & Regression Models – Monthly Data, AMI Data • Section F, Threshold of Expected Savings • Appendix 1: Description of the LBNL Temperature and Time-of-Week Model
Baseline Adjustments (Attachment A p. 8-9, and under "Normalized", p. 2)	1.Documentation of the baseline assumptions and strategy for collecting necessary information.					Described in Attachment B, in the following sections: • Section D, Data Collection Strategy • Section E, Calculations & Regression Models - Monthly Data, AMI Data, • Section G, Baseline Adjustments, 1. Baseline Assumptions
	2.Description of how normalization methods capture (or not) baseline assumptions.					Described in Attachment B, Section E, in the following sub-sections: (Section C does not list any sub-sections) • Calculations & Regression Models – Monthly Data, AMI Data, Steps 3 & 4
	3. Description of the methods that will be used to adjust the baseline for non-routine adjustments, when applicable for the type of proposal.					Described in Attachment B, Section E, "Non-Routine Adjustments" sub-section

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Application to Behavioral, Operational, Retro-commissioning (B.R.Os) (Attachment A p. 9-10)	1. Program/project proposals shall: Include requirement that participant sign up for a maintenance plan for at least three years.					Not Applicable
	2.Program/project proposal shall: Include requirement that participants commit to install a minimum set of measures according to PA pre-defined criteria.					Not Applicable
	3.PA is encouraged to include a training component to program/project offerings.					Not Applicable
	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 Applicable
	b) During the claimable expected useful life (EUL) period of one year, continuous feedback should be in place.					Not Applicable
	c) PAs shall consider incentive structures that encourage long term savings.					Not Applicable
	d) 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 Applicable
Financing (Attachment A p. 12)	1. Description of any use of financing programs or external financing to support the program or proposed project.					Not Applicable
Additional Comments from Review						Regulatory Lead: Elizabeth Baires EBaires@semprautilities.com Policy Lead: Lujuanna Medina

Compliance Area	PA Proposal Requirements	Not applicable	Initial Review: Included? Y/N	Full Review: Accept/ Don't Accept	Resubmission: Accept/ Don't Accept	Referenced Section in SoCalGas Advice Letter 4948-A
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