STATE OF CALIFORNIA Edmund G. Brown Jr., *Governor*

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

April 13, 2017

Advice Letter 5003-A and 5003-B

Ronald van der Leeden
Director, Regulatory Affairs
Southern California Gas
555 W. Fifth Street, GT14D6
Los Angeles, CA 90013-1011

Subject: Supplement – SoCalGas Assembly Bill 793 Implementation Plan

Dear Mr. van der Leeden:

Advice Letter 5003-A and 5003-B are effective as of April 6, 2017 per Resolution E-4820.

Sincerely,

Edward Randolph

Edward Randolph
Director, Energy Division

Ronald van der Leeden
Director
Regulatory Affairs

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August 11, 2016

Advice No. 5003-A
(U 904 G)

Public Utilities Commission of the State of California

Subject: Supplement - Southern California Gas Company Assembly Bill 793 Implementation Plan

Purpose

Southern California Gas Company (SoCalGas) hereby submits for approval by the California Public Utilities Commission (Commission) its proposed implementation plan to meet the legislative mandates in Assembly Bill (AB) 793, consistent with Joint *Administrative Law Judge's Providing Guidance on Compliance with Assembly Bill 793 Activities* (Ruling), issued on June 10, 2016.

This supplemental Advice Letter (AL) replaces AL 5003 in its entirety, filed on August 1, 2016, and seeks to inform on SoCalGas' current existing AB 793 offerings and to allow SoCalGas to offer two new program proposals that meet the objectives of Section 717 of AB 793 on January 1, 2017. In addition, this AL provides the necessary future AB 793 implementation efforts that SoCalGas proposes to offer in its portfolio after January 2017.

Background

On October 8, 2015, the Governor enacted AB 793, which amended Section 2790 and added Section 717, to the Public Utilities Code (Pub. Util. Code). Subsection 717(a) reads as follows:

(1) Develop a program no later than January 1, 2017, within the electrical or gas corporation's demand-side management programs authorized by the Commission, to provide incentives to a residential or small or medium business customer to acquire energy management technology for use in the customer's home or place of business.[1]

[1] Pub Util. Code § 717 (a) (1).

(2) Develop a plan by September 30, 2016, to educate residential customers and small and medium business customers about the incentive program developed pursuant to paragraph (1). The commission may require that the plan be integrated into, or coordinated with, any education campaign required by the commission.[2]

Lastly, Public Utilities Code Section 2790 was amended to include energy management technology as a component of home weatherization services for low-income customers.

In response to AB 793 directives, the Ruling outlines the necessary information and guidance to SoCalGas for submitting implementation plans to the Commission in order to meet AB 793 legislative mandates. Additionally, the Ruling included the process in which investor-owned utilities (IOUs) shall submit their AB 793 implementation plans as Tier 2 Advice Letters.[3] Furthermore, the Ruling directed that each AL include a joint marketing and education plan that is consistent across IOUs which is set forth in the accompanying attachments.[4]

SoCalGas initially filed AL 5003 on August 1, 2016, in compliance with the Joint Ruling. On August 4, 2016, the Commission's Energy Division requested that SoCalGas remove the Joint IOUs AB 793 Marketing Plan (Joint Plan) from its initial AL. Accordingly, this supplemental AL supersedes AL 5003, in its entirety, and is filed for the purpose of removing references to the Joint Plan. The IOUs Joint Plan will be filed separately via a Joint IOUs AL.

SoCalGas' AB 793 Implementation Plan

SoCalGas recognizes that Senate Bill (SB) 350 and AB 793 have amplified the need for new and innovative energy efficiency efforts across California. SB 350 clearly outlines a plan for the state to aggressively incorporate dramatic reductions in greenhouse gases and transition to resources less dependent on carbon-emitting resources. SoCalGas believes that energy efficiency is essential to meet these legislative objectives and that a paradigm shift is required on customer adoption of energy efficiency in order to reach the volume of energy savings needed to meet California's goals.

Based on the overarching principles described above, SoCalGas' AB 793 Implementation Plan outlines comprehensive, innovative, and scalable approaches for incorporating AB 793 into its existing energy efficiency portfolio.

SoCalGas' Implementation Plan includes strategies for increasing deployment of current demand-side program offerings that promote the energy management technologies (EMTs) consistent with the goals of AB 793. In addition, the Implementation Plan includes information on existing offerings related to AB 793 and future offerings anticipated post-January 2017, as presented in Attachment A of this AL.

[2] Pub Util. Code § 717 (a)(2).
[3] The Ruling, page 8.
[4] *I.d.*

Additionally, the Implementation Plan includes a comprehensive matrix of all EMT products currently offered by SoCalGas in its EE portfolio, as well as future EMT products under consideration. This EMT matrix identifies where each of these EMTs will be offered within SoCalGas' portfolio, as presented in Attachment B of this AL.

SoCalGas presents two new AB 793 program proposals to address the EMT needs of three market segments: Residential, Low-Income, and Small to Medium-Sized Commercial. To meet the needs of the Residential segment, SoCalGas is proposing a multi-measure deemed rebate program that offers a whole home energy management building solution. For the small to medium-sized commercial segment, SoCalGas will be targeting the lodging sub-segment by offering a pre and post incentive for energy management systems installed. This particular proposal will utilize a normalized meter based approach for claimable savings. Details of these proposals are presented in Attachments C, D, and E as well as their accompanying Evaluation, Measurement & Verification (EM&V) Plans located in Attachments D and F of this AL.

Lastly, the Implementation Plan includes SoCalGas local marketing, education and outreach strategies that outline the tactics that will be utilized within its service territory to actively promote energy management technologies to residential, low-income, and small to medium-sized commercial customers which will serve to enhance the anticipated AB 793 Joint IOUs Marketing Plan Tier 2 AL. Further details are presented in Attachment G of this AL.

Protests

Anyone may protest this AL 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 AL, which is August 31, 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 AL is subject to Energy Division disposition and should be classified as Tier 2 (effective after staff approval) pursuant to General Order (GO) 96-B. Therefore, SoCalGas respectfully requests that this AL be made effective on September 10, 2016, which is 30 calendar days after the date filed.

Notice

A copy of this AL is being sent to SoCalGas' GO 96-B service list, the Commission's service lists for R.13-11-005 and R.13-09-011. 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.

_____

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) #: 5003-A

Subject of AL: Supplement - Southern California Gas Company Assembly Bill 793 Implementation Plan

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: 9/10/16

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
EDTariffUnit@cpuc.ca.gov

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

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

ATTACHMENT A

Advice No. 5003-A

Detailed Implementation Plan in Compliance with Assembly Bill (AB) 793

Attachment A

Detailed Implementation Plan In Compliance with Assembly Bill (AB) 793

A. Overview

SoCalGas recognizes that Senate Bill (SB) 350 and AB 793 have amplified the need for new and innovative energy efficiency (EE) efforts across California. SB 350 clearly outlines a plan for the state to aggressively incorporate dramatic reductions in greenhouse gases and transition to resources less dependent on carbon emitting resources. SoCalGas believes that energy efficiency in its varied range of applications has the ability to meet tasks outlined by these essential state legislative measures. At the same time we see growing customer demand and requirements for more energy efficient systems and environmentally friendly energy solutions. Furthermore, SoCalGas recognizes a paradigm shift is required in the approach to EE programs in order to reach the volume of energy savings contemplated by the State and to meet customer needs. Fulfilling the requirements and meeting customers' needs will require innovative approaches, and possibly alterations to existing programs and measures to incorporate advancing energy management technologies.

Based on the overarching principles described above, SoCalGas' AB 793 Implementation Plan outlines comprehensive, innovative, scalable approaches for incorporating AB 793 into is energy efficiency portfolio. SoCalGas believes the AB 793 efforts outlined in this plan will also significantly meet the needs of the current and future market place.

Energy Management Technology Defined

Energy Management Technology (EMT) is a software, product, or service that helps customers manage their energy use. It provides the customer the ability to closely track their electric, water and/or gas use at specific times of the day or night; it educates the customer on how their home or building uses various forms of energy, and allows them to make more informed choices on when they should use or curtail use of certain products, appliances and or equipment. EMTcan also give the customer remote access to control certain products or equipment while they are away from their home or facility.

Existing Market Barriers to Adoption of Energy Management Technologies

Performance uncertainty is a key market barrier to greater adoption of energy management technologies. To overcome this perceived barrier, the product offerings must inform and convince residential and commercial customers on the energy and cost saving benefits. The promotion of a variety of energy management technologies by several market actors (e.g., retailers, home security services, utilities) reflects the disparate communications presented to the customer. It creates yet another market barrier, perceived opportunism and asymmetric information, which creates customer uncertainty in reliability of product information. These market actors are testing

incentives ranging from commercial appeal to ease of adoption as an add-on to other home automation services to reduce the customer hassle factor associated with adopting newer technologies. In general, industry experts have reported that potential market participants (home owners and business owners) lacked the understanding of the full benefits of energy management technologies, and maintained a perception of high first cost for the product relative to the assumed cost savings.[1]

EMT market adoption is dependent on the consumers' desire to: save money on their energy bills; build convenience or optimize their facilities energy usage into their home or facilities through intelligent energy usage for multiple end uses; and be proactive in preserving resources needed to generate energy. For IOUs, load curtailment and energy efficiency programs can increase awareness and effectiveness of energy management technology product benefits including energy savings and/or bill reductions. Three main opportunities exist for investor-owned utilities (IOUs): improved grid reliability, reduction in expensive power purchases, and meeting mandated-energy efficiency goals.

Industry experts indicate there is substantial global growth for energy management technologies such as smart thermostats, but the aforementioned market barriers are likely to keep the overall penetration rate of energy management technologies relatively low until such market barriers are reduced.[2]

Existing Policy Barriers to EMT

- California regulators share the market's concerns about EMT performance and associated benefits. In order to safeguard against overstating these perceived EMT benefits, current guidelines, set by regulators, limit the recognized energy savings which, in turn, protects the utility ratepayer investment in the promotion of such newer technologies. This barrier will need to be addressed by increasing the confidence in the reported EMT benefits through reliance on advanced metering infrastructure (AMI) data. AMI data can identify changes in energy consumption and usage patterns associated with EMI technologies through various measurement & verification techniques thereby overcoming the performance uncertainty barrier facing regulators, utilities and customers alike.

- The current California Public Utilities Commission (CPUC) definition of energy efficiency behavior programs is very narrow. It currently does not allow for IOUs to include or initiate behavioral interventions and does not allow for quasi experimental design.

[1] *Navigant Research Report: Standalone, Networked, and Learning Smart Thermostats: Global Market Analysis and Forecasts*. Q4 2013. p. 2

[2] *I.d.*

B. Strategies for Increasing EMT Adoption

To overcome the perceived market barriers and increase the adoption and application of EMT in the residential and small/medium-sized customer segments, SoCalGas will conduct initial market research to identify current customer awareness of EMT and related benefits including energy use management and bill reduction. This will create a baseline of current customer awareness. SoCalGas will also actively implement the following program intervention strategies:

- **Education and outreach** targeted at residential, low income and small/medium-sized commercial customers.
- **Partnerships** with key market actors including other energy utilities, vendors, retail networks, local governments, regional energy networks, community choice aggregators, and/or publicly-owned utilities.
- **Financial incentives**, including possible direct install and retailer point-of-sale, to reduce the first high cost market barrier perceived by the customer; and
- **Information** sharing that provides the customer secure and quick access to their energy usage thereby allowing customers to monitor their usage and make appropriate short and long term decisions on how to reduce their overall energy footprint.

C. Existing EMT Offerings

The Commission approved additional funding for the EMTs promotion to help alleviate potential grid constraints and to act as an early offering in response to AB 793 energy management technology requirements. In response, Southern California Edison Company (SCE) developed a program offering which includes a $75 customer rebate for the purchase and installation of a qualifying smart thermostat upon enrollment in SCE's Peak Time Rebate Direct Load Program (also known as "Save Power Days Program"). This also meets the intended first step in implementing AB 793 EMT requirements.

To create greater market adoption of EMT, SoCalGas partnered with SCE to co-promote EMT to shared customers. Specifically, SoCalGas has coordinated with SCE on its "Save Power Days Program" and is currently providing an additional $50 customer rebate for installation of qualifying smart thermostat.

SoCalGas continues to partner with SCE and other market actors (i.e. the Los Angeles Department of Water and Power (LADWP)) to leverage other existing programs that can be rapidly deployed throughout SoCalGas' service territory. Table 1 below further outlines additional information on energy management technology offerings that are currently or will be part of SoCalGas programs prior to January 1 2017.

Table 1. SoCalGas Existing EMT Offerings Expected by December 31, 2016

Program Name	SCE "Save Power Days" Demand Response	LADWP DI	SCG PLA
Program Description	Rebate for customers who install a qualifying smart thermostat.	LADWP Direct Install Smart Thermostat program	SCG existing PLA program amended to include a customer rebate for qualifying smart thermostats
Target Market	Single Family Residential	Single Family Residential	Single Family Residential
Total Program Projected Uptake	50,000	5000	20,000
Qualifying Products	Nest Learning Thermostat WeatherBug Energy Hub	Smart Thermostat	Nest Learning Thermostat WeatherBug Energy Hub
SCG Rebates	$50	$50	$50
Program Duration	July 6, 2016 through December 31, 2017	TBD	Ongoing beginning July 2016

D. New EMT Programs and Offerings

Augmenting SoCalGas' existing offerings and recognizing the strategies stated above to increase participation/adoption of energy management technologies, SoCalGas has identified a variety of new possible measures that could provide the necessary innovative EMT needs solutions for its customers. In addition, SoCalGas has presented two new program proposals that could address the needs of the applicable sectors identified in AB 793, specifically the Residential and Medium Commercial Sectors.

1. Recommended New EMT Product Offerings by Sector

SoCalGas utilized a cross-organizational team to identify all new possible measures that could possibly be categorized as energy management technologies. Then, through an internal vetting process, SoCalGas' team identified a list of potential offerings and the timeframe in which those measures could be incorporated into SoCalGas' energy efficiency portfolio. Those products are as follows:

Recommended Residential Product Offerings:

- ***Smart Thermostats***
- ***Smart Products***
  - Shower Feedback System
  - Smart Vents
  - Water Heater Controller
- ***Smart Appliances***
  - Smart Natural Gas Clothes Dryers
  - Smart Natural Gas Full Range Stoves
- ***Energy Usage Monitoring Application (existing)***
  - Bill Tracker Alerts
    - Available via text and email
    - Deployed weekly
  - My Account "Ways to Save" online tools, inclusive of the following suite of tools:
    - "My Savings Plan" and "My Energy Survey"
    - "Analyze Usage" [Advanced Meter-enabled hourly and daily natural gas usage and costs]
    - "Compare Bills" [bill analysis tool]
    - "Usage History" [monthly usage and cost history]
    - "Calculate Carbon Footprint"
    - A subset of the analysis tools above, including viewing of hourly and daily gas usage, are also available via the SoCalGas Mobile App.
- ***Energy Usage Monitoring Application (future development path)***
  - Potential future Energy Management Platforms (TBD)

Recommended Commercial Product Offerings:

- ***Small Commercial***
  - Smart Thermostat
  - Boiler Controller
- ***Medium Commercial***

- Energy management system with key components - (i.e. smart thermostats, equipment controllers, meter modules, web energy usage application)

Further descriptions as well as qualifying requirements, applicable vendors and market costs for each of the aforementioned products are contained in Section B and C of Attachment B. SoCalGas notes that these products are subject to a more thorough assessment of the expected energy savings and market viability.

2. New Program Proposals by Sector

SoCalGas identified two new potential programs that could be implemented and launched by January 1, 2017. These two new programs, the Residential Sector New Program Proposal and the Medium Commercial Sector New Program, can be offered to all three customer sectors. Both programs entail a comprehensive EMT solution for each sector and serve as rapid deployment. Once the AB 793 Implementation Plan is approved as outlined in this Advice Letter, SoCalGas plans to kick-off implementation of those proposals. Table 2 and 3 summarize at a high level the two proposals. Further details on these two new proposals can be found in Attachment C and Attachment E of this filing.

Table 2. **SCG Residential Sector New Program Proposal (*expected launch date January 1, 2017)***

Proposal	Residential Energy Management Technology Solutions
Target Market	Single Family Residential
Description	A multi-measure that requires the home owner to incorporate at the minimum three categories of smart energy management technologies that encourage both electric/gas savings as well as water savings. In addition, they will need to download a mobile/web application that will allow them to track and monitor their usage. This will assist single family residential customers to incorporate energy management technology while also improving their overall energy usage and awareness thus optimizing their energy and water usage.
Key Partners	Electric Utilities and Water Districts
EM&V Plan	Yes
Claimed Savings	Deemed
Incentive	•Deemed Rebate – Residential
Qualifying Measures	**ELIGBILE MEASURES[3]:** (Customers will need to install at least one measure from each 3 of the three categories and must enroll in an Energy Usage Monitoring application)[4] **Category 1: Gas** Smart Thermostat Shower feedback system *Smart Vents – HVAC Vents *Water Heater Controller **Category 2: Water** Shower feedback system **Category 3: Electric** Smart Thermostat Smart Strips *Smart Vents **SoCalGas Energy Usage Monitoring Applications Available to Customers** ▪ Bill Tracker Alerts

[3] Some eligible measures will have dual fuel savings but will only count as fulfilling one category thus encouraging the program participants to incorporate different EMT.
[4] Items identified with an asterisk are subject to change due to their market viability and uncertainty of claimable savings by Q1 2017. Future M&E research maybe needed and thus availability to program participants could be significantly delayed.

	▪ My Account
Critical Path to Implementation	•Identifying an Electric Utility partner and forming an agreement •Receiving approved Energy Division Deemed work papers in time for launch

Table 3. SCG Medium Commercial Sector New Program Proposal (*expected launch date January 1, 2017)*

Proposal	**Commercial Energy Management Lodging Program (CEMLP)**
Target Market	Medium Commercial - Hotels and Motels
Description	A program that will encourage and assist medium commercial customers to incorporate energy management technology while also improving their overall building performance with existing measures and optimizing their energy usage.
Key Partnerships	• Energy Management System (EMS) Vendor • Electric Utility
EM&V Plan	Yes
Claimed Savings	Metered-Based Approach – Medium Commercial (15k – 50k therms)
Incentive	• % Co-Pay– Energy Management System • Pay for performance: Audit the building, then use the either EMT or EMS system (control set points) to capture savings and incent the customer after 1 year of post implementation.
Qualifying Measures	Energy Management Systems
Critical Path to Implementation	Partnering with an electric utility to share costs and benefits.

E. Future EMT Offerings and Programs

As the market for EMT grows, energy usage monitoring applications will be more accessible to customers. Leveraging these applications will create a greater customer demand for access to their energy use information on a real-time basis.

1. Future Product Offerings

SoCalGas plans to promote more EMTs as they are introduced in the market. To support this future product development and promotion, SoCalGas will apply the following process:

2. Future Integrated Data Sharing Platform

Consumers have a high level of trust in information from their utilities; it is important to maintain this trust and relationship and leverage it by providing new energy data-enabled insights, tools and programs to consumers. Consumers expect to manage and control the energy use in their own homes and businesses, and are very open to utilizing utility tools. Further significant investments in software and infrastructure upgrades are required in the future in this area to not only provide more convenient energy usage data accessibility and customer-authorized data sharing with third parties, but also to allow for a wider range of secure integration with external home energy management EMT vendor software and applications. For SoCalGas, such investment would likely include build-out of a "Green Button Connect My Data" data sharing platform and/or similar customer-authorized data sharing platform(s), and would require CPUC authorization of the additional funding required to build out and operate such a platform. In addition, development of any sharing platform must also incorporate data security protocols and adherence to state and federal mandated rules regarding customer privacy provisions.

As a result, SoCalGas will initiate a development path for a more innovative data sharing platform for its customers as well. The timeline and critical paths to implementing are illustrated in Figures 1 and 2 below.

3. Green Button My Data and Future Opportunities

In Decision (D.) 11-07-056, the electric IOUs were required to implement the "Green Button Connect My Data" (or similar) data-sharing infrastructure and supporting operations. This platform provides a secure and private platform for customer-authorized data sharing with qualified third party-developed energy management applications and software. SoCalGas currently does not have a Green Button Connect My Data offering, however does offer the Green Button download feature. SoCalGas' Green Button download feature was launched within its My Account , "Ways to Save," "Analyze Usage" online tool June 2013.

As it currently exists, Green Button facilitated data integration requires web/mobile/software applications to gain authorization from consumers using specific standards. Such authorization can be obtained in several ways. For instance, a typical method requires the consumer to provide authorization using a webpage, similar to how Facebook and Google based applications request users to approve access to their accounts. Once this authorization is granted, the application is able to automatically retrieve the consumer's energy data without any further involvement of the consumer. This greatly simplifies the process of transmitting customer-authorized energy usage data transmittal to third party "Green Button" apps.

SoCalGas' Green Button download platform has limitations. First, there currently are few software/web/mobile applications that can consume Green Button natural gas interval data via the Green Button download process. Secondly, Green Button download requires users to manually download and upload interval usage data and lacks the automated, one-time authorization of data sharing features that "Green Button Connect My Data" offers.

SoCalGas believes however that the Green Button platform provides significant future opportunities. SoCalGas is currently evaluating and planning further enhancements, including the potential build-out of the more extensive Green Button Connect My Data or similar customer-authorized data sharing platform, subject to future authorized funding approval.[5] Further details on the estimated implementation of this task are also included in Figure 3 below.

[5] The cost to upgrade to a full Green Button Connect Platform has not been estimated and an authorized funding pathway to support such an upgrade for SoCalGas would need to be identified.

4. Future AMI Infrastructure Coordination

Currently AMI infrastructure presents a great opportunity to leverage not only real time data analysis, but also data sharing customer engagement attributes provide customers more granular and timely insights regarding their energy use patterns. SoCalGas' Advanced Meter infrastructure deployment continues through the AMI will be fully launched Q1 of end of 2017. SoCalGas will aim to identify leverage opportunities to incorporate new innovative products as well as integrating energy monitoring and measurement validation opportunities as the energy management market develops.

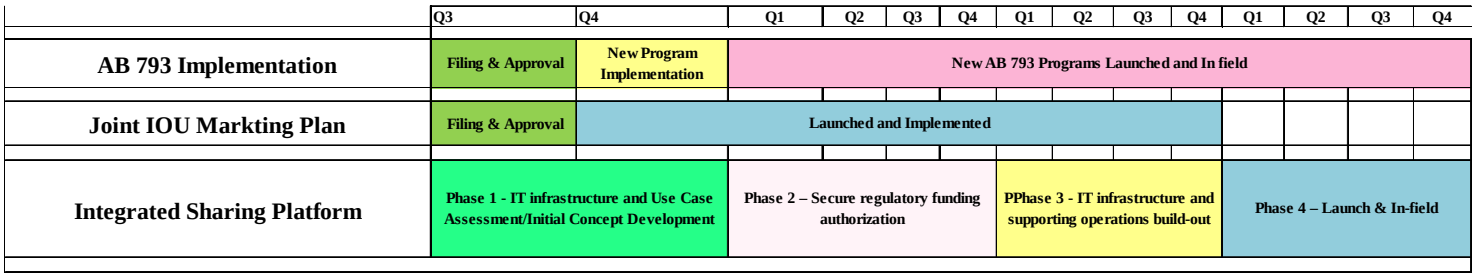
5. Low Income Market Segment

In accordance with AB 793 Section 717, SoCalGas will aim to assist low income customers in adopting and integrating energy management technologies within their homes. Once the anticipated ESAP decision is issued and upon a favorable CPUCapproval of SoCalGas' pending low income application, SoCalGas will seek to incorporate EMT into ESAP.[6] SoCalGas anticipates that the decision will likely be issued end of year 2016.

F. AB 793 Implementation Timeline and Product Roadmap

AB 793 preliminary offerings were launched in June 2016. SoCalGas now anticipates a full implementation in January 2017, with its new program proposals in-field and available to customers by January 1, 2017 as the legislative bill mandates. Figure 1 below provides a high implementation timeline.

Figure 1. SoCalGas AB 793 Implementation Timeline, 2017-2019



[6] If the upcoming anticipated ESAP decision does not address AB 793 measures, SoCalGas ESAP organization will seek alternative approved regulatory vehicles to have such measures integrated into the ESAP program.

Product Roadmap

Figure 2 below provides a visual product roadmap for the next 3 years for new products as well as future products planned. SoCalGas would note that given all of these products are subject to a more thorough assessment of expected savings and market viability this list could change once the plan is implemented. SoCalGas will consistently seek out products and services that enable customers to reduce their energy usage as well as meet the states grid and environmental goals. Products or services that cannot contribute to these needs will not be sought after.

Figure 2. SoCalGas EMT Offerings Product Roadmap

	2016		2017			2018				
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Smart Thermostat EE (Res)	Work Paper	Phase 1 - Launch & In- Field				Evaluate		Phase 2 - Expand & WP update		
Smart Thermostat EE (Small Com)	Work Paper (SDG&E Lead)		Phase 1 Launch & In-Field			Evaluate			Phase 2 - Expand	
Shower Feedback System (Res)	No Work Paper needed		Phase 1 - Launch & In-Field			Evaluate		Phase 2 - Expand & WP update		
Water Heater Controller (Res)	Internal Product Assessment		Work Paper	Phase 2 - Launch & In- Field				Evaluate	Phase 3 - Expand	
Smart Vents (Res)	Product Testing (PG&E Lead)		Phase 1 - ET Assessment	Work Paper					Phase 1 - Launch & In- Field	
Boiler Controllers (Com)	Phase 1 - ET Assessment		Evaluate		Phase 2 - Launch & In-field				Phase 3 - Expand	

In Home Display (Low Income)	**TBD[7]**										
Smart Appliances (Res)	Phase 1 - ET Assessment		**Evaluate**		Work Paper	**Phase 2 - Launch & In-field**					
Energy Management Systems (Com)	**No Work Paper needed**		**Phase 1- Launch & In-Field**			**Evaluate**				**Phase 2 - Expand**	
Mobile Apps (Res)	**TBD due to IT assessment and Integrated Sharing Platform**										
Green Button Data + (Res/Com)	**Phase 1 - IT infrastructure and Use Case Assessment/Initial Concept Development**		**Phase 2 – Secure regulatory funding authorization**				**Phase 3 - IT infrastructure and supporting operations build-out (again noted as subject to funding authorization).**				

[7] This product has been identified as a possible low income offering to meet AB 793 compliance. This products road map/assessment will be determined once the anticipated ESAP decision and if found to be a viable EMT offering for Low Income customers, SoCalGas will utilize the appropriate regulatory vehicle to have that included in its ESAP program.

ATTACHMENT B

Advice No. 5003-A

Detailed Overview on SoCalGas
Energy Management Technology (EMT) Offerings

Attachment B

Detailed Overview on SoCalGas Energy Management Technology (EMT) Offerings

A. New EMT Offerings Matrix

Table 1 below provides a list of current products and new products that are currently in the pipeline to be assessed. In addition, the table provides probable targeted segments and the possible intervention strategies that may be utilized. Since many of these products have yet to begin assessment SoCalGas would note that these products may no longer be pursued if the assessment proves they do not provide the energy efficiency needs of its customers.

Table1. SoCalGas Potential Energy Management Technology (EMT) Products Matrix

#	Product Name	Market Cost	Target Market Segment	Intervention Strategy	Incentive Payment	Projected Annual Uptake	Programs To Be Offered In
1	*Smart Thermostat*	$100-$225	Single Family Residential	Rebate	$50 rebate	20,000	• SCG PLA • SCE/SCG Save Power Days • SCG Residential EMT Solution Program
4	*Commercial Smart Thermostat*	$225-$350	Small Commercial	Direct Install	N/A	5,000	• SCG Small Business DI (SBDI) program
5	*Shower Feedback System*	$249	Single Family Residential Low Income	Rebate	$50	5,000	• SCG PLA • SCG Residential EMT Solution Program
7	*Smart*	$1099 -	Single Family	Rebate	TBD	<1,000	• SCG

#	Product Name	Market Cost	Target Market Segment	Intervention Strategy	Incentive Payment	Projected Annual Uptake	Programs To Be Offered In
	Natural Gas Clothes Dryers	$1300	Residential			(due to their current high cost)	Residential EMT Solution Program
8	*Smart Natural Gas Full Range Stoves*	$2200-$3500	Single Family Residential	Rebate	TBD	<1,000 (due to their current high cost)	• SCG Residential EMT Solution Program
9	*Smart Vents*	$250 – 8 vents $325 – 10 Vents	Single Family Residential	Rebate	$50 - 8 vents $75 – 10 Vents	5,000	• SCG PLA • SCG Residential EMT Solution Program
11	*Residential Water Heater Controller*	$50 - 60	Single Family Residential	Rebate	$5	3,000	• SCG Residential EMT Solution Program
12	*Boiler Controller*	$200-$1700	Small and Medium Commercial	Direct Install; Rebate	TBD	5,000	• SCG SBDI • SCG Commercial Rebate Program
13	*Energy Management System*	$0.10 – $1.00 per sq. ft.	Medium Commercial Lodgings	Pay for Performance	25% Co Pay 1.50 per therm Ex Post	100	• SCG Commercial EMT Lodging Program

B. Residential Sector Recommended Product Details by Product Category

1. Smart Thermostats

Qualifying Product	*Smart Thermostat*
Description	Home automation thermostat responsible for controlling a home's heating, and sometimes air conditioning. They allow the user to control the temperature of their home throughout the day using a schedule, such as setting a lower temperature at night.
Qualifying Requirements	• Scheduling and control through web and mobile applications • Providing data on energy consumption or HVAC status • Automatically installing software updates/upgrades • Customer performance reports • Occupancy sensor or geo-fencing
Market Costs Range	$100-$225
Available Vendors/Manufacturers	Nest (generations 1-3) Ecobee (Smart Si and ecobee3) Honeywell Lyric (WINK)
Savings Source	Work Paper filed, awaiting approval

2. Smart Products

Qualifying Product(s)	*Residential Water Heater Controller*
Description	Add-on or integrated modules provide Wi-Fi connectivity to storage or tank less water heaters. The monitoring systems provide feedback to billing occupants on usage, set point schedules, fault alerts, leak detection, and other information. The controllers can improve efficiency by identifying poor performance and communicating high water consumption or optimizing set point schedules.

Qualifying Requirements	• Must allow remote monitoring and control • Have fault detection and diagnostics, including water leakage • Ability to set temperature schedules
Market Costs Range	$50-$60
Available Vendors/Manufacturers	Rinnai WiFi Module Rheem Econet (Works with Rheem only water heaters; work with WINK Hub)
Saving Source	Currently being assessed

Qualifying Product(s)	**Shower Head Feedback System**
Description	Specialized sensor cuts off water flow when desired temperature is reached.
Qualifying Requirements	• Must be compatible with any shower and any stall size • Mobile applications that provides daily feedback results
Market Costs Range	$199-249
Available Vendors/Manufacturers	Evadrop Smart Shower
Saving Source	Work Paper

3. Smart Appliances

Qualifying Products	***Smart Natural Gas Clothes Dryers*** ***Smart Natural Gas Full Range Stoves***
Description	WiFi enabled appliance that offers usage tracking to help customers be smarter about their energy usage; wirelessly delivering the data straight to their computer, phone, or tablet. In addition, these appliances offer advanced troubleshooting guides and self-diagnosis capabilities designed to simplify maintenance for any user.

Qualifying Requirements	• Usage tracking • Remote alerts and controls • Smart Maintenance feature
Market Costs Range	Full range stove: $2200-$3500 Clothes Dryer: $1099 - $1300
Available Vendors/Manufacturers	LG Samsung GE
Saving Source	To be assessed

C. Commercial Sector Recommended Product Details

1. Energy Management Systems

Qualifying Product(s)	Commercial Energy Management System
Description	Customer can schedule, control and monitor water heating, space heating, cooling, lighting and other energy loads either on-site or remotely through the internet-enabled Web application, through wireless devices or mobile smartphone apps. Typically includes touchscreen module, smart thermostat, wireless module, and web application.
Qualifying Requirements	• Fast and easy installation • Short payback period typically 24 months • Must be scalable and customized to customer needs
Market Costs Range	Small Commercial Building Size- $500 -1,500 Medium Commercial Building size - $3,700 - $7,500
Available Vendors/Manufacturers	Ecobee EMS Siemens Echoview EMS

Saving Source	Normalized Metered Data

2. Smart Thermostats

Qualifying Product	***Commercial Smart Thermostat***
Description	Facility automation thermostat responsible for controlling building heating, and air conditioning. Allows user to control the temperature of their facility throughout the day using a schedule, such as setting a lower temperature at night.
Qualifying Requirements	• Scheduling and control through web and mobile applications • Providing data on energy consumption or HVAC status • Automatically installing software updates/upgrades • Customer performance reports • Occupancy sensor or geo-fencing
Market Costs Range	$250 - $350 per Smart Thermostat installed
Available Vendors/Manufacturers	NEST Honeywell Ecobee
Savings Source	Work Paper in development (SDG&E Lead)

3. Equipment Controllers

Qualifying Product(s)	**Boiler Controller**
Description	Monitors flow and return and varies the threshold settings and firing cycle in order to achieve genuine energy saving. The return temperature is used to determine when to reduce the boiler setting and when to extend the firing cycle, without affecting comfort levels.
Qualifying Requirements	• Wi-Fi Enabled • Communicates with EMS protocols

Market Costs Range	$200 - $1700 (depending on size of boiler unit and controller complexity)
Available Vendors/Manufacturers	Honeywell TekMar Concert
Savings Source	To be assessed

ATTACHMENT C

Advice No. 5003-A

Detailed AB 793 Proposal for SoCalGas' Commercial Energy Management Technology Lodging (CEMTL) Program

Attachment C

Detailed AB 793 Proposal for SoCalGas' Commercial Energy Management Technology Lodging (CEMTL) Program

A. CEMTL PROGRAM DESCRIPTION

The CEMTL program is an energy management system retrofit program that addresses incorporating energy management technologies within the commercial hospitality (hotel and motel) segment. Specifically, the program will provide incentives for the integration of energy management systems (EMS). The CEMTL program will target owners of existing medium sized commercial lodging facilities buildings within its service territory. The CEMTL program will be implemented in collaboration between SoCalGas, and an electric utility, thus allowing for the CEMTL Program to be evaluated by monitoring two key energy savings metrics, natural gas and electric.

The CEMTL Program is also designed to incentivize persistent energy savings in customer facilities over time. The program incentives would be provided both on a pre- and post-measurement of energy savings. This pre- and post-measurement incentive strategy will be facilitated by metered or billing data. The program will also help to collect the information needed for energy savings evaluation. Additionally, in support of participants utilizing an energy management system, this program will offer facility audits, technical assistance, and energy efficiency facility upgrade information.[1]

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 D. 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 CEMTL program will aim to achieve at least 10% reduction in both gas and electric energy consumption.

Full implementation of the CEMTL Program is anticipated in January 2017.

B. PROGRAM SAVINGS POTENTIAL AND CEMTL PROGRAM OBJECTIVES

[1] During the audit, program designers envision that a program participant could also be encouraged to incorporate additional EE upgrades prior to the EMS installed and thus capture additional savings.

Market Potential

Currently, there are over 3,000 North American Industry Classification System (NAICS) Code classified hotels and motels within the SoCalGas service territory with an annual usage of less than 50K therms.[2] Their annual gas consumption amounts to 21 MM therms and 64% of consumption accounts for space and water heating. Of those 3,000 classified hotels and motels, 400 would be categorized as medium commercial business as defined by this program. The medium commercial lodging facilities account for approximately 10 MM therms, approximately 48% of this sub-segment's annual overall consumption. The majority of their gas usage is also used for space and water heating.

Program Objectives

The program objectives for the CEMTL program fall into two categories: performance objectives and process objectives. The performance objectives of the CEMTL program are: (1) to assess the performance of the AB 793 implementation; and (2) to ensure it is meeting expectations and is on a path to succeed. The performance objectives will be actively monitored and will be reported to the Commission. The process objectives are aimed at ensuring a strong infrastructure for program implementation and evaluation that could support the scaling up of the CEMTL program in the future.

Objectives:

- Assess incentive levels to identify and promote strategies to align financial and energy benefits for facility owners;
- Determine whether this technology is effectively motivating customers within this segment to participate in rate payer funded EE programs and achieve greater energy savings;
- Demonstrate an effective pay-for-performance method to determine energy savings using weather normalized meter consumption data in a new segment; and
- Establish a scalable model for EMS in the commercial building sector by incentivizing market participants to achieve measureable energy savings and adopting this new technology.

CEMTL Forecasted Energy Efficiency Savings

Based on market potential and the program's objectives, SoCalGas estimates this program to achieve approximately 369,000 therms.[3] The table below is the program's

[2] Customers with an annual consumption above 50K are considered large commercial and are outside the scope of the legislative mandates of AB 793.

[3] Estimate is based on a 16% penetration rate of the SCG Medium Commercial Hotel customer segment multiplied by the 22% reduction of annual therm usage based on the average annual

estimates of potential MMtherms savings for the life of the preliminary implementation of this program. These estimates are aspirational and will be reassessed as post measurement savings are provided and verified.

	2017[4]	2018[5]	2019 and annually thereafter
Gas Savings (MMTherms)	0.0	.185	0.369

C. PARTNERSHIPS

Energy management systems serve to provide energy reductions both for gas and electric end uses. For this purpose it will be critical to the program's success to partner with an electric utility. SoCalGas is partnering with municipal electric utilities and other IOUs in the delivery of some aspects of this program. In such partnerships, this program will integrate electric measures, wherever possible. This program will operate in all regions within SoCalGas' territory with a particular focus on regions where partnerships with electric municipal utilities or IOUs exist.

In addition, SoCalGas will reach out to vendors of qualifying products to identify points of leverage, these could include but are not limited to:

- EMS market viability
- EMS installation advisement & technical support
- Facility audit support
- Technology training and outreach

Both utility and vendor partnerships will provide an additional enhancement to the implementation and success of this program.

D. PROGRAM STRUCTURE

To successfully implement the CEMTL 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 education and outreach materials specific to this program that will help guide program participants. These materials will be designed to build customer awareness of energy management systems to lodging facilities and the many corresponding benefits of optimizing the facilities energy usage, thus equating to dollars saved for the program participant. The

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usage of the SCG Medium Commercial Hotel customer segment. The 22% reduction is based on vendor historical findings in similar establishments across the country.

[4] This estimate assumes post measurement won't be completed until 2018.

[5] This estimate assumes only half of the customers will be reached by 2018.

implementer will be responsible in offering technical assistance on installations, conducting facility inspections as appropriate, and processing in-take surveys. SoCalGas will conduct an expedited targeted competitive solicitation 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 D. Table 3 below provides a summary of program responsibilities. SoCalGas, in collaboration with a partnered Electric Utility, will be responsible for the overall program design and modifications needed for the program.

Table 3. Summary of Program Responsibilities

SoCalGas and Electric Utility Partner Responsibilities	Implementer Responsibilities	EM&V Contractor Responsibilities
Program design and project management	Conduct outreach and marketing specific to this proposal	Analyze billing/AMI data, independent variables (routine), and non-routine variables
Maintain application procedures and materials	Provide different vendor options	Establish baseline energy performance
Advise on energy and water saving measures	Offer advisement on best EMS components to optimize energy savings	Normalization
Track program data and provide usage/AMI data to M&E as applicable	Offer technical assistance for installations	Calculated energy savings and persistence
Monitor M&E analysis	Conducts comprehensive energy audit on the facility and provide a key intake survey	Net-to-Gross adjustment for net energy savings
CPUC and ED Staff Coordination		

E. CUSTOMER ELIGIBILITY

NAICS Code classified (72110) Lodging Medium Commercial[6] customers 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 CEMTL program. In addition, customers may participate in the CEMTL program provided they utilize a participating contractor per program guidelines.

Participating contractors will work with the program implementer to 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 CEMTL program participants must install a qualifying energy management system as applicable to their building facility.

F. INCENTIVE STRUCTURE

The CEMTL Program will utilize a hybrid incentive approach designed to assist medium commercial lodging customers in incorporating the innovative, yet costly, energy management system.[7] Upon execution of an agreement, customers that agree to incorporate the energy management system will be informed of their eligible incentives:

Pre-Measurement Incentive
Customers who participate in the CEMTL program are eligible to receive a standard up-front payment of 25% of the installed project cost.

Post-Measurement Incentive
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 gas saved. The maximum incentives available to each project will be capped at 50% of the customer's total project costs.

This performance based approach will assist property owners with making informed decisions, identifying measures for energy savings, and maximizing energy reductions for each commercial lodging sector building.

[6] Medium commercial is defined for this program's purposes as greater than 15k therms but less than 50K therms in annual consumption.
[7] EMS are priced on a square footage basis and vary per facility, they also sometimes include at time service fees in which the customer will be required to participate once installed. This service fee is typically for the energy usage/monitoring service.

G. MEASURES INCENTED AND TREATMENT

The CEMTL program objective is to promote the adoption of energy management technologies, specifically an energy management system. In addition, the program's objective is to show the long-term energy benefits of this innovative technology in the commercial lodging sector. When the facility is audited prior to the Energy Management System (EMS) installation, additional energy efficiency measures could be identified through the participants and a list of qualifying upgrades could be provided to the customer.

For ease of implementation and to ensure consistency the CEMTL program will require that the EMS meet the following minimum requirements:

- Fast and easy installation;
- Short pay-back period - typically 24 months;
- Must offer multiple key components including but not limited to, smart thermostats, VFD's, equipment controllers, touchscreen, sensors, etc.);
- Remote access and control of onsite devices and systems available 24/7 through a Web and/or Mobile application; and
- Must be scalable and customized to customer needs.

H. CEMTL PROGRAM BUDGET

In the June 10, 2016 ALJ Ruling, the Commission provided the applicable options in which AB 793 implementation proposals could be filed based on the anticipated funding source request. For IOUs seeking to utilize current authorized funds, the IOU is authorized to file tier 2 advice letters and for those seeking new/incremental funding must file new applications.[8]

For the purposes of the AB 793 proposals and for considering the already existing budget constraints that currently exist within SoCalGas portfolio and the large incremental costs of implementing AB 793, SoCalGas will utilize existing funds for 2017 and request incremental funding to support years 2018 and 2019 in its upcoming energy efficiency business plan application scheduled to be filed November 1, 2016.

[8] AB 793 ALJ Ruling dated June, 10, 2016, p. 7.

		2017	2018	2019	Total
	Administrative Costs	$90,000	$93,000	$92,000	**$275,000**
	Marketing Costs	$55,000	$55,000	$55,000	**$165,000**
Direct Implementation	**Incentive Costs**	$250,000	$650,000	$500,000	**$1,400,000**
	Implementer Fee	$200,000	$230,000	$230,000	**$660,000**
	EM&V Costs	$50,000	$100,000	$100,000	**$250,000**
	Total Costs	$645,000	$1,128,000	$977,000	**$2,750,000**

ATTACHMENT D

Advice No. 5003-A

Commercial Energy Management Lodging Program: Evaluation, Measurement & Verification (EM&V) Plan

Attachment D

Commercial Energy Management Lodging Program: Evaluation, Measurement & Verification (EM&V) Plan

Program Description, Barriers and Goals

The Commercial Energy Management Lodging Program is designed to assist medium size hotels and motels to manage their energy usage by embracing Energy Management Systems (EMS), using an incentive co-pay and pay-for-performance implementation approach.

According to the latest California Commercial Saturation Survey (CSS) by Itron in 2014, roughly 2-4% of IOUs non-residential customers have EMS. The 2014 CSS report estimated 48% of installed EMS are considered to be fairly new (i.e., less than 5 years old). The availability of EMS is very much dependent on the size of businesses. While 60% of large business reported to have EMS, only 22% and 2% of medium and small business reported to have this capability, respectively.

SoCalGas estimates that less than 2% (i.e., low-end of the overall non-residential average) of the hotels/motels are likely to have energy management system. SoCalGas expects the percent of medium-size hotels/motels with EMS will be significantly less than the average medium-size businesses (i.e., less than 22%).

A recent Navigant Consulting Whitepaper[1] defined the new generation of Building Energy Management System as an "IT based solution that extends the capability of sensing, control, and automation hardware to direct both automated and manual improvements to system operations." These new EMS systems can be fully networked into cloud-based solution with end-to-end strategy to support:

- Visualization and reporting;
- Fault detection and diagnostic;
- Predictive maintenance and continuous improvement; and
- Optimization

The Commercial Energy Management Lodging Program is well poised to assist the medium size hotels and motels to embrace this new technology and to improve energy and resource utilization. The program goal is to reduce participant's energy usage by 10-12% per year by better utilizing the features/function of the EMS to reduce, improve, and optimize energy usage for both gas and electricity usage.

Eligible Measures

Energy Management Systems which may include smart thermostats, sensors, controllers and VFDs. For further details on qualifying products and requirements please see Attachment B, Section B.

[1] Next-Generation Building Energy Management Systems New Opportunities and Experiences Enabled by Intelligent Equipment, sponsored by Daikin Applied and Intel, Q2, 2015.

Program Theory, Barriers & Implementation Strategy
As California CSS reported above, only about 22% of the mid-size non-residential customers embraced EMS. SoCalGas theorized that the saturation level for mid-size hotels/motels is much below this level. This EMS program implementation is targeting this market segment to reduce medium-size hotels/motels' energy-intensity and to improve their energy utilization.

The IDSM Market Characterization Study[2] for Residential and Small Commercial Customers, defined core value of IDSM is to allow the customers to optimize energy management opportunities over various DSM measures. This study cited the following motivations for addressing energy management opportunities:

- Monetary savings;
- Long-term energy savings;
- Ease of use;
- Low risk; and
- Return on investment

Below is a list of adoption barriers for non-residential customers:

- **Limited manpower**—this will be important since medium-size hotels/motels may not have an engineering or on-site maintenance staff. The EMS project will need to compete for the property manager/owner's attention.
- **Different utility program and business time line**—the EMS is a business system investment and it will take time for the hotel/motel owners to consider the investment.
- **Capital expenditure and budget competition**—the EMS project will need to compete for limited investment resources with other urgent business and operational needs.
- **Constraints in technical expertise**—it may be important to identify a project champion early in the project to make sure the individual will receive the necessary EMS product training to get the most out of the installation.

Hotels/Motels' decision-making process is not homogenous and may vary significantly due to complex property ownership structures. The investment decisions are typically filtered up to two different groups: (1) management group, and (2) ownership group. For smaller properties, without site engineering/maintenance staff support, the decision-making process may be shorter in duration since the owners are typically directly involved in paying bills and managing energy usage.

A top down approach of targeting and marketing to hotel/motel property owners have met with mix success. Due to these complexities, the Navigant's Measure, Application, Segment and Industry Study for Chain Operations,[3] suggested to not treat hotels/motels

[2] IDSM Market Characterization Study for Residential and Small Commercial, by Evergreen Economics, August 2014, (CALMAC # SDG&E0286.01).

[3] Measure, Application, Segment and Industry Study for Chain Operations, Navigant Consulting, 2015 (CALMAC #SCE0377.04).

as chain operation due to the individual and specific business characteristics. One possible consideration is to use commercial real estate database, such as CoStar to develop a short list of medium-size hotel/motel properties based on capacity (i.e., # of hotel rooms) and vintage for initial program targeting.

The concept of Innovation Adoption Life Cycle and Technology Life Cycle are equally applicable for the non-residential EMS applications. Given the CSS data, SoCalGas theorize that the non-residential EMS users are "Early Adopters," especially for the new generation of software oriented EMS design. SoCalGas will argue that this current generation of the EMS technology/products is in the early "Diffusion Stage."

Given the above information, to be successful, the program design will need to consider the following elements:

- Overcome property owners/managers' purchase barriers
    - Provide a clear demonstration of product/technology benefits, especially short-term monetary savings and operational benefits for long-term energy benefits.
    - Support EMS application training and education to help overcome technology adoption barriers, uncertainty, and risk.
    - Since the new generation of EMS systems are likely to offer extensive software and programming capabilities, it is important to engage the manufacturers and distributors to provide training and application support to ensure proper installation and usage.
    - Provide important environmental and EE/conservation messaging (i.e., non-energy benefits) to engage and develop a sense of responsibility and good citizenship.
    - Provide appropriate incentive to induce purchase behavior.
    - Continue to reinforce messaging, training/education to ensure persistence of desired energy/resource savings overtime. This is especially important give the program's pay-for-performance design.
- Ensure quality installation and proper interface with contractors and other market actors
    - Engage the manufacturers and distributors to provide proper user training.
    - Provide appropriate contractor and installation training if necessary.
- Program process diagram
    - Perform customer targeting to minimize free-ridership;
    - Implementer performs an on-site audit to scope the requirements for EMS and other EE/DSM investment options;
    - Implementer work with the property owners/managers to establish business priorities for the investment and operational needs of the EMS;
    - Implementer develop investment requirements, calculate pay-back, operational savings, energy savings and ROI;
    - Implementer presents the project to the customer for approval;
    - Customer agrees to make the investment and participate in the program (or not);

- Contractor/installer performs the installation and provide hands-on training to support the operational needs of the EMS;
- Customer assign staff to support ongoing operational needs of the EMS;
- EMS generates reporting, diagnostic, gap analysis, and other recommendations to improve hotel/motel's operations; and
- Overtime, the hotel/motel is able to reduce energy-intensity and to improve energy/resource utilization.

Savings Calculation Methodology for Pay-for-Performance

As indicated above, this program implementation will offer two types of incentives for qualified participants: (1) a deemed incentive for EMS purchase and installation, and (2) a pay-for-performance incentive to reward persistence. The below description will focus on the pay-for-performance data collection and calculation process.

A whole building approach, described as Option C Whole Facility of the industry-standard IPMVP will be employed to determine the natural gas 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 savings from all measures implemented in the treated facility, and is most appropriate given the characteristics of the target market and M&V protocol of this program where:

- An initial on-site audit will help scope the site specific variables;
- 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; and,
- Non-routine adjustments can be made to account for unexpected changes, as necessary.

Regression-based energy models may be used to describe how selected parameters such as weather and occupancy 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 commercial lodging buildings: monthly billing data from utility natural gas bills and short time interval natural gas 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 Guideline 14 Measurement of Energy, Demand,

and Water Savings, 2014. ASHRAE Guideline 14 is a more technically detailed M&V guideline than IPMVP. Therefore, concepts and formulas from ASHRAE Guideline 14 will be used in the estimation of savings and uncertainties for this program.

Required Data

Energy Data

The required energy data to be used in the whole building approach includes monthly gas bills during the baseline, installation, and post-installation periods. If AMI meters are present, then hourly reads over these periods will be collected. If AMI meters are not present, then monthly billing data and meter reads dates are required so that the duration (in days) of the billing period may be determined.

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

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

A minimum of twelve months of monthly data or 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 twelve-month period following confirmation of measure installation and commissioning; this is referred to as the reporting period. It is often the case that less than twelve 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.

Data Quality

The quality of data will be evaluated to ensure data collected, either through manual reads or AMI, is continuous and accurate. 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 twelve months of continuous data requirement during the baseline and reporting periods.

Independent Variables

Commercial buildings are expected to serve space heating loads through their heating hot water delivery systems. For this program, the gas tariff is assumed to have minimal impact on energy consumption. The influencing parameters expected to explain heating energy use are therefore ambient weather conditions which determines heating demand as well as the occupant's need for warm or cool space temperatures throughout the seasons, and the occupancy rate which drives the demand for heating hot water production.

Weather

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

Occupancy Rate

The percentage of rooms being occupied will be collected. The number of people staying in each room would provide valuable information but this data can be difficult to obtain. Data for this parameter will be collected for the period coincident with the energy use data (baseline and reporting period). From discussions with each building owner, a normal year level of occupancy will be identified. If no normal year occupancy rate can be identified, the reporting period occupancy rate will be used in normalized savings calculations, described below.

Calculation Description

Option C

Under Option C energy savings for an entire facility are calculated using data from utility meters. Two types of whole facility data are expected in the targeted commercial lodging buildings: monthly billing data from utility natural gas bills and short time interval natural gas data from AMI meters.

Monthly Data

The following methodology describes the determination of natural gas therm normalized metered energy consumption and savings.

To estimate gross savings for each customer, a regression model using twelve months of energy use data, corresponding heating degree-days (HDD), and occupancy rates (OC) 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 twelve months of reporting period data is collected, the normalized metered energy usage 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 Commercial EMT program customer. The model is shown in equation (1).

$$E_n = \alpha_n + \beta_H HDD_n + \gamma_{OC} OC_n + \varepsilon_n \quad (1)$$

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 $HDD_n = \sum_{i=0}^{n}(\bar{T}_{amb,i} - \tau_H)$

$\gamma_{OC} =$ Occupancy coefficient estimated by the regression

$OC_n =$ Occupancy rate per day reporting period n (i.e. avg. number monthly occupants per day, or % daily building occupancy)

$\varepsilon_n =$ 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 twelve 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 Commercial EMT program customer.

$$E_m = \alpha_m + \beta_H HDD_m + OC_m + \varepsilon_m \quad (4)$$

Where:

$E_m =$ Energy consumption per day for reporting period m

$\alpha_m =$ Baseload energy consumption per day for reporting period n, estimated by the regression

$\beta_H =$ 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 $HDD_m = \sum_{i=0}^{n}(T_{amb,i} - \tau_H)$

$\gamma_{OC} =$ Occupancy coefficient estimated by the regression

$OC_m =$ Occupancy rate per day reporting period m (i.e. avg. number monthly occupants per day, or % daily building occupancy)

$\varepsilon_m =$ Regression residual

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

AMI Data

The following methodology describes the use of hourly AMI interval data when developing whole building energy models.

To estimate gross savings for each customer using their AMI data, a regression model using up to twelve months of energy use data, and corresponding ambient dry-bulb temperature (T) 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 twelve months of reporting period data is collected, the normalized metered energy usage 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 using the baseline period energy and dry-bulb temperature for each Commercial EMT customer. The model is shown in equation (6). Note that this model accounts for occupancy internally by flagging occupied and unoccupied time periods and creating separate regression coefficients for these periods.

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

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

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

Where:

The coefficients, α_i and β_i are the regression coefficients for the time indicator and temperature variables t and T, 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 twelve months of reporting period data has been collected, fit a time-of-week and temperature model, using the reporting period energy and dry-bulb temperature from the reporting period for each Commercial EMT customer.

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

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

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

Where:

The coefficients, α_i and β_i are the regression coefficients for the time indicator and temperature variables t and T 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 data. Use the TMY data set for the building's climate zone. This is accomplished by inputting the TMY 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.

Non-routine events

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 building size
- Changes to common area facilities
- Changes to space heating equipment or operations

The baseline conditions of these static factors need to be fully documented during the baseline period and initial on-site audit, 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 building owner, a project implementer, or a third-party verifier. Engineering calculations will be used to quantify the energy impact from such changes using IPMVP Option A, retrofit isolation techniques, and used in adjusting the energy savings. To the degree possible, energy impacts from non-routine events will be calculated based on actual measurements.

Accounting for Individual Measure Savings

The Option C approach for monthly and AMI data will yield gross savings results for the whole building, a summation of the savings of the three individual measures. Individual gross savings estimates for the smart thermostat and boiler controls measures will be estimated using workpapers dedicated to those measures. EMS gross savings are calculated using the gross savings for the whole building and the smart thermostat and boiler control measures. Net savings for individual measures are calculated by applying Net-To-Gross (NTG) ratios from the smart thermostat and boiler controls identified in the two corresponding workpapers. The following provides a step-by-step procedure of this analysis.

Step 1. Calculate gross savings for the EMS system.

$$X_{EMS=}\ X_{WB} - \ (X_{ST+}X_{BC})$$

Where:
X_{WB} = Gross savings of the whole building, calculated using meter data under Option C.
X_{EMS} = Gross savings of the energy management system installation measure
X_{ST} = Gross savings of the smart thermostat measure
X_{BC} = Gross savings of the boiler controls measure

Step 2. Calculate net savings for the smart thermostat and boiler controls measures.

$$Y_{ST} = NTG_{ST} * X_{ST}$$
$$Y_{BC} = NTG_{BC} * X_{BC}$$

Where:
Y_{ST} = Net savings of the smart thermostat measure.
Y_{BC} =Net savings of the boiler control measure
NTG_{ST} = Net-to-gross ratio for the smart thermostat measure
NTG_{BC} = Net-to-gross ratio for the boiler control measure

Step 3. Calculate net savings for the EMS system. Similar to SoCalGas' HOPP proposals, the program team will initiate a NTG/free-ridership survey as a part of project exit survey to provide a NTG estimate. We understand that the Energy Division may independently conduct additional impact evaluation to verify accuracy of the program energy savings.

$$Y_{EMS} = NTG_{ST} * X_{EMS}$$

Step 4. Calculate total net savings for the whole building.

$$Y_{WB} = Y_{BC} + Y_{ST} + Y_{EMS}$$

Where:
Y_{WB}= Net savings for the entire building.

Early EM&V/NTG Survey
See above

Program Savings
Program savings will be reported as the total gross savings achieved from each participating building's first twelve month reporting period. That is, only the savings from the buildings 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

Early M&V Calculation Verification, Rapid Feedback, and Process Evaluation
Since this is a new legislative mandate and new program design, SoCalGas recommends a combination early M&V (optional task) to verify pay-for-performance calculation accuracy, market characterization, and process evaluation to assess program effectiveness.

This program is a part of the statewide non-residential AB793 implementation effort; this evaluation can be consolidated into a statewide study. SoCalGas will defer the necessary program impact evaluation to Energy Division, CPUC. SoCalGas will work with Energy Division to rationalize these study needs as a part of the 2017 statewide M&E Roadmap update effort.

Researchable Questions

- Pay-for-Performance Energy and Incentive Calculation (optional study task, budget permitting)
    - Is this calculation correct? Is any part of the calculation methodology needs to be adjusted?

- Market Characterization
    - What is the market for EMS?
    - From a technology/product life cycle and adoption perspective, where is the non-residential EMS located?
    - What are the necessary condition/s for this market to evolve and grow?
    - What is the role for the manufacturers, distributors/contractors, and program administrators?
    - Can the concept of market transformation apply for EMS applications?
- Program process evaluation
    - Program evaluability – Is the program tracking and M&V calculation data bases collecting sufficient information to support program process and impact evaluations?
    - Program targeting and prospecting
        - What is the best way to target the medium-size hotels/motels giving the complexity in property ownership?
        - For this customer group, what is the best way to overcome purchase and installation barriers for EMS implementation?
        - What marketing and messaging are needed?
        - What training is needed to improve awareness, knowledge and engagement for the EMS project?
    - Customer
        - Post installation, what staff trainings is necessary to ensure successful ongoing operation of the EMS?
        - Is the customer using the EMS as designed?
        - Can the customer reduce energy-intensity and improve hotel/motel energy/resource utilization?
        - What are the barriers to achieving these operational goals?
    - What is the optimal role for the following?
        - Role of partners to deliver electricity, water and other resources,
        - Role EMS manufacture, distributor and/or system integrator,
        - Role of installers/contractors.
        - What training is needed to ensure proper installation?
    - Free-ridership
        - What is the free-ridership for the EMS installation?
        - How can the program reduce the level of free-ridership?
    - Persistence
        - Is the EMS used as design?
        - Is the EMS providing the necessary data to improve energy/resource utilization?
    - Cost effectiveness
        - Is this program cost effective?
        - If not, how can this be improved?
    - Future program scaling and considerations
        - Can this program be scaled beyond medium-size hotels/motels?
        - If yes, why?
        - If no, why not?
- Rapid feedback

- Can a combination of the priority process evaluation items be bundled into a rapid feedback study? The goal is to complete this rapid feedback analysis by the end of 2017 so the recommendations can be incorporated into the 2018 program design.

Preliminary Study Concept and Outline

Validating Models for a Population Sample (Optional Study Task, pending budget availability)

This task may be explored 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. This activity would include collecting a sample of annual monthly billing and/or AMI data for commercial buildings in SCG service territory. The data would need to be from commercial buildings 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. Similarly, for AMI data, hourly models would be developed as described above in the AMI 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 equations 5 and 8, the savings uncertainty would be estimated for different levels of savings.

Results of these runs as well as building 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 and medium commercial buildings 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 793 projects and programs are successful. These methods are documented in the PG&E-sponsored Emerging Technology Report completed in 2013.[4]

Market Characterization

- Identify the location of non-Residential EMS from the perspective of Technology/Product Life-Cycle and Adoption Life Cycle.
- Identify the necessary elements and condition for EMS to progress on both of these Life Cycle concepts. What does it take for the EMS market to grow and scale?
- Compare EMS with a similar product to derive lessons learned.

[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.

- Conduct a purchase decision study to better understand the interaction between product price and incentive to induce purchase decision for non-residential customers.

Rapid Feedback and Process Evaluation

Please develop a study statement of work to address the researchable questions above. At a minimum, the program process evaluation should include the following elements:

- Program Design
    a. Document program theory, logic model and key metrics.
    b. Is the program design effective to overcome the above list of barriers and concerns? What program design changes are needed beyond 2017?
    c. Is the program cost effective? If yes, how can we improve cost effectiveness? If not, how can this program be cost effective?
    d. What are the future program design considerations?
    e. Is this program evaluable to support both impact and process evaluation?
- Partners, Manufacturers/distributors and Contractor/Retailers Interactions
    a. What is their optimal role? What are the challenges?
    b. What training/skills are necessary to support a successful program implementation?
    c. What training/skills are necessary to support a successful customer installation and EMS ongoing operations?
- Participants & Non-participant Response
    a. Participants:
        i. What are the participants saying about this program? What do they liked and/or dis-liked?
        ii. What percentage of them are free-riders? How can the program improve customer targeting to reduce the level of free-ridership?
        iii. Why do they drop-out? What are they saying about this program and EMS implementation? What does it take for them to participate?
    b. Non-Participants:
        i. Why don't they use EMS?
        ii. How are they managing their energy/resource usage?
        iii. What does it take for them to participate in the program?
- Rapid Program Feedback – Consider bundle priority items to initiate a rapid feedback research to provide timely program inputs by the end of 2017, to influence program design options for 2018.
- Study Time Frame:
    - Provide rapid feedback findings by the end of 2017.
    - Initiate comprehensive, program process and market characterization study, after the program has been up and running for a minimum of 12-month.

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 and natural gas 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. Natural gas energy use data (therms) from advanced metering systems is also available in hourly time intervals from SoCalGas. Therefore, the time intervals used in the TTOW models will be hourly, and models based on daily time intervals will be used if more accurate models are needed. 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.
- For natural gas use in commercial buildings, we expect high gas use at low ambient temperatures, with use decreasing as temperature warm. At some point, space heating is no longer required, and the only use for gas is for water heating, which is expected to have a milder relationship with ambient temperature. We therefore also

[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

expect multiple regimes for natural gas use, though they are likely fewer than for electric use.

- 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 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:

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

- 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:

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

- 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.

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

- 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.

ATTACHMENT E

Advice No. 5003-A

Residential Energy Management Technology Solution (REMTS) Program: Detailed AB 793 Proposal

Attachment E

Residential Energy Management Technology Solution (REMTS) Program: Detailed AB 793 Proposal

A. REMTS PROGRAM DESCRIPTION

The Residential Energy Management Technology Solution (REMTS) Program is a bundled measure deemed rebate program that will provide incentives to single family residential customers for integrating energy management technologies in their homes and will emphasize data access by proactively providing energy usage information to residential consumers through some form of mobile or web application. Specifically, the program will provide incentives for the incorporation of energy management technologies for both gas, electric and water EMT measures thus capturing a multi-measure comprehensive whole home approach. The REMTS Program will target owners of existing single family homes within the SoCalGas service territory. The REMTS Program will be implemented in collaboration among SoCalGas, an electric utility partner and water utility, allowing for the REMTS Program to capture deemed energy savings (natural gas and electric) and water savings.[1]

The REMTS Program is designed to incentivize participants to adopt new innovative technologies and to encourage customers to reduce their home's overall energy usage. As mentioned above, these incentives would be provided as a downstream deemed rebate approach.

The REMTS Program will aspire to achieve at least 5% reduction in energy (therms) consumption for each household. SoCalGas submits that this constitutes a "stretch goal." However, SoCalGas estimates that 5% target is a prudent goal based on recent studies and the uniqueness of these products.

Upon approval by the Commission, SoCalGas anticipates the full implementation of the REMTS Program on January 2017. To reduce costs and to ease implementation SoCalGas will work with the Non-profit organization, EFI, to launch this program and have it easily available for participants to receive their deemed rebates by January 2017.[2]

[1] The REMTS program is being proposed as a core SoCalGas offering and may possibly seek a co-fund agreement with an electric partner in its initial implementation. However, incentives for all electric and water savings would be sought out to be paid by the electric partner identified and the water partner identified.
[2] Similar to EE Kits process.

Once the REMTS Program is implemented, SoCalGas will evaluate the effectiveness of the program in achieving adoption of this new technology and validating the attainable savings.

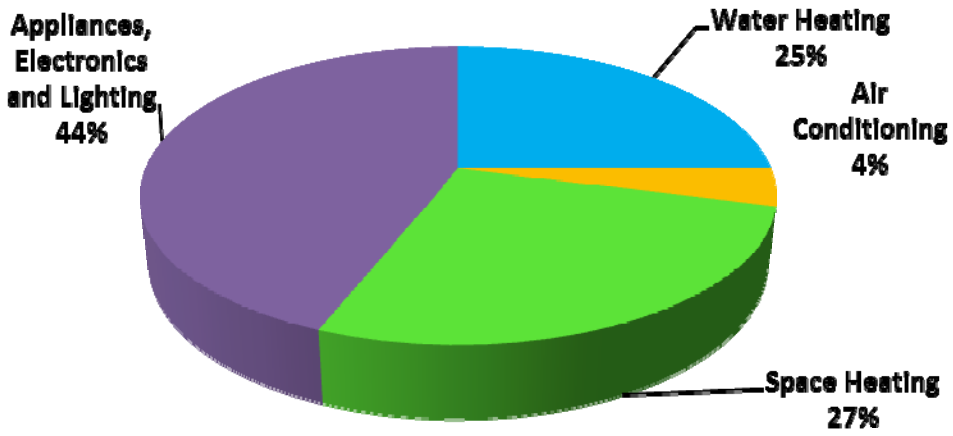
B. PROGRAM SAVINGS POTENTIAL AND REMTS PROGRAM OBJECTIVES

1. Market Potential

SoCalGas has 21.4 million gas customers through 5.9 million meters and use over 8.7 billion therms of gas annually. The residential sector makes up 5.4 million of the gas meters in SoCalGas' overall territory, this constitutes to nearly 90% of SoCalGas' meters and an annual usage of 2 billion therms. Single family customers constitute for approximately 70% of energy consumed by SoCalGas' residential sector.

In addition, California residential energy consumption is primarily utilized for space and water heating as well as lighting, plug load and appliances as shown in Figure 1 below which are key applicable end uses that can easily integrate with energy management technologies and provide residential energy savings.

Figure 1. California Residential Energy Consumption by End Use[3]



2. Program Objectives

The program objectives for the REMTS Program fall into two categories: performance and process. The performance objectives are: to assess the performance of the AB 793 program and to ensure it is meeting expectations and is on a path to succeed. The performance objectives will be actively monitored and reported to the Commission. The process objectives are aimed at ensuring that a strong infrastructure for program

[3] EIA. Residential Fact Sheet, 2009.

implementation and evaluation that could support the scaling up of the REMTS Program in the future.

Program Goals and Objectives:

- Assess incentive levels to identify and promote integration of this innovative technology solution within the residential and low income segments;
- Determine whether this (bundled measures and energy usage monitoring accessibility) approach is effectively enticing to segment candidates to participate in ratepayer-funded programs relating to energy management and achieve greater energy savings; and
- Establish a scalable model within the single family sector by incentivizing market participants to achieve measureable energy savings and look to expand to other segments or delivery channels within the residential sector.

3. REMTS Forecasted Energy Efficiency Savings

Based on market potential, the program's aspirational goal and the objectives mentioned above, SoCalGas estimates this program to achieve in total over the life of program 660,000 therms. The table below is the program's initial estimates of potential therms savings for the life of the preliminary implementation of this program. These estimates will be reassessed through SoCalGas' energy efficiency portfolio annual planning process.

	2017	2018	2019 and annually thereafter
Gas Savings (Therms)	27,500	38,500	49,500

C. PARTNERSHIPS

Energy Management Technology products can serve to provide energy reductions both in gas, electric and water end uses. For this purpose it will be critical to the program's success to partner with an electric utility and leverage existing relationships with water utilities. This program will operate in all regions within SoCalGas' territory with a particular focus in regions where partnerships with electric municipal utilities or IOUs exist.

In addition, SoCalGas will reach out to vendors and distributors of qualifying products to identify points of leverage, these could include but are not limited to:

- EMT market analysis;
- Marketing, education and outreach; and
- Pricing assistance for low income offerings.

D. PROGRAM STRUCTURE

SoCalGas plans to offer the deemed measures, as a package, through SoCalGas' EFI online storefront. EFI will the program measures incented. Customers who purchase these deemed measures will receive their rebate at the point of purchase, and the products will be shipped to the customer by EFI. Once the customer receives and installs the measures the customer will be required to provide confirmation of the installations via a mail-in postage paid card, or via an online form. The customer will verify they installed the measures and will be asked to sign up for one of the following services SoCalGas offers: My Account to analyze their usage via the Ways to Save tools, download and install SoCalGas mobile app to utilize Ways to Save from their phone, or bill tracker alerts to be received via text or email or both. This will allow the customer to track their bills, and their actual usage data from their advanced meter. From SoCalGas' perspective this process allows for easy customer participation tracking and significant cost savings in implementation.

E. CUSTOMER ELIGIBILITY

Single Family home owners with an active SoCalGas account that have a dual fuel HVAC system will be eligible to participate in the REMTS Program.

All REMTS Program participants will be required to install one EMT measure for each of the three applicable saving source categories listed below:

- Natural gas
- Electric
- Water

Specific measures applicable to each savings source category can be found in Table 5. In addition, the customer will be required to sign up for one mobile or web application that offers real time energy usage or billing data information. Current applicable energy monitoring mobile or web applications are:

- Bill Tracker Alerts
  - Available via text and email
  - Deployed weekly
- Mobile Ways to Save Navigation through SoCalGas mobile app
- My Account
  - Hourly and Daily Usage
  - Monthly Usage
- Home Energy Profile
- Bill Analyzer
  - Bill Highlights
- Carbon Calculator

F. INCENTIVE STRUCTURE

SoCalGas REMTS will utilize rebates for its applicable measures, these rebates are listed and would be additive based on the number of measures installed. In addition, to further entice customers to participate, adopt this new technology and meet at least the minimum eligibility requirements of the program, a $10 kicker would be added to the total rebated sum for each applicant. Table 3 list the programs applicable measures and current/proposed deemed rebate incentives.

Table 3. SoCalGas REMTS Program Applicable Gas Measures Deemed Rebate Incentives[4]

Measure	Deemed Rebate
Smart Thermostat	$50
Shower Feedback System	$50
Water Heater Controller	$5
Smart Vents	TBD
Smart Natural Gas Stove/Oven[5]	TBD
Smart Natural Gas Dryer[6]	TBD
Program Kicker for meeting the minimum program eligibility requirements	$10

In addition, rebates will be provided for only qualifying products. For a list of qualifying products and the requirements associated with those products, please see Section B in Attachment B.

[4] For measures that do not have a deemed rebate established, SoCalGas will utilize the E3 calculator to provide the missing values once all the necessary M&E information is provided for those particular measures.
[5] This product will be assessed in the next 6-8 months to see if the available technology is viable source of energy efficiency savings for SCG ratepayers. If determined EE is viable, a deemed work paper and rebate will be established.
[6] This product will be assessed in the next 6-8 months to see if the available technology is viable source of energy efficiency savings for SCG ratepayers. If determined EE is viable, a deemed work paper and rebate will be established.

G. MEASURES INCENTED AND TREATMENT

The REMTS Program objective is to promote adoption and integration of energy management technologies with long-term energy benefits through a comprehensive home solution. The energy efficiency measures identified represent the best measure mix with the highest potential for both energy (therms and electric) and water savings.

Measures highlighted in yellow rows in Table 5 will require longer M&E assessment on claimable savings and will not be offered on the preliminary roll out, but will be made available once an approved work paper is received.

In addition, the electric utility partner(s) have yet to be identified, so establishing all the possible applicable measures at this time would be premature. Once a utility partner is identified and an agreement is put in place, the Implementation Plan would be updated to reflect the applicable electric measures. Some of the possible applicable measures could include but are not limited to:

- Smart Strips
- Connected Lighting
- Smart Refrigeration

However, as stated above and throughout the proposal, SoCalGas' objective is to incorporate electric measures so a comprehensive EMT offering can be provided to its customers. Table 5 below will be updated to reflect this once the partner is identified.

Table 5. Measure Treatment by Measure Category[7]

Measures Applicable to Single Family Residential				
End Use	**Measure**	**Intervention Strategy**	**Source Savings**	**Savings Category**
Space Heating and Cooling	Smart Thermostat	Deemed Rebate	Work Paper *(Estimated approval date – August 2016*)	Gas/Electric
Water Heating	Shower Feedback System	Deemed Rebate	Work Paper *(Estimated approval date – November 2016*)	Gas
Water Heating	Water Heater Controller	Deemed Rebate	Work Paper *(Q1 2017*)	Gas

[7] These measures listed could significantly change due to results from the EAR process. SoCalGas aim is to get all measures incorporated in its portfolio as soon as possible but to mitigate risk on ratepayer funds will only offer incentives of measures with accompanying approved work papers.

Water	Shower Feedback System	Deemed Rebate	Work Paper *(Estimated approval date – November 2016*)	Water
Space Heating and Cooling	Smart Vents	Deemed Rebate	Work Paper *(Q1 2017*)	Gas/Electric
Cooking	Smart Natural Gas Stove/Oven	Deemed Rebate	Work Paper *(Q4 2017*)	Gas
Heating	Smart Natural Gas Dryer	Deemed Rebate	Work Paper *(Q4 2017*)	Gas
Measures Applicable to Low Income Single Family Residential				
End Use	**Measure**	**Intervention Strategy**	**Source Savings**	
Space Heating and Cooling	Smart Thermostat	Direct Install	Work paper	Gas/Electric
Water Heating	Shower Feedback System	Direct Install	Work paper	Water/Gas

H. REMTS PROGRAM BUDGET

In the June 10, 2016 ALJ Ruling, the Commission provided the applicable options in which AB 793 implementation proposals could be filed based on the anticipated funding source request. For IOUs seeking to utilize current authorized funds, the IOU is authorized to file tier 2 advice letters and for those seeking new/incremental funding must file new applications.[8]

For the purposed of the AB 793 proposals and for considering the already existing budget constraints that currently exist within SoCalGas portfolio and the large incremental costs that the implementation of AB 793 will carry, SoCalGas will utilize existing funds for 2017 and request incremental funding to support years 2018 and 2019 in its upcoming energy efficiency business plan application scheduled to be filed November 1, 2016.

[8] AB 793 ALJ Ruling dated June, 10, 2016, p. 7.

		2017	2018	2019	Total
	Administrative Costs	$55,000	$55,000	$55,000	**$165,000**
	Marketing Costs	$33,000	$33,000	$33,000	**$99,000**
Direct Implementation Costs	**Incentive Costs**	$275,000	$385,000	$495,000	**$1,155,000**
	Implementer Costs	$0	$0	$0	**$0**
	Total Initial Program Budget	$363,000	$473,000	$583,000	**$1,419,000**

ATTACHMENT F

Advice No. 5003-A

Residential Energy Management Technology Solutions Program: Evaluation, Measurement & Verification (EM&V) Plan

Attachment F

Residential Energy Management Technology Solutions Program: Evaluation, Measurement & Verification (EM&V) Plan

Program Description

The Residential Energy Management Technology Solutions (REMTS) is designed for single family homeowners regardless of income levels, using a deemed savings approach. For income qualified homeowners, they are eligible for direct install service at no charge. For all other participating households, incentives will be available for eligible measures.

This program is targeting homeowners willing to adopt a minimum of three eligible EMS technologies, along with a mobile application for usage monitoring to encourage gas, electric and water savings, to achieve a 5% savings goal. The program goal is to improve households' awareness and knowledge of energy and water utilization, thus motivating actions to improve and reduce usage.

Program Deemed Measures & Eligibility

The following is a list of eligible deemed program measures for gas, electricity, and water. SoCalGas will be working with a list of Southern California utilities and agencies to provide this comprehensive service. To be eligible, the participating homeowners must agree to adopt three different measures, and be willing to use mobile application for energy/usage monitoring.

Category	Eligible Measures
Gas	Smart Thermostat Smart Vents (not for initial roll-out) Residential Water Heater Controller Smart Natural Gas Clothes Dryers (not for initial roll-out) Smart Natural Gas Full Range Stoves (not for initial roll-out)
Water	Shower feedback system
Electric	Smart Thermostat Smart Strips
Energy Monitoring	Mobile application and/or web application (No energy/water claim)

In addition to the above list of measures, as indicated in the program description, SoCalGas currently offer a long-list of program measures and services to support energy usage information.

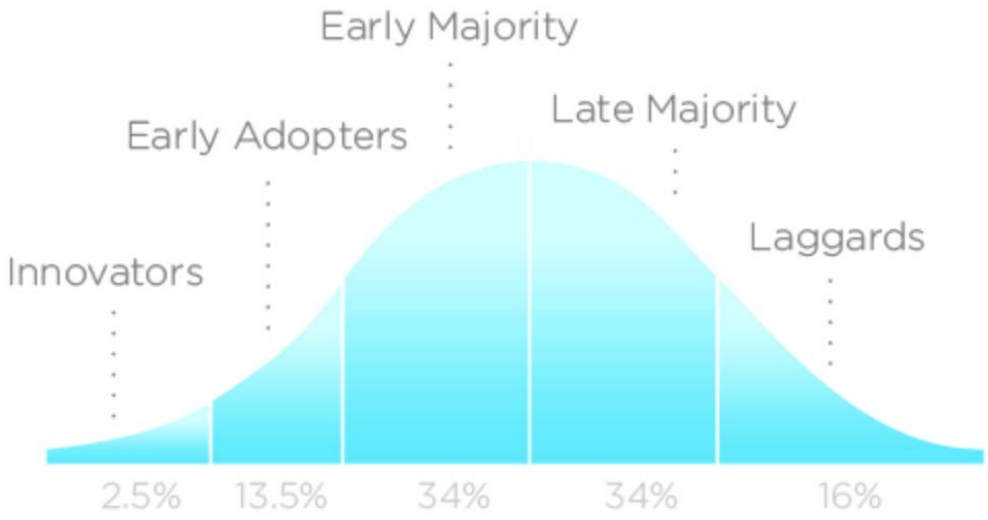
Program Theory

This REMTS Program is designed to meet the needs of AB793 implementation to support a new generation of EMS technologies and applications for homeowners. As stipulated by R.13-11-005 and R.13-09-011, EMS technologies are broadly defined to be products, services, and/or software that would allow customers to better understand

their usages and to better manage these resources. With the integration of high-power computing, data analytics, mobile/wireless applications and interactive information displays, today's EMS technologies are capable of self-learning (i.e., learn about your schedule to reduce the amount of manual programming), remote sensing (i.e., know when to use the cooler outside air instead of conditioned air to accommodate changing conditions), and may be compatible with other home automation capabilities.[1]

As a part of the AB793 implementation, it is important to understand where these new technologies/products are located on the technology adoption life cycle typically referred to as the S-curve, as modeled in the diffusion of innovation theory, pioneered by Everett Rogers. Since different customers respond to new products in different ways, these interactions and preferences will be reflected in the product diffusion curve (i.e., sales & adoption curve). Rogers classified individuals into five groups.[2]

- Innovators (2.5% of the curve);
- early adopters (13.5% of the curve);
- early majority (34% of the curve);
- late majority (34% of the curve); and
- laggards (16% of the curve).



INNOVATION ADOPTION LIFECYCLE

While the innovators and early adopters tend to be more technology savvy, the late majority and laggards are typically more price sensitive. As with any new technology and/or product introduction, marketing efforts to promote technology/product awareness and knowledge can be critical to business success.

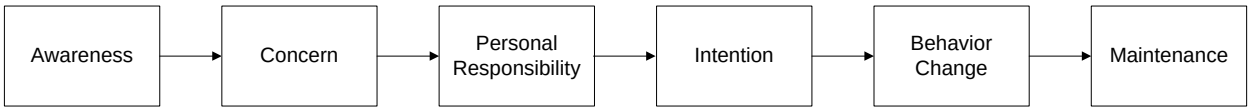
[1] ConsumerOnlineReport.com, July 15, 2016.

[2] Wikipedia, Technology Perception Dynamic and Innovation Adoption Life Cycle description, July 16, 2016.

In addition to the above Innovation Adoption Life Cycle, it is also important to understand the Technology Life Cycle:[3]

- **Innovation stage:** This stage represents the birth of a new product, material of process resulting from R&D activities. In R&D laboratories, new ideas are generated depending on gaining needs and knowledge factors. Depending on the resource allocation and also the change element, the time taken in the innovation stage as well as in the subsequent stages varies widely.
- **Syndication stage:** This stage represents the demonstration and commercialization of a new technology, such as, product, material or process with potential for immediate utilization. Many innovations are put on hold in R&D laboratories. Only a very small percentage of these are commercialized. Commercialization of research outcomes depends on technical as well non-technical, mostly economic factors.
- **Diffusion stage:** This represents the market penetration of a new technology through acceptance of the innovation, by potential users of the technology. But supply and demand side factors jointly influence the rate of diffusion.
- **Substitution stage:** This last stage represents the decline in the use and eventual extension of a technology, due to replacement by another technology. Many technical and non-technical factors influence the rate of substitution. The time taken in the substitution stage depends on the market dynamics.

To take this one step further, the California IOUs have studied various consumer/homeowner customer decision theories. The below consumer/homeowners Stage-Decision Model[4] is a good starting place for program design consideration.



The homeowners' attitude and opinion about energy efficiency and conservation behavior can be influenced using various program interventions. The program can start with focused marketing messaging to generate "awareness" and "concern" leading to a sense of "personal responsibility" and "intention" about energy efficiency, conservation, and environmental concerns. The utility incentive and/or rebate is designed as an inducement to motivate actions. Once the installation and/or purchase of the eligible measures are completed, it is important to continue the key messaging to reinforce persistence of energy/resource savings (i.e., maintenance).

Given the above theoretical building blocks, SoCalGas theorized the following:

- **Innovation Adoption Life Cycle:** Todays' EMT purchasers are behaving more like "Early Adopters." To gain foothold in "Early Majority" and "Late Majority" of the S-Curve, the consumers/homeowners must be willing participants to

[3] Technology Management - Growth & Lifecycle, Shahid kv, Sep 28, 2009, Attribution Non-commercial.
[4] "Consider What We Measure" by ODC and RIA, 2011.

generate product demand. As indicated above, while early adopters are more technology savvy, the others will increasingly demand ease-of-use and better prices from the manufacturers.

- **Technology Life Cycle:** Many of the leading edge EMT technologies are likely to be in the early "Diffusion Stage." While the AB793 legislative support is important, ongoing success will require a balancing act between supply side and demand side activities. The technology/product acceptance will require market actors to successfully manage the product strategy and marketing mix (i.e., product, promotion, price, and placement) for the EMS products to gain market share.
- By linking the **Stage-Decision Model** above into the program design, a successful program design will require the following elements:
    - Overcome consumer/homeowner purchase barriers
        - Providing consumers/homeowners clear demonstration of product/technology benefits[5]
        - Support training and education to help overcome technology adoption barriers and uncertainty
        - Provide important environmental and EE/conservation messaging (i.e., non-energy benefits) to engage a sense of personal responsibility
        - Provide appropriate incentive to induce purchase behavior
        - Continue to reinforce messaging to ensure persistence of desired energy/resource savings
    - Overcome retail/distribution sales barriers
        - Collaborate with manufacturers and retailers to promote the availability of incentives and benefit of EMTs
    - Ensure quality installation and proper interface with contractors
        - Provide appropriate contractor and installation training if necessary

Preliminary M&E Study Concept

Since this is a new legislative mandate and new program design, SoCalGas recommends a combination a process evaluation and market characterization to assess program effectiveness. Since this program is a part of statewide implementation effort, this evaluation can be easily consolidated into a statewide study. SoCalGas will defer the all program impact evaluation to the CPUC's Energy Division. SoCalGas will work with the Energy Division to rationalize these study needs as a part of the 2017 statewide M&E Roadmap update effort.

Researchable Questions

[5] IDSM Market Characterization Study for Residential and Small Commercial, by Evergreen Economics, August 2014, (CALMAC # SDG&E0286.01). In summary, the customer wants and needs for IDSM solutions are oriented towards personal, monetary savings, long-terms energy savings, ease of use, low risk and return on investment as priorities. For this study, the core value of IDSM is to allow the customers to optimize energy management opportunities over various DSM bundles.

The program team theorized the following list of market and program barriers as researchable questions. Since these applications are emerging technologies and markets, it is important to understand the implications of product/technology and adoption life-cycles and users' responses to support program scaling overtime:

EMT Market Characterization

- Build upon completed California market characterization studies to update EMTs Technology Life Cycle by analyzing the following:
    - What is the range and scope of residential EMT technologies, products and applications (i.e., EMS, HANs, Mobile Application/Connectivity, etc.)?
    - What is the current market size in US (sales volume, units)?
- Conduct a customer decision study to test consumer acceptance of EMT technologies/products?
    - What is the anticipated market diffusion and under what market conditions?
    - How would the upcoming dynamic rate implementation impact EMT adoption?
- Provide a list of recommendations and/or necessary market conditions to increase consumer acceptance.

Adoption Barriers

- Is the technology mature enough to demonstrate consistent benefits and energy/resource savings?
- Is the technology cost effectiveness enough given the level of incentive offered? To increase market penetration beyond "early adopters," what would be necessary?
- To continue this program effort, what are the appropriate program intervention strategy and program actions to match the product life-cycle needs/constraints?

Homeowner Characteristics

- Program participants:
    - Given EMTs' technology and innovation adoption life-cycle stage today, please characterize these program participants from a demographic and energy usage perspective. Do they fit into one or more of the current customer segments?
    - What are motivation and driver for the eligible purchases (i.e., 3 measure requirements)?
    - What energy savings behavior are needed to ensure savings persistence and to prevent take-back?
    - What education/training activities are required to support purchase decision and ongoing usage of these EMTs?
- Program non-participants (i.e., potential future participants)

- To continue this program effort, what are the appropriate intervention strategy and messaging to entice additional program participation?

Manufacturers/Installation Contractors/Retailers

- Manufacturers:
  - What is the level of collaboration between program and the manufacturers?
  - Are the products/technology packaged or bundled to support program implementation?
- Retailers:
  - What are the retailer sales staff training requirements?
  - What are the retailer marketing and signage requirements (in-store & on-line)?
- Contractors/Installers:
  - What are the installation requirements, if any?
  - What are the contractor training requirements, if any?

Outline of Study Concept

This study will have three parts: (1) market characterization, (2) rapid feedback evaluation, and (3) comprehensive process evaluation of program implementation to address the list of researchable questions above.

1. Market Characterization
   a. Provide a characterization of EMTs' Technology Life Cycle over time,
   b. Provide a characterization of EMT's Diffusion curve over time,
   c. Provide a characterization of how dynamic rate implementation would impact the adoption of EMTs over time,
   d. Provide a list of recommendations to support EMT products/technology program intervention and eventual market transformation goals.
2. Process Evaluation
   a. Program:
      i. Document program theory, logic model and key metrics,
      ii. Is the program design effective to overcome the above list of barriers and concerns? What program design changes are needed beyond 2017? What program design changes are necessary to move Energy Management Technologies and Solution further down the product life cycle and to gain adoption?
      iii. Is the program cost effective? If yes, how can we improve cost effectiveness? If not, how can this program be cost effective?
      iv. Since residential energy management solution is a part of the whole house solution, are there synergy for either marketing or implementation integration?
      v. Is this program evaluable? Can the tracking and reporting activities support program evaluability for both process and impact evaluations?

b. Contractor/Retailers
    i. What are the contractor/retailer and training needs to support this initiative?
c. Manufacturers and Other Market Actors
    i. Since this intervention is heavily supported by multiple vendors, what is the best way to organize this private/public partnership to generate market transformation effects overtime?
d. Participants & Non-participants
    i. What are the participants saying about this program? What do they like and/or dis-like?
    ii. What percentage of them are free-riders?
    iii. Which measure/s are more likely to be free-riders?
    iv. For non-participants, what does it take for them to participate from the perspective of marketing promotion, price, distribution channel, etc.?
e. Rapid Program Feedback – Consider initiating a rapid feedback study focusing on a bundled of priority researchable items to provide timely program inputs by the end of 2017, to influence program design options for 2018.

- Study Time Frame:
    - Provide rapid feedback findings by the end of 2017.
    - Initiate market characterization study in 2017.
    - Initiate comprehensive, program process and market characterization study, after the program has been up and running for a minimum of 12-months.

ATTACHMENT G

Advice No. 5003-A

SoCalGas Local Marketing, Education, and Outreach

Attachment G

SoCalGas Local Marketing, Education, and Outreach

A. SoCalGas Local ME&O strategies

The 2016-2018 program is designed to create awareness of EMS technology, educate how EMS technology would allow customers to conserve energy, and inform of the various product & services available under the EMS portfolio. The program will activate based on the following key platform strategies:

1. Development of a messaging strategy to create an integrated local-level campaign to generate awareness.

2. Development of a Grassroots community outreach strategy for residential and SMB business customers to continue familiarity with EMS and portfolio benefits.

3. Optimize tactical communications through an integrated owned, earned and paid media approach.

B. SoCalGas Local Tactics

To support the defined strategies, specific tactical executions are recommended to deploy communications consistently across targeted owned, earned and paid channels for residential and commercial & industrial initiatives.

All Target Market Segment Tactics: Residential

Tactics – Owned

1. Development and launch of dedicated web page/s on www.SoCalGas.com, where customers would be directed to gather information and maximize engagement regarding EMS and portfolio offerings.

2. Organize Q4 2018 post campaign research to gauge campaign effectiveness and identify audience opportunities.

3. Leverage communication channels owned and controlled by SoCalGas' to deploy communications within our service territory about EMS and portfolio offerings.
    a. Channels include, but not limited to: Bill Inserts, Company E-Newsletter, and Web Marquee.

4. Identify cross-promotional opportunities of EMS within Customer Assistance communication activities.

a. Cross-promotional opportunities include, but not limited to: Direct Mail, E-mail blast, and collateral integrations.

Tactics – Earned

1. Event Outreach Support: Identify community events that are suitable for the EMS message and attended by our target segments. Collaborate with SoCalGas' Media & Employee Communications team to conduct media outreach to attract media attendance and generate coverage in local papers, blogs, and on radio and broadcast channels.

2. Event Social Support: Develop an ongoing social media promotion to be executed through SoCalGas' Social Media team that will generate interest in community outreach efforts, drive visits to event booths, and increase overall EMS awareness. Social analytic optimization through social management - continue the conversation with engaged consumers through paid and promoted posts, utilizing the feedback to target messaging.

Tactics – Paid

1. Develop a culturally relevant, integrated, multi-channel paid media plan that will generate awareness and understanding levels among our target audience, engage with the target audiences, and drive website visits to encourage content consumption and foster consideration for adoption.

2. Build paid media performance metrics for media channels and partnership programs:
    a. Integrate local print, digital, paid search, social and grassroots/community efforts to develop a comprehensive integrated strategy that facilitates cross platform audience targeting.
        i. Utilize appropriate consumer publications.
        ii. Employ digital for online engagement, driving users to EMS content on www.SoCalGas.com.
            - Ability to optimize while in-market and leverage best performers.
            - Leverage customer insights to more effectively reach target audience.

3. Explore partnerships with media suppliers, sports affiliations, and venues with aligned target audiences.

Small-Medium Business Targeted Tactics

Tactics – Owned

1. Development and launch of dedicated web page/s on www.SoCalGas.com, where customers would be directed to gather information and maximize engagement regarding EMS and portfolio offerings.

a. Leverage communication channels owned and controlled by SoCalGas' to deploy communications within our service territory about EMS and portfolio offerings.

2. Channels include, but not limited to: Bill Inserts, Company E-Newsletter and Web Marquee.
    a. Identify cross-promotional opportunities of EMS within Small/Medium Energy Efficiency communication activities.

3. Cross-promotional opportunities include, but not limited to: Direct Mail, E-mail blast, and collateral integrations.

Tactics – Earned

1. Event Outreach Support: Identify community events that are suitable for the EMS message and attended by our target segments. Collaborate with SoCalGas' Media & Employee Communications team to conduct media outreach to attract media attendance and generate coverage in local papers, blogs, and on radio and broadcast channels.

2. Nonprofit Installation Giveaway: Identify and donate EMS technologies to a selected nonprofit and package as story of partnership and benefits to media outlets for coverage. Develop deeper content that can be featured on www.SoCalGas.com, SoCalGas' social media channels, and the partner nonprofits' channels.

Tactics – Paid

1. Build paid media performance metrics for media channels and partnership programs:
    a. Integrate local print, digital, paid search, social and grassroots/community efforts to develop a comprehensive integrated strategy that facilitates cross platform audience targeting.

2. Print & Digital Advertising: expand research, negotiate and implement print and digital campaigns utilizing broad based business publishers (Business Journals, Business Sections of Local Newspapers) to educate business owners on the benefits of EMS across key identified industries.
    a. Identify appropriate business, professional trade shows, and consider sponsorship.

3. Develop a direct mail campaign to communicate EMS technologies to selected small/medium segments to generate awareness and interest.

A. SoCalGas Local ME&O AB 793 Plan Schedule

Table 1. Market Facilitation Schedule

SoCalGas Local Market Facilitation Plan 2016-2017	4Q16	1Q17 /4Q18	4Q18
CPUC Program Approvals			
Campaign & Production Development			
Trade Shows, Community Event Outreach			
In-Market Campaign Live			
Post Campaign Research			