STATE OF CALIFORNIA EDMUND G. BROWN JR., *Governor*

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

April 12, 2016

Advice Letters: 4764-E and 4764-E-A

Pacific Gas and Electric Company
Attn: Erik Jacobson, Director, Regulatory Relations
Senior Director, Regulatory Relations
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177

SUBJECT: PG&Es Time-of-Use Pilot Design in Compliance with D.15-07-001

Dear Mr. Jacobson:

Advice Letters 4764-E and 4764-E-A are effective as of February 25, 2016, per Resolution E-4762 Ordering Paragraphs.

Sincerely,

Edward Randolph

Edward Randolph
Director, Energy Division

Erik Jacobson
Director
Regulatory Relations

Pacific Gas and Electric Company
77 Beale St., Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177

Fax: 415-973-7226

December 24, 2015

Advice 4764-E
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: **Pacific Gas and Electric Company's Time-of-Use Pilot Design in Compliance With Decision 15-07-001**

Purpose

This Advice Letter (AL) requests approval of Pacific Gas and Electric Company's (PG&E's) residential time-of-use (TOU) pilot design in compliance with Decision (D.) 15-07-001 (Decision), *Decision on Residential Rate Reform for Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company and Transition to Time-of-Use Rates*.

Background

On July 3, 2015, the California Public Utilities Commission (Commission or CPUC) issued D.15-07-001 requiring PG&E, Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E) (collectively the IOUs) to each submit a Tier 3 advice letter to conduct certain pilot programs and studies of residential TOU electric rate designs (TOU Pilots and Studies) beginning the summer of 2016, and request for authorization of estimated Opt-In TOU Pilot Study costs, the actual costs for which will be recorded in the Memorandum Accounts already established through D.15-07-001, for later reasonableness review.[1]

[1] D.15-07-001 further requested that the IOUs also present estimated costs associated with the default TOU pilots to take place starting in 2018. However, as indicated in the report of the consultant hired to support the Energy Division-led TOU Working Group established under D.15-07-001, an extension was sought and granted to the deadline for the IOUs to file plans for their 2018 default TOU pilots. (See SCE letter, "Re: Request for Extension of Time to File Default TOU Pilot Plans Required by Decision 15-07-001", dated November 30, 2015). ALJ McKinney's December 23, 2015 ruling grants the IOUs' request to clarify that the default TOU pilot rate designs are not required to be filed at the same time as the opt-in TOU pilots. The November 30, 2015 letter states that the IOUs, working with the TOU Working Group, will focus on the default TOU pilot design between July and October 2016. They expect a report by November 2016, followed by an advice letter filing in December 2016.

To support the development of the residential TOU Pilots and Studies, the IOUs were directed to form a multi-stakeholder working group (TOU Working Group), led by Energy Division staff, to address issues regarding the TOU rate design and study as detailed in D.15-07-001. The Decision also directed the TOU Working Group to hire one or more qualified independent consultants to assist with the design and implementation of the TOU Pilots and Studies. Through a competitive bidding process, Nexant, Inc. (Nexant) was chosen as the independent consultant to assist the TOU Working Group with the design of the TOU pilots.

Nexant began working on the project on September 18, 2015, and developed a report describing the agreed upon residential Opt-In TOU Pricing Opt-in Pilot Plan, dated December 17, 2017 (Nexant Report), which is attached to PG&E's Opt-In Pilot Proposal as Appendix A. As described in the Nexant Report, as a result of working diligently about 2 1/2 months, the TOU Working Group was able to successfully design three Opt-In TOU pilot programs, involving more than a dozen total TOU rate treatments across the three IOUs. PG&E's Opt-In TOU Pricing Pilot Plan, included with this advice letter as Attachment 1, builds on the Working Group's efforts as described in the Nexant Report. PG&E's proposal provides greater detail and more specific implementation parameters for PG&E's Opt-In TOU Pilot.

Cost

The preliminary estimate of the incremental costs for PG&E's Opt-In TOU Pilot, over the three-year period from 2015 – early 2018, is approximately $23 million; a year-by-year overview of the estimated costs may be found in Chapter 15 of Attachment 1. Actual costs will be tracked in PG&E's Electric Preliminary Statement Part GS, *Residential Rate Reform Memorandum Account (RRRMA)*. The RRRMA was established in PG&E's AL 4672-E,[2] pursuant to Ordering Paragraph 12 of D.15-07-001. The estimated costs presented in Attachment 1 represent a conservative, high level estimate based on certain assumptions. PG&E will refine these estimated costs using customer findings, such as pre-tests that the IOUs are conducting early next year. This refinement will most likely result in some changes, and possibly a reduction in cost estimates, assuming that the scope of the pilot does not change significantly.

[2] PG&E filed AL 4672-E on July 22, 2015, which was approved by Energy Division Disposition on August 19, 2015 with an effective date of July 22, 2015.

Timing and Implementation

Chapter 14 of the attached report contains an implementation schedule. In summary it includes:

- Marketing and Recruitment – Spring 2016
- Start Opt-In Pilot – Summer 2016
- End Opt In-Pilot – End of 2017

It is of the utmost importance that the CPUC issue a resolution approving this pilot proposal as soon as possible (ideally at its February 25, 2016 decision conference, but if not on that date, then at its March 17, 2016 decision conference). Any delay beyond March 17, 2016 will mean the pilot cannot begin on the envisioned June 1, 2016 launch date, which would prevent collection of critical summer TOU pilot performance data.

Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, facsimile or E-mail, no later than January 13, 2016, which is 20 days after the date of this filing. Protests must be submitted to:

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

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

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

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

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

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

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

Effective Date

PG&E respectfully requests that this Tier 3 AL be approved and become effective as of the Commission's February 25, 2016 decision conference.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for R.12-06-013. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter filings can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Erik Jacobson
Director, Regulatory Relations

Attachment 1: PG&E's Opt-In TOU Pilot Proposal

Appendix A: Nexant Report

cc: Service List R.12-06-013

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING SUMMARY
ENERGY UTILITY

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

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

Utility type:	Contact Person: Kingsley Cheng
☑ ELC ☐ GAS	Phone #: (415) 973-5265
☐ PLC ☐ HEAT ☐ WATER	E-mail: k2c0@pge.com and PGETariffs@pge.com

EXPLANATION OF UTILITY TYPE

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

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: **4764-E** **Tier: 3**

Subject of AL: **Pacific Gas and Electric Company's Time-of-Use Pilot Design in Compliance With Decision 15-07-001**

Keywords (choose from CPUC listing): Compliance

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

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: D.15-07-001

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

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

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

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

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

Resolution Required? ☑Yes ☐No

Requested effective date: **February 25, 2016** No. of tariff sheets: N/A

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

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

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

Tariff schedules affected: N/A

Service affected and changes proposed: N/A

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

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

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

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

Advice 4764-E
December 24, 2015

Attachment 1

PG&E's Opt-In TOU Pilot Proposal

PACIFIC GAS AND ELECTRIC COMPANY

OPT-IN TIME OF USE PILOT PROPOSAL

IN COMPLIANCE WITH CPUC DECISION 15-07-001

December 24, 2015

PACIFIC GAS AND ELECTRIC COMPANY
OPT-IN TIME OF USE PILOT PROPOSAL
IN COMPLIANCE WITH CPUC DECISION 15-07-001

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CHAPTER 1

EXECUTIVE SUMMARY

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
EXECUTIVE SUMMARY

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
EXECUTIVE SUMMARY

A. Introduction

Pacific Gas and Electric Company (PG&E) presents in this chapter an Executive Summary overviewing its residential Opt-In Time-of-Use (TOU) Pilot proposal, being provided to the California Public Utilities' Commission (CPUC or Commission) as part of the advice letter required to be filed by January 1, 2016 in Decision (D.) 15-07-001,[1] issued in the Commission's Residential Rate Reform Order Instituting Rulemaking (RROIR).[2]

PG&E has been working diligently since August 25, 2015 on its Opt-In TOU Pilot proposals,[3] in conjunction with the Energy Division-led, multi-stakeholder TOU Working Group, and the expert consultant, Nexant, Inc., selected by the TOU Working Group in the end of September 2015 to help design all three IOUs' Opt-In TOU Pilots. PG&E would like to complement and thank the Energy Division, Nexant, and all of the stakeholders in the TOU Working Group for their diligent collaborative efforts in pulling together reasonable IOU Opt-In TOU Pilot plans in a very short time.

PG&E incorporates by reference the December 17, 2015 report, prepared by Nexant, Inc., for the TOU Pilot Working Group, entitled "Time-Of-Use Pricing Opt-in Pilot Plan" (Nexant Report), which is attached hereto as Appendix A. PG&E generally agrees with the Nexant Report, and its proposal showing in this advice

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1 *See* D.15-07-001, p. 166.

2 PG&E and the IOU's agreed as part of the TOU Working Group's efforts to file their Opt-In TOU Pilot Proposal advice letters early, by December 24, 2015, to support potential CPUC approval of the Resolution approving these pilots at its February 25, 2015 decision conference. A timely decision on these Advice Letters is critically important if the target launch date of June 1, 2016 is to be met.

3 As set forth in the utilities' joint letter request to ALJ Halligan, dated November 30, 2015, PG&E and the other two utilities have described why the efforts of the TOU Working Group to date had to focus primarily on the Opt-In Pilots, targeted to begin in June 2016. The joint utilities have requested that, once the Opt-In Pilot is underway, that the TOU Working Group begin to scope and make plans for the Default TOU pilot, also ordered in D.15-07-001, starting after August 2016. This two-stage planning approach will allow the TOU Working Group to capture early lessons learned from the Opt-In TOU Pilot, but will not cause a delay in the roll-out of the Default TOU Pilot, which cannot by law begin until January 1, 2018. An ALJ Ruling granting that request was issued on December 16, 2015.

letter augments the Nexant Report by providing PG&E-specific descriptions, timelines and estimated costs.

PG&E's Opt-In TOU Pilot proposal is fully compliant with the CPUC's RROIR Decision, the requirements of Public Utilities Code (Pub. Util. Code) Section 745 and is consistent with the approaches agreed to by the CPUC-ordered TOU Working Group, led by the Energy Division. In D.15-07-001 (the RROIR decision), the CPUC required PG&E and the other two IOUs to design, develop, market, recruit, and implement an Opt-In TOU Pricing Pilot program that would help interested parties, including the CPUC, understand the impact of various residential TOU designs on customer responses. The purpose of these pilots is to better inform the development of default TOU rate proposals which each IOU is required to file by January 1, 2018.[4]

The pilots are also needed to provide the CPUC with data for performing its assessment of "unreasonable hardship," as required under Pub. Util. Code Sections 745(c)(2) and 745(d) before the CPUC can order implementation of default TOU rates.[5]

B. Summary of PG&E's TOU Opt-In Pilot Proposal

PG&E's Opt-In TOU pilot will test how well a randomly selected group of approximately 18,500 PG&E Schedule E-1 (tiered monthly rate) residential customers sign up for, accept, understand and adjust to three Pilot TOU Rates that vary in complexity, price ratios and peak period durations, compared to a fourth Control Group of customers who remain on Schedule E-1 tiered monthly rates.[6] The Pilot will also seek to study the relative load response on these three Pilot TOU

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4 The RROIR decision also ordered a future Default TOU Pilot, which statutory restrictions in Pub. Util. Code Section 745 prevent from being begun until January 1, 2018. The CPUC's target timeframe for implementing residential Default TOU is 2019.

5 PG&E, SCE and SDG&E are jointly filing the required legal brief on statutory construction of Pub. Util. Code Section 745 as regards certain definitions of terms (such as "senior citizen," "economically vulnerable," "hot areas" and "unreasonable hardship"). As explained in that brief, the Opt-In TOU Pilot has been carefully designed by the TOU Working Group so as to cover a range of potential definitions, such that the CPUC need not issue a ruling resolving these questions of statutory construction prior to approving the IOUs' respective Advice Letters setting forth their Opt-In TOU Pilot proposals.

6 As recommended by the TOU Working Group, PG&E's three Pilot TOU Rates are protected to have approximately the following numbers each TOU Pilot Rate #1: about 5,300; TOU Pilot Rate #2: about 3,750; and TOU Pilot Rate #3: about 3,750; for a total of about 18,500 participants.

Rates. The sample sizes were designed for a 90 percent confidence interval, with stratifications to include large enough treatment cells to look specifically at senior citizens and economically vulnerable customers in hot areas, as to whom, under Pub. Util. Code Section 745(c)(2), the CPUC must ultimately assess whether default TOU would cause "unreasonable hardship." (*See* Chapter 5.)

At the request of Energy Division, PG&E's Opt-In Pilot will also include a study of two technologies: a thermostat study (including Smart Thermostats) and a TOU-related Smartphone App /Web-responsive Tool, to see whether either such technology significantly helps customers accept and engage with the Opt-In Pilot TOU Rates. (*See* Chapter 6.)

As detailed in Chapter 2, all three of the Opt-In TOU Pilot Rates to be studied reflect PG&E's updated high-cost generation period that has already shifted into the evening hours (around 4 p.m. – 9 p.m.), as follows:

- **TOU Pilot Rate 1:** is similar to PG&E's recently approved new opt-in E-TOU rates, with a 5-hour summer peak period (weekdays from 4 p.m. – 9 p.m.) and a 4-month summer season (June – September). TOU Pilot Rate 1's summer peak to off-peak price ratios are 1.47:1 in Tier 1 and 1.34:1 in Tier 2.
- **TOU Pilot Rate 2**: is a variation on TOU Pilot Rate 1. Although it also has a 4-month summer season, this rate has a shorter, 3-hour summer peak period (from 6 pm – 9 pm, including on weekends), with partial peak "shoulder periods" (from 4 p.m. – 6 p.m., and 9 p.m. – 10 p.m.). PG&E TOU Pilot Rate 2's summer peak to off-peak price ratios are 1.78:1 in Tier 1 and 1.55:1 in Tier 2.
- **TOU Pilot Rate 3:** was required by the CPUC to be studied, based on the more complex rate recommended by the CAISO. TOU Pilot Rate 3 has a 4 p.m. – 9 p.m. peak period on weekdays, year-round, and adds a new spring season (March – May) with super-off-peak prices between 10 a.m. – 4 p.m., to reflect emerging excess capacity during these times per the CAISO's "duck curve." PG&E's TOU Pilot Rate 3's summer peak to off-peak ratios are 1.57:1 in Tier 1 and 1.41:1 in Tier 2.

As shown in Chapter 3, the estimated bill impacts show that TOU Pilot Rates 1 and 2 will not have unduly large adverse effects on pilot participants. PG&E was unable to conduct a formal bill impact study on TOU Pilot Rate 3 in time for this Advice Filing, and reserves the right to supplement this showing with that data once it becomes available (expected by the second week of January). This delay in initial

bill impact information is not prejudicial, however, because TOU Pilot Rate 3 is not believed to be likely to become the eventual residential *default* TOU rate. Rather TOU Pilot Rate 3 seems more likely to be the basis for a potential, new, more complex opt-in TOU rate offering, if warranted based on the outcome of the Opt-In TOU Pilot.

It will be very challenging to recruit 18,500 PG&E residential customers to opt-into this TOU Pilot in just 2 short months (between March 2016 and mid-May, when Welcome Kits will need to go out to enrollees before the targeted June 1, 2016 launch date). As a result, Nexant and the TOU Working Group agreed that a January 2016 pre-test of recruitment channels is needed to provide essential input that will assist the IOUs with finalizing their approach for full-scale pilot outreach (to 200,000 customers). The pre-test will also help determine the most cost-effective delivery methods (e.g., courier service versus U.S. Postal Service letters, with live outbound calling as contingency), as well as the most effective types of communication and messaging. The pre-test will further assist the IOUs in determining what level of customer incentive payments are likely to be the most cost-effective approach for maximizing participation in the pilots. (*See* Chapters 7 and 8.)

During the Pilot, customers will receive educational outreach materials through various media to provide them with information on their rate, as well as low or no-cost tips for how to reduce their bills by shifting more usage to the off-peak periods. (*See* Chapters 8 and 11.) Customer Call Center support, as well as Information Technology and other operational needs have been scoped. (*See* Chapters 9 and 10.) Qualitative as well as quantitative surveys of participating customers will help assess customer acceptance, understanding, and engagement on these rates, and will seek to identify barriers or perceived problems they may experience. (*See* Chapter 12.)

A formal Measurement and Evaluation study will be performed, providing interim results in Q1 2017 and Q4 2017. Final results will be published in Q1 2018, after the Opt-In Pilot officially ends on December 31, 2017. (*See* Chapter 13.)

Because the Commission has already approved Memorandum Accounts for recording of IOUs' actual pilot costs, followed by reasonableness review, the preliminary cost estimates provided herein are *not* presented for purposes of cost-recovery approval at this time. Rather, the IOUs were asked to provide, in their

TOU Pilot Advice Filings, initial cost estimates in order to give the Commission, and other interested parties, a general sense of the magnitude of costs likely to be incurred under the proposed pilot program design. Although actual costs will certainly vary, PG&E's cost estimates in the advice letter represent a conservative, high-level estimate based on certain assumptions. PG&E will refine these estimated costs using customer findings, such as pre-tests that the IOUs are conducting in early 2016. This refinement will most likely result in some changes and possibly a reduction in cost estimates, again assuming that the scope of the pilot does not change significantly.

Accordingly, PG&E presents its preliminary, high-end conservative cost estimate, which totals approximately $23.1 million over a 3-year period. The annual breakdown of that total estimated cost is: $13,312,713 for 2015 and 2016, $9,050,345 for 2017, and $745,125 for 2018. A preliminary Opt-In TOU Pilot cost forecast for 2017 and 2018 was already included in PG&E's 2017 GRC Phase 1 Application, and pilot costs for 2015 and 2016 to be recorded in the memorandum account which PG&E has proposed be recovered through its 2017 GRC Phase 1 proceeding currently pending before the CPUC.

PG&E concurs with the Energy Division, Nexant and the TOU Working Group that much will be learned through the three IOUs' Opt-In TOU Pilots, and that those lessons are essential to ensure that the CPUC's planned eventual rollout of default TOU to upwards of 10 million customers statewide in 2019 can be as successful as possible.

For the reasons set forth in the chapters below, PG&E respectfully requests that the CPUC find reasonable and grant timely approval to its proposed Opt-In TOU Pilot Plan. A timely approval is absolutely essential if PG&E is to meet the targeted pilot launch date of June 1, 2016 (the start of PG&E's residential TOU summer season). Recruitment of some 18,500 customers to opt-into the pilot can only be begin after a final Commission approval of an Opt-In TOU Pilot. Given that the target start date for the pilot is June 1, 2016 (the start of PG&E's residential TOU summer season), PG&E requests that Commission approve this advice letter request no later than its Decision Conference on March 17, 2016. That date will leave less than two months to complete recruitment by mid-May, for roll-out of the Welcome Kits before launching the pilot rates starting on June 1, 2016. The Working Group has recognized that this is a very short time to accomplish such

large opt-in enrollments, even with the proposed incentive payments and other features of the pilot. Therefore, if it is possible to accomplish approval at the Commission's at its February 25, 2016 decision conference this would allow an additional three weeks of recruitment.

PG&E's Opt-In TOU Pilot Proposal showing is presented herein through the following chapters that supplement the Nexant Report, as follows:

- Chapter 1 – Executive Summary
- Chapter 2 – Rate Design
- Chapter 3 – Bill Impact
- Chapter 4 – Exclusions
- Chapter 5 – Experimental Design and Sample Size
- Chapter 6 – Technology Treatments
- Chapter 7 – Recruitment Pre-Test
- Chapter 8 – Marketing and Recruitment
- Chapter 9 – Information Technology and Operations
- Chapter 10 – Customer Support
- Chapter 11 – Education and Outreach
- Chapter 12 – Customer Insight and Research
- Chapter 13 – Measurement and Evaluation
- Chapter 14 – High Level Schedule for Implementation
- Chapter 15 – Overall Summary of Opt-In Pilot Cost Estimates
- Chapter 16 – Conclusion

PACIFIC GAS AND ELECTRIC COMPANY

OPT-IN TIME OF USE PILOT PROPOSAL

IN COMPLIANCE WITH CPUC DECISION 15-07-001

CHAPTERS 2 AND 3 – UPDATED AND REVISED

CLEAN

January 8, 2016

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 2

RATE DESIGN

UPDATED AND REVISED VERSION

PACIFIC GAS AND ELECTRIC COMPANY
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RATE DESIGN

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
RATE DESIGN

A. Introduction

This chapter describes the design of rates for the three TOU treatment groups, to be used in Pacific Gas and Electric Company's (PG&E) proposed Residential Opt-In TOU Pilot project. As described in later chapters, under the basic experimental design arrived at by the TOU Pilot Working Group, customers will first be randomly selected and, with the aid of a monetary incentive, asked to volunteer to participate in the overall pilot project. Each customer will be randomly assigned to either a control group (which will be billed on PG&E's standard residential rate, Schedule E-1) or to one of three TOU pilot rate treatment groups. Comparisons can then be made between a particular TOU pilot rate treatment group and the control group to measure the effects of each of the three TOU pilot rates described in this chapter (e.g., the average amount of load shifting obtained, and the relative levels of customer acceptance and satisfaction among these three TOU pilot rates).

B. TOU Treatments – PG&E's Initial Proposal

Initially, as part of the Working Group process in Fall 2015, PG&E proposed that there to be two TOU rate treatment groups, both with simple designs.

PG&E's TOU Pilot Rate 1 was patterned after PG&E's new E-TOU schedules, recently approved by the California Public Utilities Commission (CPUC or Commission) in D.15-11-013.[1] As shown in Table 2-1, it is a simple rate for customers to understand, with just two TOU periods (peak and off-peak) that are defined the same way in both summer (June through September) and winter (all other months). Peak hours for both seasons occur only on non-holiday weekdays,[2] for a 5-hour period between 4 p.m. and 9 p.m. All other hours have reduced off-peak rates. That initially-proposed structure for Rate 1 did not change during the Working Group process.

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1 Deciding Application 14-11-014, PG&E's 2015 Rate Design Window (RDW) Proceeding.

2 Weekdays are defined to exclude holidays. Holidays that fall on weekdays are treated the same as weekend days.

TABLE 2-1
PG&E'S PROPOSAL FOR TOU PILOT RATE 1

TOU Treatment 1	Weekdays	Weekends
Summer		
Peak	4 p.m. – 9 p.m.	N/A
Off-Peak	9 p.m. – 4 p.m.	All hours
Winter		
Peak	4 p.m. – 9 p.m.	N/A
Off-Peak	9 p.m. – 4 p.m.	All hours

PG&E's initial TOU Pilot Rate 2 proposal was for a simple variation from TOU Pilot Rate 1, to test the effect of shortening the peak period to three hours, focusing on the highest-cost hours from 6 p.m. to 9 p.m. This initial TOU Pilot Rate 2 design is shown in Table 2-2. It had the same 4-month summer season definition as TOU Pilot Rate 1, and had the same simple two-period TOU design (peak and off-peak, defined in the same way in both summer and winter). The only difference from TOU Pilot Rate 1 is that Pilot Rate 2's peak period is shortened by two hours to be weekdays from 6 p.m. to 9 p.m., with the weekday hours from 4 p.m. to 6 p.m. shifted to off-peak hours. PG&E continues to believe that a simpler two-period rate design like this, with only a peak and an off-peak period, is easier for residential customers to understand, accept, and engage with. However, as described in Section C below, PG&E's initially proposed two-period structure for TOU Pilot Rate 2 was changed somewhat through the Working Group process.

TABLE 2-2
PG&E'S *INITIAL* PROPOSAL FOR TOU PILOT RATE 2

TOU Treatment 2	Weekdays	Weekends
Summer		
Peak	6 p.m. – 9 p.m.	N/A
Off-Peak	9 p.m. – 6 p.m.	All hours
Winter		
Peak	6 p.m. – 9 p.m.	N/A
Off-Peak	9 p.m. – 6 p.m.	All hours

C. TOU Treatments – PG&E's Revised Proposal

After PG&E had developed and presented its initial proposal to the Working Group, an Assigned Commissioner and ALJ Ruling of October 15, 2015

(October 15, 2015 Ruling) directed the IOUs to test three TOU Pilot rate treatments, not two, and required that the third treatment be a more complex design similar to that recommended by the California Independent System Operator (CAISO).

Also, in late October 2015, PG&E had discussions with Energy Division staff during which staff recommended revising PG&E's TOU Pilot Rate 2 to make it more complex than PG&E had initially proposed, by adding a summer partial-peak period containing the two hours immediately preceding and the one hour immediately following the three-hour peak 6 p.m. to 9 p.m. peak period.[3] Because the weekday periods from 4 p.m. to 6 p.m., and from 9 p.m. to 10 p.m., are still relatively high-cost hours (though not as high as the hours from 6 p.m. to 9 p.m.), and given that PG&E's new E-TOU rate already will provide some insights into a two-period TOU rate, PG&E was amenable to testing this design despite its greater complexity (which may make it more difficult for customers to understand, accept, and engage with).[4] To offset the additional complexity of a third TOU period, PG&E proposed to make the TOU period definitions used on weekends identical to those used on weekdays, which Energy Division staff found acceptable. PG&E's revised TOU Pilot Rate 2 proposal is shown in Table 2-3. If, however, the CPUC were to instead adopt the simpler, initially-proposed TOU Pilot Rate 2, PG&E would not object.

TABLE 2-3
PG&E'S *REVISED* PROPOSAL FOR TOU PILOT RATE 2

TOU Treatment 2	Weekdays	Weekends
Summer		
Peak	6 p.m. – 9 p.m.	6 p.m. – 9 p.m.
Part-Peak	4 p.m. – 6 p.m., 9 p.m. – 10 p.m.	4 p.m. – 6 p.m., 9 p.m. – 10 p.m.
Off-Peak	10 p.m. – 4 p.m.	10 p.m. – 4 p.m.
Winter		
Peak	6 p.m. – 9 p.m.	6 p.m. – 9 p.m.
Off-Peak	9 p.m. – 6 p.m.	9 p.m. – 6 p.m.

[3] Energy Division staff did not recommend any changes to PG&E's proposed TOU Pilot Rate 1 design.

[4] This conclusion is based on customer research that was presented in PG&E's 2015 Rate Design Window Proceeding (A.14-11-014), Exhibit (PG&E-1), Chapter 4, Appendix 4 ("TOU Rate Development Conjoint Research Report Among Residential Customers," Final Report prepared by Hiner and Associates, September 25, 2014).

In response to the October 15, 2015 Ruling, PG&E also developed a third, more complicated (what the Working Group has called "spicy"), TOU Pilot Rate treatment design. TOU Pilot Rate 3 added a third season in the spring (running from March through May), to allow for lower prices during low-cost hours from 10 a.m. to 4 p.m. to be charged in a "super-off-peak" period. As detailed in the CAISO's "duck curve" graphs, these are hours when output from renewable generation is beginning to approach or exceed aggregate customer demand. The TOU Rate 3 design is shown in Table 2-4. For summer and winter seasons, the design is the same as that of TOU Pilot Rate 1, with peak hours on weekdays from 4 p.m. to 9 p.m., and all other hours being off-peak. In the spring, the peak period hours are also the same as TOU Pilot Rate 1, but the remaining hours are divided into off-peak and super-off-peak periods, with the latter encompassing the low-cost hours from 10 a.m. to 4 p.m. identified by the CAISO.

TABLE 2-4
PG&E'S PROPOSAL FOR TOU PILOT RATE 3

TOU Treatment 3	Weekdays	Weekends
Summer		
Peak	4 p.m. – 9 p.m.	NA
Off-Peak	9 p.m. – 4 p.m.	All hours
Winter		
Peak	4 p.m. – 9 p.m.	NA
Off-Peak	9 p.m. – 4 p.m.	All hours
Spring		
Peak	4 p.m. – 9 p.m.	NA
Off-Peak	9 p.m. – 10 a.m.	9 p.m. – 10 a.m.
Super-Off-Peak	10 a.m. – 4 p.m.	10 a.m. – 4 p.m.

The final designs for PG&E's TOU Pilot Rates 1, 2, and 3, respectively, are those shown in Tables 2-1, 2-3, and 2-4. Figures 2-1, 2-2 and 2-3 show the same information in "refrigerator magnet" graphical format.[5]

[5] Simplified versions of colored figures like these can be made into magnets or clings that pilot participants can put on their appliances (like their refrigerators, for example) to remind them of the TOU period definitions for their particular pilot rate.

FIGURE 2-1
TOU PILOT RATE 1 IN GRAPHICAL FORMAT

Treatment	Season	Hour Ending																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TOU Treatment 1	Summer Weekdays	Off-Peak																Peak					Off Peak		
	Summer Weekends	Off-Peak																							
	Winter Weekdays	Off-Peak																Peak					Off Peak		
	Winter Weekends	Off-Peak																							

FIGURE 2-2
TOU PILOT RATE 2 IN GRAPHICAL FORMAT

Treatment	Season	Hour Ending																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TOU Treatment 2	Summer Weekdays	Off-Peak																Part-Peak		Peak			Part-Peak	Off Peak	
	Summer Weekends	Off-Peak																Part-Peak		Peak			Part-Peak	Off Peak	
	Winter Weekdays	Off-Peak																		Peak			Off Peak		
	Winter Weekends	Off-Peak																		Peak			Off Peak		

FIGURE 2-3
TOU PILOT RATE 3 IN GRAPHICAL FORMAT

Treatment	Season	Hour Ending																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TOU Treatment 3	Summer Weekdays	Off-Peak																Peak					Off Peak		
	Summer Weekends	Off-Peak																							
	Winter Weekdays	Off-Peak																Peak					Off Peak		
	Winter Weekends	Off-Peak																							
	Spring Weekdays	Off-Peak										Super-Off-Peak						Peak					Off-Peak		
	Spring Weekends	Off Peak										Super-Off-Peak						Off Peak							

D. Control Group

After much discussion, the Working Group decided that the rate on which the control group for the TOU pilot should be placed should be based on each utility's

standard tiered rate, as it will exist in 2016.[6] For PG&E, the standard tiered rate is Schedule E-1 (or Schedule EL-1, for low-income customers who have certified that they qualify for the California Alternate Rates for Energy (CARE) Program). Per the Commission's final decision in Phase 1 of the Residential Rate OIR, D.15-07-001, the Schedule E-1 rates for the control group will, in Summer 2016 when the pilot begins, have three tiers, defined as follows:

- Tier 1: Usage between 0 and 100 percent of baseline;
- Tier 2: Usage between 100 and 200 percent of baseline; and
- Tier 3: Usage in excess of 200 percent of baseline.

In 2017, the second year of the pilot, there will also be three tiers. However, they will be defined differently: usage up to a customer's baseline amount will still be in Tier 1, but Tier 2 will consist of usage between 100 and 400 percent of baseline, and usage above 400 percent will be in a third SUE tier.

E. PG&E's Pilot TOU Rate Design

This section describes how the illustrative rates for PG&E's Pilot control group and its three TOU Pilot Rate treatments were designed. The rates are illustrative because PG&E does not at this time know the exact residential revenue requirement that will be in effect on June 1, 2016 when the pilot begins. However, to reflect the higher rates expected for 2016, PG&E as set the illustrative rates shown in this report 10 percent higher than current rates to account for a 4 percent lower sales forecast for 2016 and a higher expected revenue requirement for PG&E's 2016 Annual Electric True-Up (AET). Further support for targeting illustrative rates with a 10 percent increase is that the residential portion of the transmission revenue requirement is scheduled to increase by $150 million on

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6 The alternative considered by the TOU Working Group was to base the control group rate plan on the standard tier structure expected in 2019, when there will be two standard tiers, plus a Super-User of Electricity (SUE) tier. Although using the 2019 structure would better model the standard rate structure that will be in place when default TOU rates are expected to go into effect, the concern was that control group customers would see significantly different rates when the experiment began than the current E-1 rates (i.e., narrower tier differentials), and that it might be difficult to disentangle the effects of the TOU rate treatments from the effects of tier narrowing. So the decision was made to use the 2016 E-1 design as a basis for designing control group rates, since the amount of narrowing from current rates will be less pronounced.

March 1, 2016.[7] Prior to the commencement of the pilot, PG&E will update its three TOU Pilot Rates based upon the then-current Residential revenue requirement. The control group rates will simply be the Schedule E-1 rates in effect on June 1, 2016. Over the course of the TOU Pilot, whenever a change to Residential rates occurs, both the control group and the TOU treatment rates will change, to reflect changing revenue requirements.

The control group rates were obtained by first re-classifying forecasted 2016 sales to correspond to the tier definitions that will be in place beginning March 1, 2016 (i.e., a three-tiered structure with the tiers defined as previously described in Section D). PG&E then designed rates to collect the required revenue such that the ratios between the tier prices matched the prescribed 2016 glide path ratios directed by D.15-07-001. The resulting illustrative rates are shown in Table 2-5.

TABLE 2-5
ILLUSTRATIVE RATES FOR TOU PILOT CONTROL GROUP

Control Group	Non-CARE	CARE
Tier 1	$0.19566	$0.12310
Tier 2	$0.24066	$0.15141
Tier 3	$0.35414	$0.22281

PG&E then developed each of the three TOU treatment rates on a revenue-neutral basis compared to the control group rates. A primary objective in designing the TOU treatment rates was for them to be cost-based. TOU Pilot Rate 1, for example, was designed to reflect PG&E's generation costs by TOU period, using hourly generation cost data developed in PG&E's 2015 RDW filing. This same rate design methodology, reflecting time-varying generation costs in rates while leaving all other rate components flat across TOU periods, was recently approved by the Commission in D.15-11-013. The illustrative rates for TOU Pilot Rate 1 are shown in Table 2-6.[8] These rates have a differential of about 10 cents

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7 On December 17, 2015, the Commission approved PG&E's proposed, uncontested, sales forecast in PG&E's 2016 Energy Resource Recovery Account (ERRA) Forecast proceeding (A.15-06-001). In addition, the average residential rate for the 2016 AET scheduled for January 1, 2016, is currently forecasted to increase by more than 7 percent.

8 The rates shown are those for Tier 2. The implicit Tier 1 rates can be obtained by applying the baseline credit to the Tier 2 rate. The baseline credits are set at a comparable level to the tier differentials present in the control group rates, and they are the same for all TOU pilots (though they differ between non-CARE and CARE).

per kilowatt-hour (kWh) between summer peak and off-peak rates. While this is well in excess of the "mild" initial starting point differential for default TOU rates of 4 cents per kWh recommended by the Office of Ratepayer Advocates,[9] and directed by the Commission in D.15-07-001,[10] it is indicative of the differential likely to eventually be in place after a transition period to allow residential customers to accept and become accustomed to responding to default TOU rates. As such, it represents a reasonable TOU rate differential for the pilot to test.

TABLE 2-6
ILLUSTRATIVE RATES FOR TOU PILOT RATE 1

TOU Treatment 1	Non-CARE	CARE
Summer		
Peak Period	$0.40900	$0.24842
Off-Peak Period	$0.30594	$0.18356
Baseline Credit	$(0.08788)	$(0.04790)
Winter		
Peak Period	$0.27351	$0.16315
Off-Peak Period	$0.25471	$0.15132
Baseline Credit	$(0.08788)	$(0.04790)

For TOU Pilot Rate 2, PG&E's initial design had used the same, Commission-approved, methodology as used to design E-TOU-A and TOU Pilot Rate 1, with the time-varying rates limited to the generation rate component. However, Energy Division staff wanted a higher ratio or greater spread between peak and off-peak rates, in order to test response to a stronger TOU price signal. To achieve that steeper ratio, Energy Division asked PG&E to also include some distribution capacity costs as well as generation capacity costs as rate components. While PG&E does not necessarily agree that distribution rates for residential customers should be time-varying, for the experimental purposes here, PG&E is amenable to testing a stronger price signal. So PG&E designed a rate which allocated a portion of distribution capacity costs, as well as generation costs, to TOU periods, to produce a larger TOU differential in the overall bundled rate. The illustrative rates for TOU Pilot Rate 2 are shown in Table 2-7.

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9 *See* D.15-07-001, mimeo, p. 134, fn. 284.

10 *See* D.15-07-001, mimeo, pp. 135-136.

TABLE 2-7
ILLUSTRATIVE RATES FOR TOU PILOT RATE 2

TOU Treatment 2	Non-CARE	CARE
Summer		
Peak Period	$0.44779	$0.27657
Part-Peak Period	$0.39027	$0.24162
Off-Peak Period	$0.28383	$0.16202
Baseline Credit	$(0.08788)	$(0.04790)
Winter		
Peak Period	$0.27468	$0.16613
Off-Peak Period	$0.25205	$0.15092
Baseline Credit	$(0.08788)	$(0.04790)

For TOU Pilot Rate 3, PG&E employed the same rate design methodology as for TOU Pilot Rate 2, including time-differentiation in the distribution, as well as the generation, rate components.[11] However, doing this alone did not produce a sufficiently low super-off-peak rate in spring as Energy Division staff wished to test.[12] So PG&E constrained the super-off-peak rate to be lower still—with rates of 8.0 and 16.9 cents per kWh for Tier 1 and Tier 2, respectively.[13] The illustrative rates for TOU Pilot Rate 3 are shown in Table 2-8.

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11 Again, PG&E does not necessarily agree that distribution rates should be time-varying, but is amenable to including a time-varying distribution rate component solely for experimental purposes in this pilot.

12 Energy Division's guidance was that the super-off-peak rate should be in the neighborhood of 10 cents per kWh, if possible. The super-off-peak rate in Tier 1 (i.e., after subtracting the baseline credit), is about 8 cents per kWh.

13 PG&E accomplished this by reducing the spring super-off-peak rate by 5 cents per kWh, and increasing all the other TOU rates on an equal cents per kWh basis to make up for the lost revenue.

TABLE 2-8
ILLUSTRATIVE RATES FOR TOU PILOT RATE 3

TOU Treatment 3	Non-CARE	CARE
Summer		
Peak Period	$0.40900	$0.24842
Off-Peak Period	$0.30594	$0.18356
Baseline Credit	$(0.08788)	$(0.04790)
Winter		
Peak Period	$0.27658	$0.16529
Off-Peak Period	$0.26361	$0.15735
Baseline Credit	$(0.08788)	$(0.04790)
Spring		
Peak Period	$0.26778	$0.15975
Off-Peak Period	$0.26142	$0.15597
Super-Off Peak Period	$0.18220	$0.10500
Baseline Credit	$(0.08788)	$(0.04790)

Finally, Tables 2-9 through 2-12 show, for TOU Pilot Rates 1, 2, and 3, respectively, the rate ratios between TOU periods for each tier and season. In all cases, these ratios are expressed relative to the off-peak rate.

TABLE 2-9
TOU RATE RATIOS FOR PILOT RATE 1

TOU Rate Ratios	Summer Peak	Summer Off-Peak	Peak:Off-Peak Ratio
Tier 1	$0.32113	$0.21807	1.47
Tier 2	$0.40900	$0.30594	1.34

TOU Rate Ratios	Winter Peak	Winter Off-Peak	Peak:Off-Peak Ratio
Tier 1	$0.18563	$0.16683	1.11
Tier 2	$0.27351	$0.25471	1.07

TABLE 2-10
TOU RATE RATIOS FOR TOU PILOT RATE 2

TOU Rate Ratios	Summer Peak	Summer Part-Peak	Summer Off-Peak	Peak:Off-Peak Ratio	Part Peak:Off-Peak Ratio
Tier 1	$0.35991	$0.30239	$0.19595	1.84	1.54
Tier 2	$0.44779	$0.39027	$0.28383	1.58	1.38

TOU Rate Ratios	Winter Peak	Winter Off-Peak	Peak:Off-Peak Ratio
Tier 1	$0.18680	$0.16417	1.14
Tier 2	$0.27468	$0.25205	1.09

TABLE 2-11
TOU RATE RATIOS FOR TOU PILOT RATE 3

TOU Rate Ratios	Summer Peak	Summer Off-Peak	Peak:Off-Peak Ratio
Tier 1	$0.32113	$0.21807	1.47
Tier 2	$0.40900	$0.30594	1.34

TOU Rate Ratios	Winter Peak	Winter Off-Peak	Peak:Off-Peak Ratio
Tier 1	$0.18871	$0.17573	1.07
Tier 2	$0.27658	$0.26361	1.05

TOU Rate Ratios	Spring Peak	Spring Off-Peak	Spring Super-Off-Peak	Peak:Off-Peak Ratio	Super-Off-Peak:Off-Peak
Tier 1	$0.17990	$0.17354	$0.09432	1.04	0.54
Tier 2	$0.26778	$0.26142	$0.18220	1.02	0.70

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3

BILL IMPACTS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
BILL IMPACTS

TABLE OF CONTENTS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
BILL IMPACTS

A. Introduction

This chapter presents bill impacts and energy burdens for the first two Pilot Rate treatments, TOU Treatment (Pilot) Rate 1 and TOU Treatment (Pilot) Rate 2.[1] To perform these calculations Pacific Gas and Electric Company (PG&E) used a data base consisting of twelve months of recent usage data from its residential billing files merged with Experian data on customer income and age of head of household (to determine senior vs. non-senior status).[2]

For each customer, PG&E first calculated the average monthly bills over the 12-month period assuming the customer was billed on four different sets of rates: (a) Control Group rate, (b) TOU Pilot Rate 1, (c) TOU Pilot Rate 2, and (d) Pilot Rate 3. For these bill calculations, customers were assumed not to change their usage in response to the TOU rates. So to the extent they would or could shift usage away from the higher-priced peak periods, the bill impacts would actually be less severe than shown in these calculations (i.e., customers who appear to see bill increases might see smaller increases or even decreases, and those who appear to see bill savings might see larger savings). Three different bill comparisons were performed:

- Moving from Control Group rates to TOU Pilot Rate 1;
- Moving from Control Group rates to TOU Pilot Rate 2; and
- Moving from Control Group rates to TOU Pilot Rate 3.

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1 As described in PG&E's initial submission, shortly prior to completing this chapter, PG&E discovered a problem with the billing determinants (i.e., the sales by tier and by TOU period) for the population of customers for whom the bill comparisons and electricity burdens were being calculated. PG&E remedied this problem and recalculated the bill comparison and electricity burdens. This updated version of Chapter 3 contains PG&E's complete, updated bill comparison and electricity burden tables and bar charts, along with summary descriptions of the results. Concurrently, to correct a problem with the TOU Pilot rates that PG&E discovered since submitting its advice letter, PG&E is also updating the illustrative TOU Pilot rates and TOU price ratios in Tables 2-6 through 2-11 of Chapter 2. The bill comparison and electricity burden results shown in this chapter are consistent with those rate updates.

2 Data were from the 12-month period between August 2014 and July 2015. Customers without age or income data or with zero bills were not included, nor were customers without interval data (necessary to calculate usage by TOU period for each of the pilot rates).

For each comparison, PG&E calculated the change in average monthly bill in both dollars and in terms of percentage change. Individual customer results were then summarized by assigning customers to income groups and showing the distribution of bill impacts. Some PG&E customers are billed on discounted rate programs, either the California Alternate Rates for Energy (CARE) program or the Family Electric Rate Assistance (FERA) program. The results for these two groups of customers are combined, and shown separately as "CARE/FERA." The results for customers billed on PG&E's standard residential rate, Schedule E-1, are also shown separately as "Non-CARE."[3]

B. Bill Impacts of Pilot Rate 1

The bill impact tables in Attachment 3-A, pages 1 through 12, show the bill impact results, comparing bills under the Control Group rates to bills under TOU Pilot Rate 1. In each table, customers are placed into cells based upon their income group and the percentage change in their bills (with negative percentage changes indicating bill reductions, or savings, from moving to the TOU rate). Each cell shows the numbers of customers, the percentage of customers, and the average annual bill on the TOU Treatment rate. The average annual bill provides some context for the percentage changes in bills, because the results for small users often shows what appear to be large percentage increases in their bills, but which are not actually very big increases in dollar terms. The twelve tables, on pages 1 through 12 of Attachment 3-A, show the bill comparison results at varying levels of disaggregation in terms of climate zone, age of head of household, and rate schedule (non-CARE vs. CARE/FERA) .

Figures 3-1 and 3-2 summarize, in bar chart form, the results for non-CARE and CARE/FERA, respectively, moving from the Control Group rates to TOU Pilot Rate 1.[4] Figure 3-1 shows that, absent load shifting, about 41% of non-CARE customers would save on TOU Pilot Rate 1. About 32%, would save between 0% and 5% on their bills, while another 9% would save between 5% and 15%. Less

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3 Technically, these customers are non-CARE *and* non-FERA. But for ease of exposition, PG&E refers to them herein as "non-CARE." FERA customers represent a very small percentage of PG&E's residential customers, less than 0.5 percent.

4 The customer percentages in these bar charts were obtained from the tables on the first two pages of Attachment 3-A. Results for specific climate zones and for customers with senior heads of household can be found in the other tables in Attachment 3-A.

than 0.5% of non-CARE customers would save more than 15%. On the flip side, about 59% of non-CARE customers would pay more on TOU Pilot Rate 1. A total of 32% would see percentage bill increases between 0% and 5%, 22% would see increases between 5% and 10%, and 4% would see increases between 10% and 15%. About 1% of non-CARE customers would see bill increases larger than 15%. A focus on percentage changes in bills can sometimes be misleading, and dollar impacts are what really matter to customers' budgets. For example, the 22% of customers falling in the category showing bill increases between 5% and 10% have an average monthly bill of $133.[5] So increases of 5% to 10% translate to increases of between $7 and $13 on monthly bills. A similar calculation for the 4% of customers seeing bill increases in the 10%-15% range shows an actual dollar impact of $15 to $22 per month. Finally even for the very small percentages of the worst-hit customers (about 0.5%), the dollar increases would range from $21 to $29, on average. And this is assuming no shift in usage from peak to off-peak, so the actual monthly dollar impacts are expected to be found to be lower through the pilot, once load response is factored in.[6]

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5 See page 1 of Attachment 3-A, showing an average annual bill of $1,600 (or $133 per month) for the 557,208 customers in this category.

6 In addition, dissatisfied participants can always opt out of the pilot.

FIGURE 3-1
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 1
NON-CARE CUSTOMERS

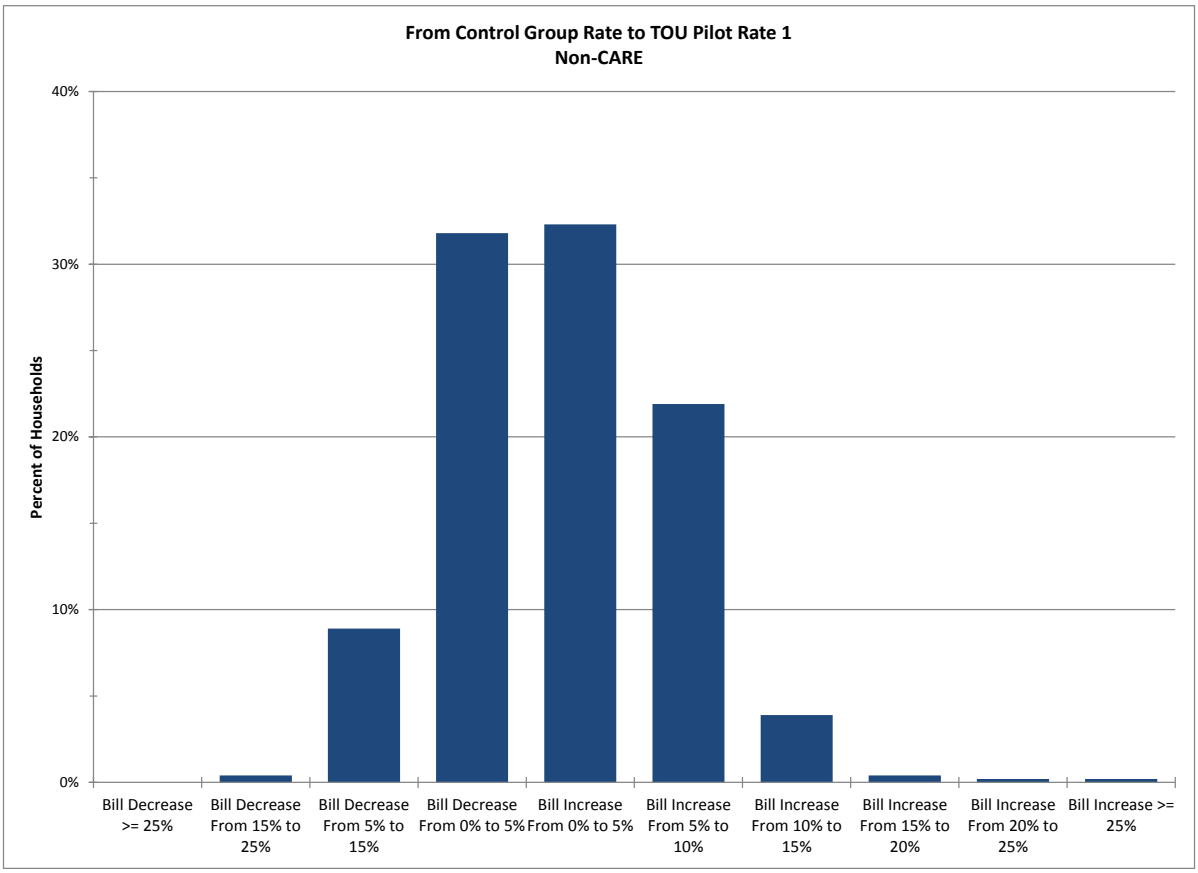
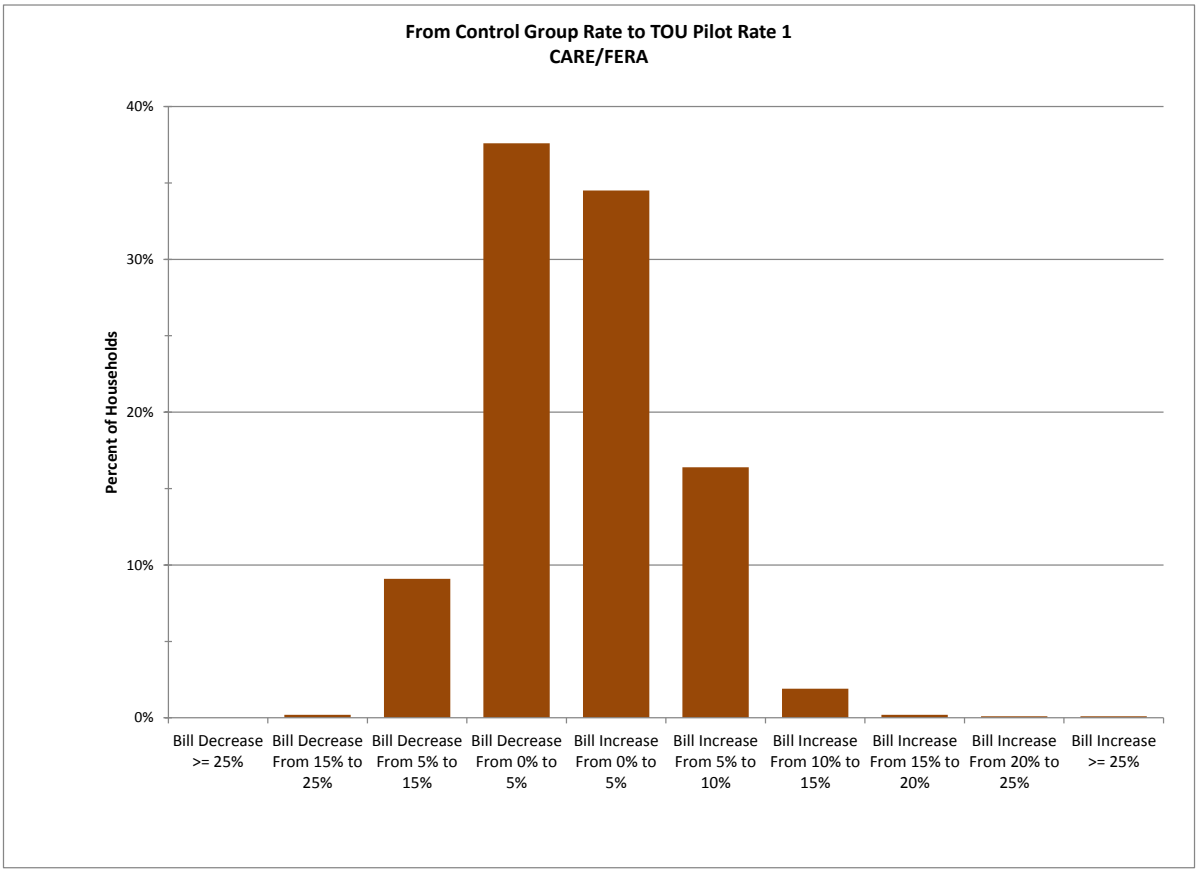


Figure 3-2 shows the distribution of bill impacts for CARE/FERA customers. About 47% of CARE/FERA customers would save on TOU Pilot Rate 1, with the remaining 53% seeing higher bills (again, assuming no load shifting). A total of 38% of CARE/FERA customers would see bill savings between 0% and 5%, another 9% would see savings between 5% and 15%. Less than 0.5% of CARE/FERA customers would save more than 15%. On the other side of the distribution, a total of 35% of CARE/FERA customers would see bill increases between 0% and 5%, 16% would see increases between 5% and 10%, and 2% would see increases between 10% and 15%. Less than 0.5% of CARE/FERA customers would see bill increases of 15% or more. In terms of dollar impacts, take, for example, the 16% of CARE/FERA customers in the 5%-10% increase

category who, as a group, have an average monthly bill of $87.[7] Thus, a monthly increases of 5% to 10% translates to increases of between $4 and $9 on their monthly bills. For the 2% of CARE/FERA customers seeing increases in the 10%-15% range, the monthly dollar increases range from $8 to $12. Even for the very small percentages of the worst-hit customers (about 0.5%), the dollar increases would range from $12 to $18, on average. Again, these bill increases will not be as large if customers shift load from peak to off-peak periods, and dissatisfied CARE/FERA customers can drop out of the pilot.

FIGURE 3-2
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 1
CARE/FERA CUSTOMERS



[7] See page 2 of Attachment 3-1, showing an average annual bill of $1,038 (or $87 per month) for the 159,914 customers in this category.

C. Bill Impacts of Pilot Rate 2

Pages 1 through 12 of Attachment 3-B show similar bill impact results, comparing bills under the Control Group rates to bills under TOU Pilot Rate 2. These twelve tables are in the identical format and order as the TOU Pilot Rate 1 rates described in Section B.

Figures 3-3 and 3-4, respectively, summarize, in bar chart form, the results for non-CARE and CARE/FERA customers moving from the Control Group rates to TOU Pilot Rate 2.[8] Figure 3-3 shows that, absent load shifting, about 42% of non-CARE customers would save on TOU Pilot Rate 2, while about 58% would pay more. In the former category, 31% would save between 0% and 5% on their bills, 10% would save between 5% and 15%, and slightly less than 1% of would save more than 15%. In the latter category, about 31% of non-CARE customers would see bill increases between 0% and 5% on TOU Pilot Rate 2, 20% would see increases between 5% and 10%, and 6% would see increases between 10% and 15%. About 1% of non-CARE customers would see increases of 15% or more. In dollar terms, the pattern of average bill increases is similar to that described in Section B for TOU Pilot Rate 1. The group of non-CARE customers seeing bill increases in the 5%-10% range would see average monthly bill increases between $7 and $13, those in the 10%-15% increase group would see dollar increases between $14 and $22, and the very small number seeing percentage increases greater than 15% would see dollar increases from $21 to $29.

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8 The customer percentages in these bar charts were obtained from the tables on the first two pages of Attachment 3-B. Results for specific climate zones and for seniors only can be found in the other tables in Attachment 3-B.

FIGURE 3-3
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 2
NON-CARE CUSTOMERS

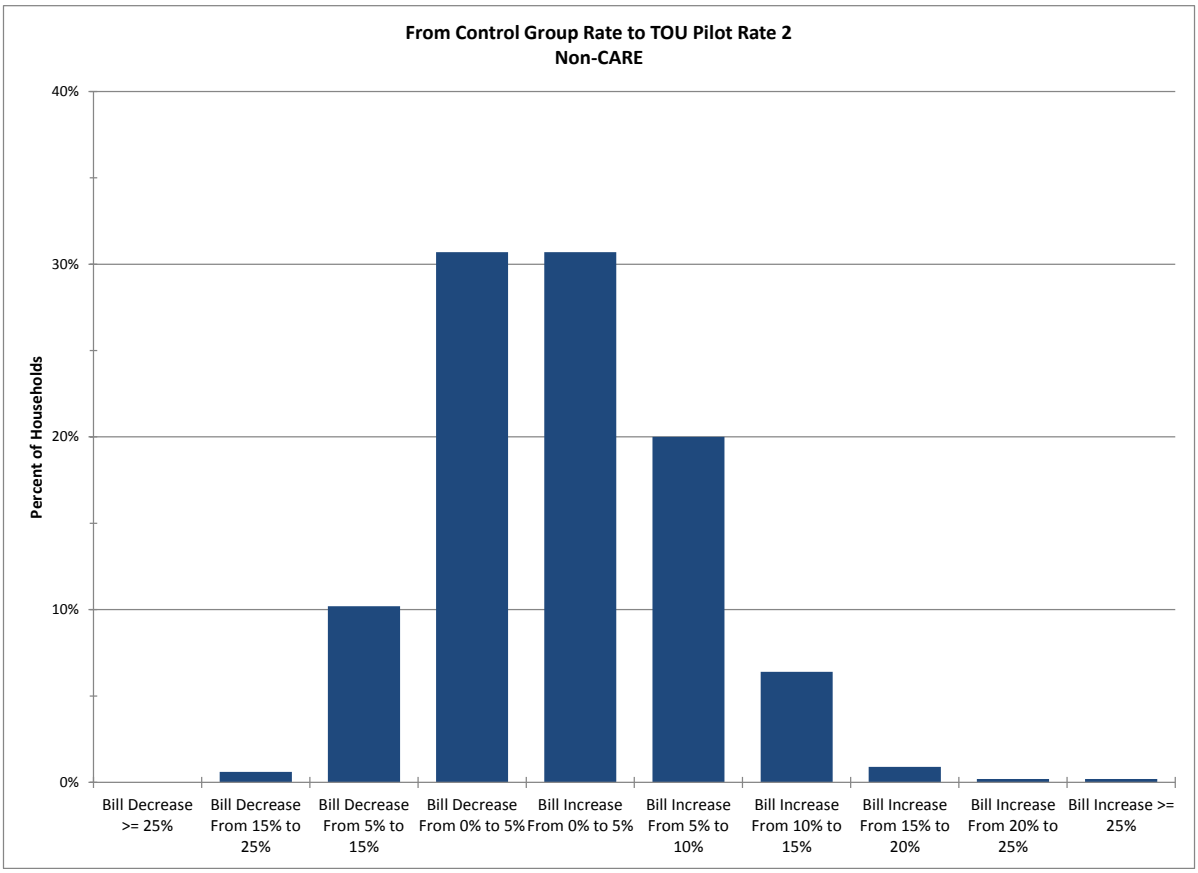
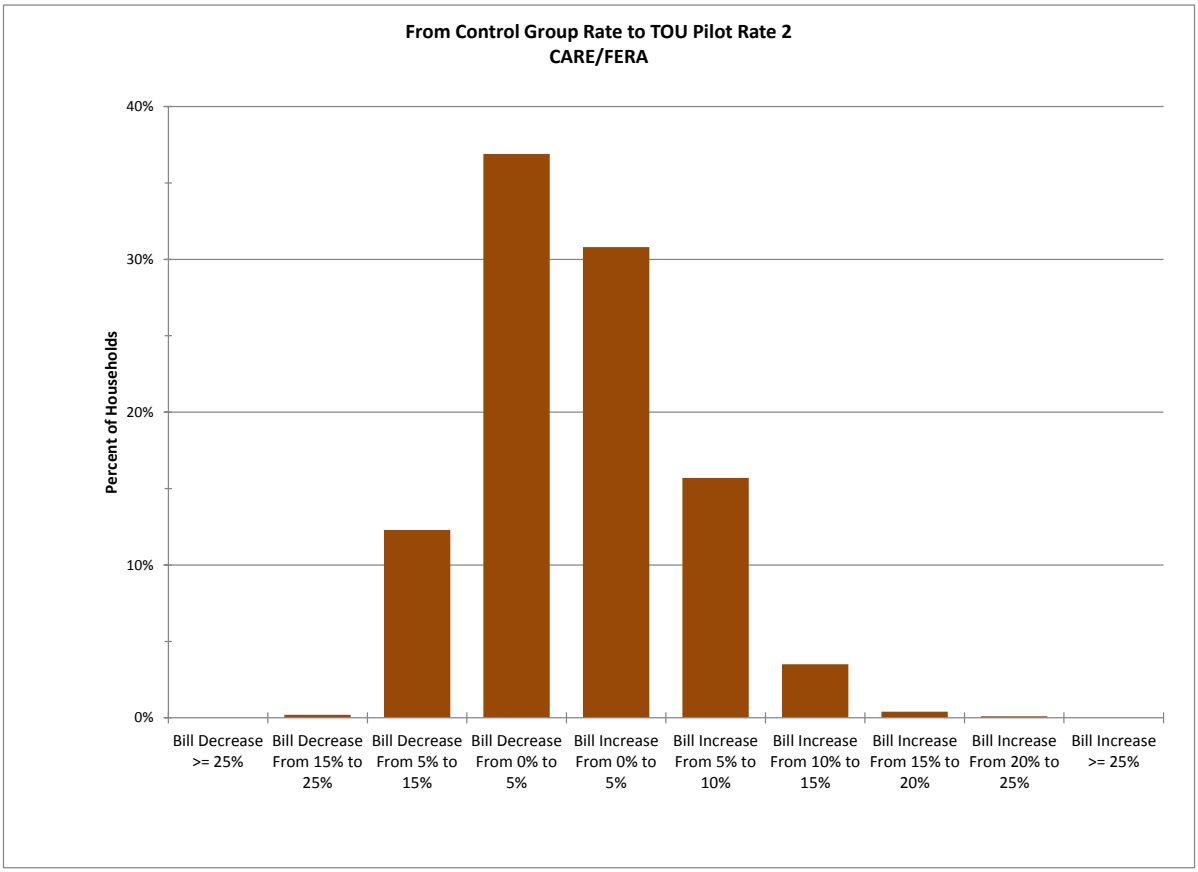


Figure 3-4 shows the distribution of percentage bill impacts for CARE/FERA customers. It has a similar shape to the non-CARE distribution shown in Figure 3-3, although a higher percentage of CARE/FERA customers, 49%, would save on TOU Pilot Rate 2 compared to 42% of non-CARE customers (again, assuming no load shifting). A total of 37% would save between 0% and 5% on their bills, with another 12% saving between 5% and 15%. Less than 0.5% of CARE/FERA customers would save more than 15%. A total of 51% of CARE/FERA customers would pay more on TOU Pilot Rate 2, with 31% seeing bill increases between 0% and 5%, 16% seeing increases between 5% and 10%, and about 4% seeing increases between 10% and 15%. About 0.5% of CARE/FERA customers would see bill increases of 15% or more. In terms of dollars, the pattern of bill increases for CARE/FERA customers is almost identical to that described in Section B for TOU Pilot Rate 1. CARE/FERA customers seeing bill increases in the 5%-10% range would see average monthly bill increases between $4 and $9, those in the 10%-

15% increase group would see dollar increases between $8 and $12, and the very small number of worst-hit customers would see increases ranging from $11 to $17.

FIGURE 3-4
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 2
CARE/FERA CUSTOMERS



D. Bill Impacts of Pilot Rate 3

In a similar fashion, the bill impact results of moving from Control Group rates to TOU Pilot Rate 3 are shown in pages 1 through 12 of Attachment 3-C. Figures 3-5 and 3-6, respectively, summarize the results for the non-CARE and CARE/FERA customer groups, moving from the Control Group rates to TOU Pilot Rate 3.[9] As seen in Figure 3-5, absent load shifting, about 37% of non-CARE customers would save on TOU Pilot Rate 3, while about 63% would pay more. Among the group of

[9] The customer percentages in these bar charts were obtained from the tables on the first two pages of Attachment 3-C. Results for specific climate zones and for seniors only can be found in the other tables in Attachment 3-C.

non-CARE savers, 28% would save between 0% and 5% on their bills, while another 8% would save between 5% and 15%, and slightly less than 1% would save more than 15%. Among the group paying higher bills, about 35% of non-CARE customers would see bill increases between 0% and 5% on TOU Pilot Rate 2, with 25% seeing increases between 5% and 10%, and 2% seeing increases between 10% and 15%. Slightly less than 1% of non-CARE customers would see increases of 15% or more on their bills. Here, too, the pattern of bill increases for non-CARE customers in dollar terms is similar to that for the other two TOU Pilot rates. On average, non-CARE customers seeing bill increases in the 5%-10% range would see average monthly bill increases between $6 and $12, and those in the 10%-15% increase group would see dollar increases between $14 and $20. The very small number of worst-hit non-CARE customers (in percentage terms) would see average monthly bill increases between $19 and $26.

FIGURE 3-5
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 3
NON-CARE CUSTOMERS

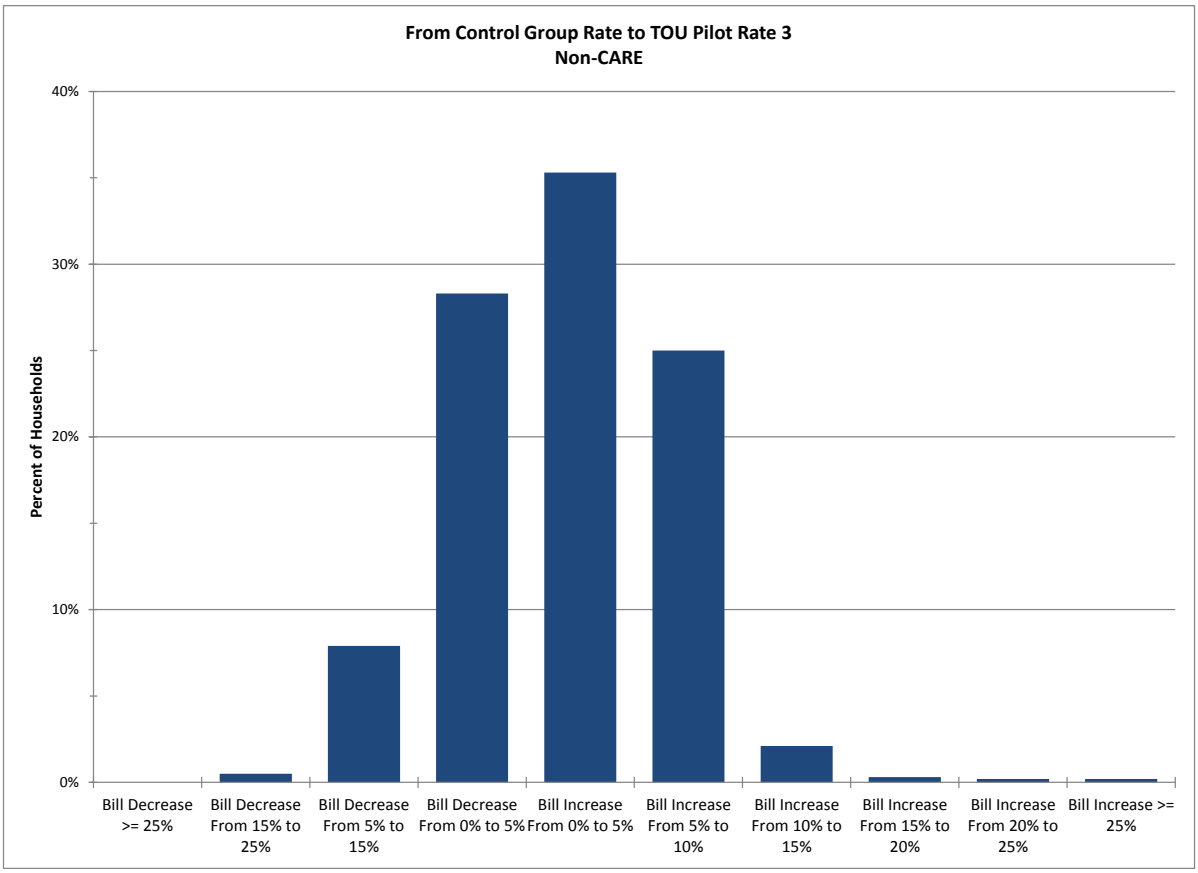
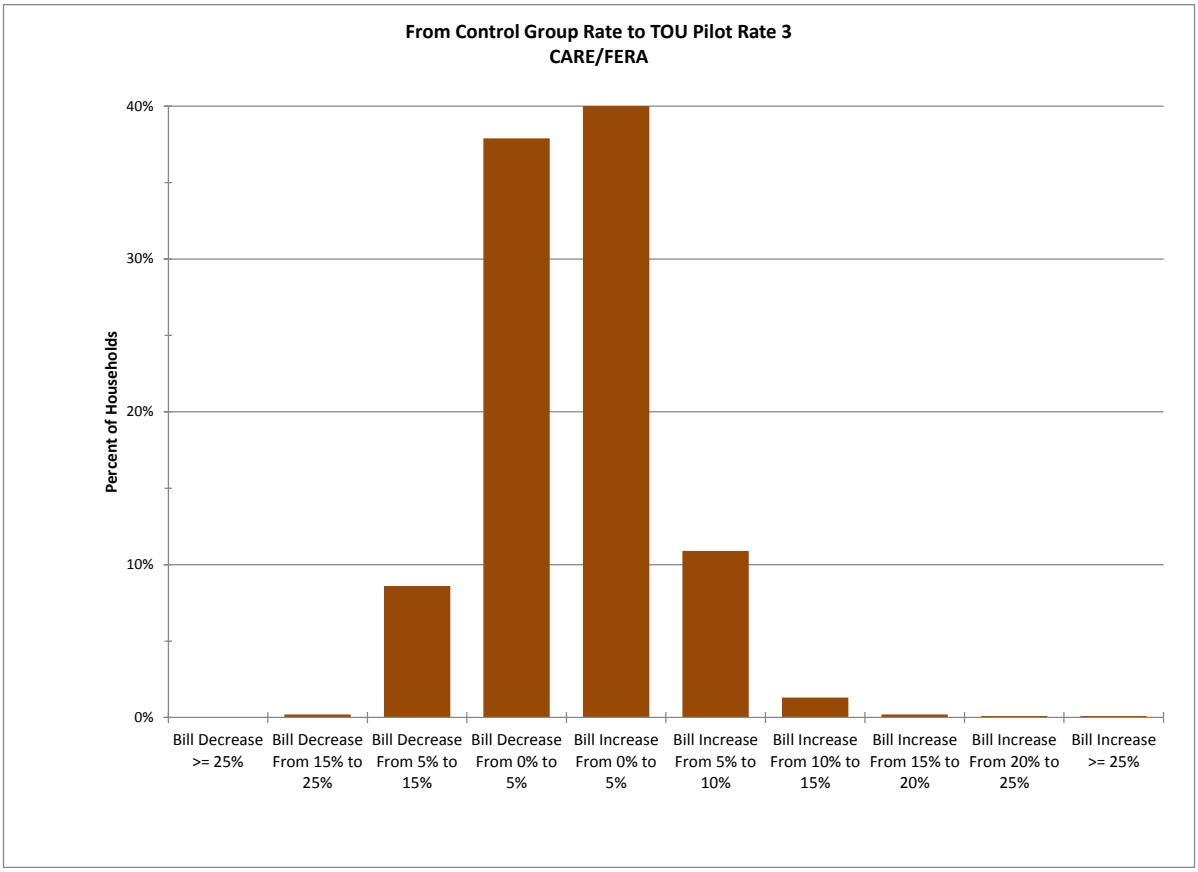


Figure 3-6 shows the distribution of percentage bill impacts for CARE/FERA customers. Of the 47% of CARE/FERA customers who would save on TOU Pilot Rate 3, 38% would save between 0% and 5%, and about 9% would save between 5% and 15% (with a tiny percentage of customers saving more than 15%). Of the 53% of CARE/FERA customers who would pay more on TOU Pilot Rate 3, 41% of customers would see bill increases between 0% and 5%, and 11% would see increases between 5% and 10%, and 1% would see increases between 10% and 15%. Here, too, only a very small percentage of CARE/FERA customers are is in the tail of the distribution, with less than 0.5 % seeing bill increases in excess of 15%. Finally, in dollar terms the pattern for CARE/FERA customers seeing bill increases is similar to the patterns for other two TOU Pilot rates: on average, CARE/FERA customers seeing bill increases in the 5%-10% range would see average monthly bill increases between $4 and $8, those in the 10%-15% increase range would see dollar increases between $7 and $11, and the small number seeing bill increases above 15% would see increases between $11 and $18.

FIGURE 3-6
DISTRIBUTION OF PERCENTAGE BILL CHANGES
GOING FROM CONTROL GROUP RATES TO TOU PILOT RATE 3
CARE/FERA CUSTOMERS



E. Electricity Burdens

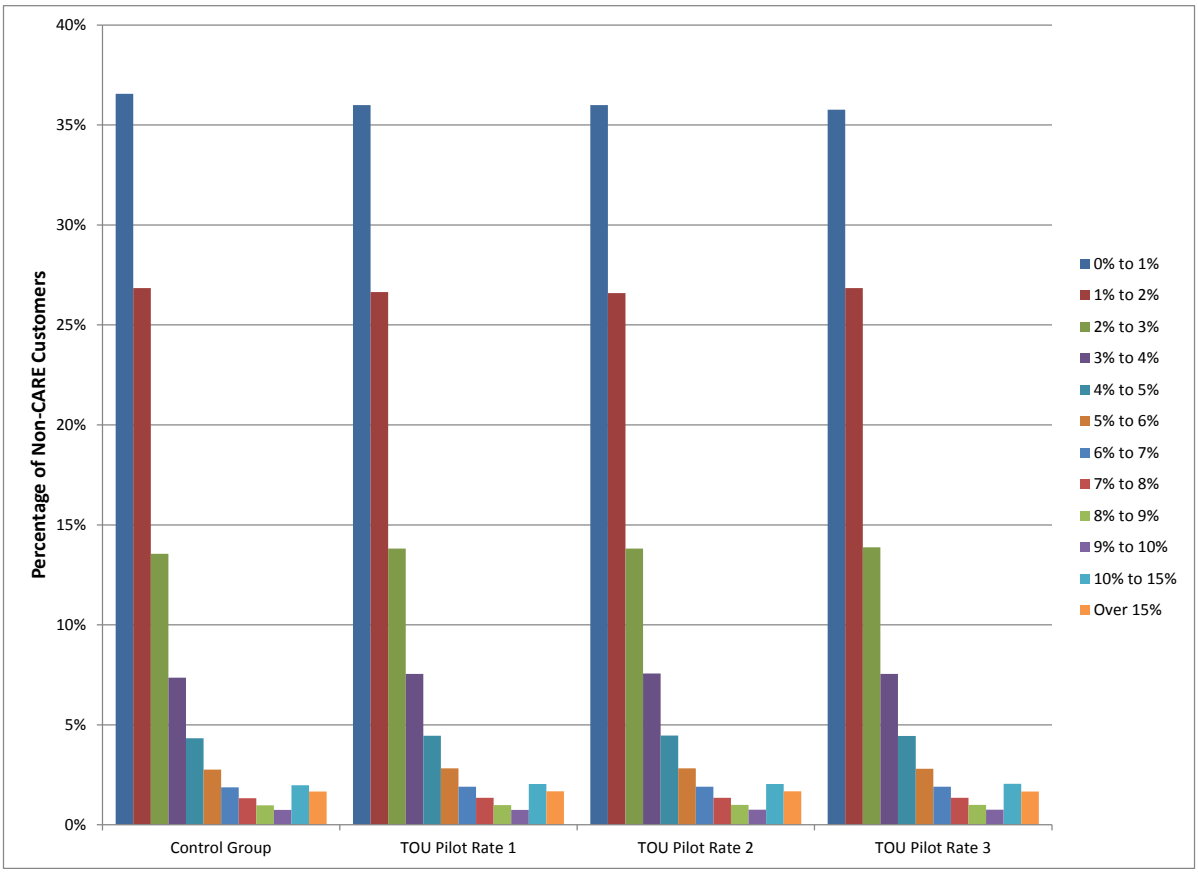
Using Experian data on household income, PG&E also calculated each customer's electricity burden under each set of rates. Electricity burden is defined as the ratio of the customer's annual electric bill to its household income. Individual customer results were then summarized by assigning customers to cells depending on their (a) electricity burden groups (e.g., zero to 1 percent, 1 percent to 2 percent, etc.), (b) age of head of household (senior, non-senior, or no age data available) and (c) rate (non-CARE or CARE/FERA). These results are shown in Attachment 3-D, and are in presented in sets of four pages. The first set of four pages shows the electricity burden results if customers' electric bills are calculated at the control group rate, the second set of four pages shows electricity burdens calculated using TOU Pilot Rate 1, the third set using TOU Pilot Rate 2, and the final set using TOU Pilot Rate 3. For each set of four pages, the first

three pages focus on customers living in specific PG&E climate zones (cool, moderate, and hot) while the fourth page shows the systemwide results for all customers combined.

Figures 3-7 and 3-8, respectively, summarize the systemwide non-CARE and CARE/FERA electricity burden results for the control group and each of the three TOU pilot rates.[10] Figure 3-7 shows that, for all four rates, the non-CARE/FERA distributions of electricity burdens are very similar and highly skewed towards the smaller percentages. For every rate, 91% of non-CARE customers have electricity burdens of 6% or less, 84% burdens have burdens of 4% or less, and 63% have burdens of 2% or less.

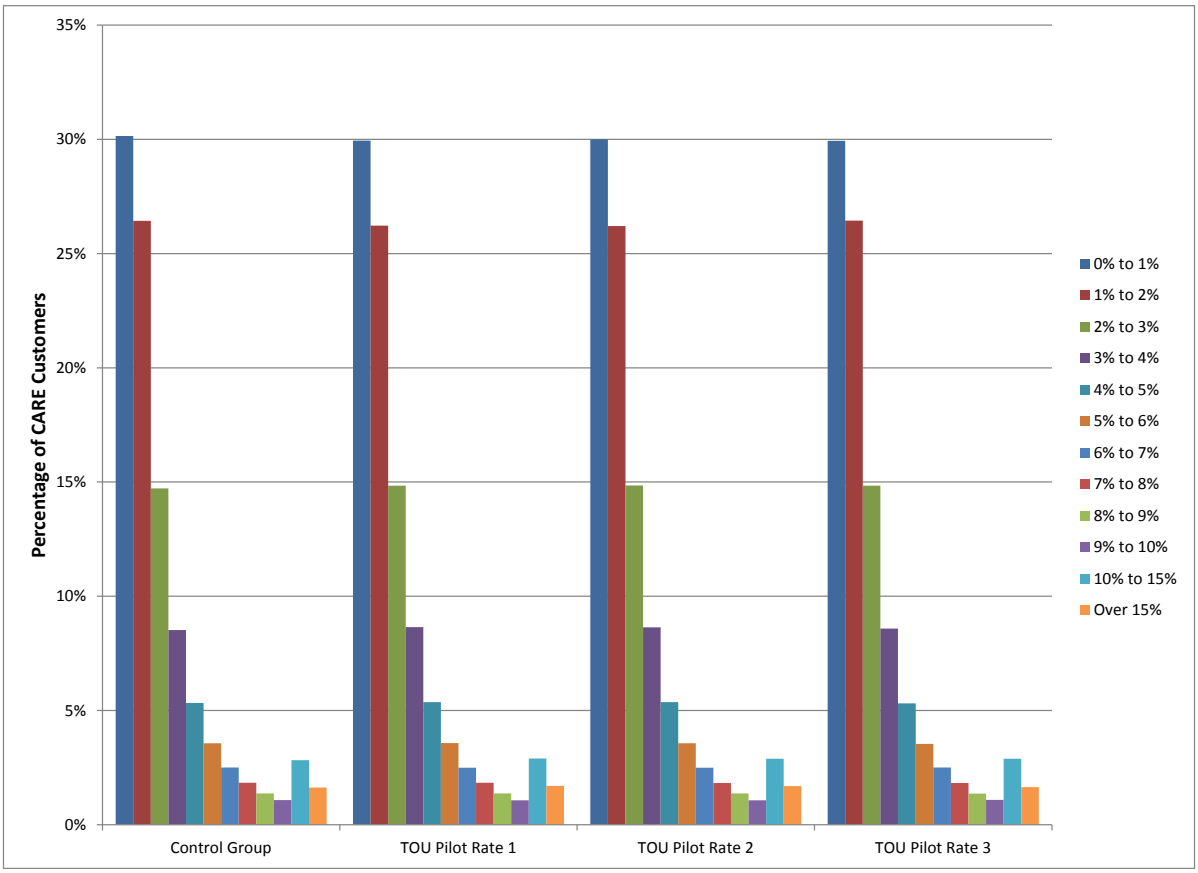
10 The customer percentages in these bar charts were obtained from the tables on pages 4, 8, 12, and 16 of Attachment 3-D. Electricity burden results for specific climate zones or age of head of household can be found in the other tables presented in Attachment 3-D.

FIGURE 3-7
DISTRIBUTION OF ELECTRICITY BURDENS
FOR CONTROL GROUP AND TOU PILOT RATES
ALL NON-CARE/FERA CUSTOMERS



The CARE/FERA results shown in Figure 3-8 show a similar pattern (although the electricity burdens are, as expected, slightly higher). Here, too, the distributions for all four rates are similar, and the results are skewed towards smaller percentages. For every rate, 89% of CARE/FERA customers have electricity burdens of 6% or less, 80% burdens have burdens of 4% or less and 56% have burdens of 2% or less.

FIGURE 3-8
DISTRIBUTION OF ELECTRICITY BURDENS
FOR CONTROL GROUP AND TOU PILOT RATES
ALL CARE/FERA CUSTOMERS



F. Conclusion

This chapter has presented the bill comparison and electricity burden results for each of the three TOU pilot rates. The results show that, moving from Control Group rates to each of the three TOU Pilot rates will result in a customer distribution where some pay lower bills and others pay higher bills—although the distributions show large numbers of customers having percentage bill changes of plus or minus 5%, and the dollar impacts generally are not severe. Moreover, these results are "pre-load shifting." To the extent customers can and do shift load, those who save can save even more, while those who have higher bills may be able to offset those effects via load shifting.

The electricity burden results show that, under either the Control Group rates or any of the TOU Pilot rates, the burdens on customers are generally small. The annual electricity bill as a percentage of household income, is small for a very large

percentage of customers. Among non-CARE customers, 91% have electricity burdens of less than 6%, and among CARE/FERA customers 89% have electricity burdens in this range. These patterns of low electricity burdens do not change significantly under any of the proposed TOU Pilot rates.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3, ATTACHMENT A

BILL COMPARISON RESULTS CONTROL GROUP VS. PILOT RATE 1

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone: ALL
Senior Category: All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	20	0.0%	$2,299	509	0.0%	$9,416	12,897	0.5%	$1,369	49,888	2.0%	$725	32,476	1.3%	$1,129	18,385	0.7%	$1,443
$15,000 ~ $19,999	11	0.0%	$4,349	366	0.0%	$9,321	8,198	0.3%	$2,126	31,011	1.2%	$990	29,440	1.2%	$1,360	20,425	0.8%	$1,594
$20,000 ~ $29,999	20	0.0%	$3,941	556	0.0%	$9,265	13,655	0.5%	$1,396	57,701	2.3%	$775	44,259	1.7%	$1,189	27,356	1.1%	$1,489
$30,000 ~ $39,999	22	0.0%	$1,112	632	0.0%	$9,515	13,612	0.5%	$1,758	59,767	2.4%	$881	55,336	2.2%	$1,277	37,611	1.5%	$1,528
$40,000 ~ $49,999	18	0.0%	$3,240	629	0.0%	$9,937	12,420	0.5%	$1,574	50,818	2.0%	$824	43,221	1.7%	$1,228	28,495	1.1%	$1,525
$50,000 ~ $74,999	45	0.0%	$3,694	1,613	0.1%	$9,373	32,216	1.3%	$2,058	154,149	6.1%	$964	158,339	6.2%	$1,356	112,911	4.4%	$1,598
$75,000 ~ $99,999	40	0.0%	$3,830	1,319	0.1%	$9,630	30,046	1.2%	$2,435	117,201	4.6%	$1,162	141,722	5.6%	$1,468	103,046	4.1%	$1,662
$100,000 ~ $124,999	22	0.0%	$2,921	1,001	0.0%	$9,355	23,371	0.9%	$2,314	90,344	3.6%	$1,080	96,964	3.8%	$1,436	69,822	2.8%	$1,653
>= $125,000	48	0.0%	$7,240	4,425	0.2%	$9,050	78,358	3.1%	$3,026	197,480	7.8%	$1,248	217,896	8.6%	$1,446	139,157	5.5%	$1,606
ALL	246	0.0%	$4,011	11,050	0.4%	$9,308	224,773	8.9%	$2,350	808,359	31.8%	$1,033	819,653	32.3%	$1,379	557,208	21.9%	$1,600

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	4,358	0.2%	$1,524	520	0.0%	$1,360	215	0.0%	$1,106	192	0.0%	$1,285	119,460	4.7%	$1,085
$15,000 ~ $19,999	4,796	0.2%	$1,708	462	0.0%	$1,690	200	0.0%	$1,301	194	0.0%	$1,742	95,103	3.7%	$1,407
$20,000 ~ $29,999	6,751	0.3%	$1,581	651	0.0%	$1,317	269	0.0%	$1,038	255	0.0%	$1,410	151,473	6.0%	$1,152
$30,000 ~ $39,999	8,664	0.3%	$1,626	738	0.0%	$1,428	307	0.0%	$1,353	324	0.0%	$1,453	177,013	7.0%	$1,281
$40,000 ~ $49,999	7,021	0.3%	$1,602	690	0.0%	$1,428	280	0.0%	$1,031	218	0.0%	$1,400	143,810	5.7%	$1,231
$50,000 ~ $74,999	23,647	0.9%	$1,710	1,946	0.1%	$1,700	928	0.0%	$1,263	875	0.0%	$1,604	486,669	19.2%	$1,380
$75,000 ~ $99,999	16,486	0.6%	$1,847	1,628	0.1%	$1,947	848	0.0%	$1,367	794	0.0%	$1,729	413,130	16.3%	$1,543
$100,000 ~ $124,999	11,514	0.5%	$1,823	1,093	0.0%	$1,776	597	0.0%	$1,393	645	0.0%	$1,808	295,373	11.6%	$1,492
>= $125,000	15,052	0.6%	$1,914	2,055	0.1%	$1,952	1,133	0.0%	$1,344	1,302	0.1%	$1,664	656,906	25.9%	$1,673
ALL	98,289	3.9%	$1,745	9,783	0.4%	$1,719	4,777	0.2%	$1,291	4,799	0.2%	$1,632	2,538,937	100.0%	$1,454

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone: ALL
Senior Category: All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	13	0.0%	$2,219	180	0.0%	$2,431	13,811	1.4%	$713	60,072	6.2%	$524	44,457	4.6%	$781
$15,000 ~ $19,999	1	0.0%	$1,288	73	0.0%	$3,014	3,762	0.4%	$1,142	15,792	1.6%	$760	14,737	1.5%	$981
$20,000 ~ $29,999	7	0.0%	$1,315	165	0.0%	$2,508	11,136	1.1%	$910	49,232	5.0%	$629	41,837	4.3%	$874
$30,000 ~ $39,999	6	0.0%	$598	161	0.0%	$2,763	8,716	0.9%	$1,051	38,171	3.9%	$723	36,863	3.8%	$942
$40,000 ~ $49,999	9	0.0%	$3,691	145	0.0%	$2,869	8,266	0.8%	$1,031	34,888	3.6%	$717	34,276	3.5%	$931
$50,000 ~ $74,999	6	0.0%	$733	372	0.0%	$3,325	15,807	1.6%	$1,287	65,697	6.7%	$814	68,243	7.0%	$1,017
$75,000 ~ $99,999	10	0.0%	$5,631	232	0.0%	$3,125	9,968	1.0%	$1,412	37,945	3.9%	$858	39,799	4.1%	$1,032
$100,000 ~ $124,999	1	0.0%	$5,007	151	0.0%	$3,098	6,760	0.7%	$1,283	26,286	2.7%	$793	23,867	2.4%	$1,011
>= $125,000	8	0.0%	$4,028	246	0.0%	$3,236	10,576	1.1%	$1,274	38,973	4.0%	$731	32,353	3.3%	$967
ALL	61	0.0%	$2,854	1,725	0.2%	$2,990	88,802	9.1%	$1,110	367,056	37.6%	$715	336,432	34.5%	$946

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	21,939	2.2%	$879	2,812	0.3%	$785	278	0.0%	$746	108	0.0%	$667	146	0.0%	$967	143,816	14.7%	$684
$15,000 ~ $19,999	8,003	0.8%	$1,041	939	0.1%	$967	93	0.0%	$974	51	0.0%	$961	48	0.0%	$1,182	43,499	4.5%	$929
$20,000 ~ $29,999	21,816	2.2%	$966	2,720	0.3%	$858	264	0.0%	$786	112	0.0%	$745	140	0.0%	$986	127,429	13.1%	$800
$30,000 ~ $39,999	19,916	2.0%	$1,006	2,246	0.2%	$904	222	0.0%	$912	110	0.0%	$891	131	0.0%	$1,135	106,542	10.9%	$887
$40,000 ~ $49,999	18,244	1.9%	$1,011	2,160	0.2%	$916	237	0.0%	$812	96	0.0%	$774	109	0.0%	$1,085	98,430	10.1%	$881
$50,000 ~ $74,999	33,243	3.4%	$1,108	3,686	0.4%	$1,048	386	0.0%	$1,055	182	0.0%	$1,013	185	0.0%	$1,256	187,807	19.2%	$990
$75,000 ~ $99,999	16,769	1.7%	$1,162	1,741	0.2%	$1,199	187	0.0%	$1,060	101	0.0%	$1,082	120	0.0%	$1,230	106,872	10.9%	$1,034
$100,000 ~ $124,999	9,267	0.9%	$1,144	931	0.1%	$1,153	123	0.0%	$1,052	61	0.0%	$860	63	0.0%	$1,505	67,510	6.9%	$979
>= $125,000	10,717	1.1%	$1,118	1,100	0.1%	$1,098	148	0.0%	$1,173	97	0.0%	$921	80	0.0%	$1,285	94,298	9.7%	$929
ALL	159,914	16.4%	$1,038	18,335	1.9%	$965	1,938	0.2%	$933	918	0.1%	$885	1,022	0.1%	$1,155	976,203	100.0%	$893

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Hot
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	7	0.0%	$296	117	0.0%	$8,325	3,101	0.4%	$2,129	7,819	1.0%	$1,505	12,552	1.7%	$1,402	11,815	1.6%	$1,532
$15,000 ~ $19,999	4	0.0%	$4,963	87	0.0%	$9,271	2,102	0.3%	$2,963	5,929	0.8%	$1,905	10,929	1.4%	$1,759	12,147	1.6%	$1,751
$20,000 ~ $29,999	8	0.0%	$2,514	133	0.0%	$9,098	3,451	0.5%	$2,072	9,536	1.3%	$1,542	16,818	2.2%	$1,506	17,243	2.3%	$1,613
$30,000 ~ $39,999	13	0.0%	$1,520	150	0.0%	$9,207	3,902	0.5%	$2,374	11,026	1.5%	$1,637	20,801	2.8%	$1,614	22,574	3.0%	$1,661
$40,000 ~ $49,999	6	0.0%	$645	166	0.0%	$8,951	3,424	0.5%	$2,205	9,050	1.2%	$1,570	16,614	2.2%	$1,551	18,300	2.4%	$1,647
$50,000 ~ $74,999	24	0.0%	$701	326	0.0%	$9,622	7,884	1.0%	$2,732	24,807	3.3%	$1,920	51,100	6.8%	$1,830	61,905	8.2%	$1,796
$75,000 ~ $99,999	12	0.0%	$2,181	203	0.0%	$10,745	6,802	0.9%	$3,426	18,243	2.4%	$2,500	38,119	5.1%	$2,160	47,610	6.3%	$1,960
$100,000 ~ $124,999	4	0.0%	$919	140	0.0%	$10,221	4,127	0.5%	$3,593	11,426	1.5%	$2,469	24,226	3.2%	$2,142	31,320	4.2%	$1,948
>= $125,000	15	0.0%	$2,526	335	0.0%	$11,445	11,105	1.5%	$4,346	20,810	2.8%	$2,722	35,590	4.7%	$2,206	40,380	5.4%	$1,966
ALL	93	0.0%	$1,615	1,657	0.2%	$9,922	45,898	6.1%	$3,153	118,646	15.7%	$2,091	226,749	30.1%	$1,886	263,294	34.9%	$1,822

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	4,004	0.5%	$1,558	391	0.1%	$1,615	116	0.0%	$1,492	119	0.0%	$1,593	40,041	5.3%	$1,555
$15,000 ~ $19,999	4,391	0.6%	$1,736	364	0.0%	$1,848	113	0.0%	$1,641	100	0.0%	$2,095	36,166	4.8%	$1,867
$20,000 ~ $29,999	6,249	0.8%	$1,621	470	0.1%	$1,542	152	0.0%	$1,297	156	0.0%	$1,709	54,216	7.2%	$1,615
$30,000 ~ $39,999	8,017	1.1%	$1,656	552	0.1%	$1,653	179	0.0%	$1,715	210	0.0%	$1,651	67,424	8.9%	$1,700
$40,000 ~ $49,999	6,592	0.9%	$1,625	535	0.1%	$1,639	147	0.0%	$1,411	133	0.0%	$1,731	54,967	7.3%	$1,659
$50,000 ~ $74,999	21,742	2.9%	$1,743	1,409	0.2%	$1,981	449	0.1%	$1,690	495	0.1%	$1,964	170,141	22.6%	$1,877
$75,000 ~ $99,999	14,728	2.0%	$1,895	1,039	0.1%	$2,325	396	0.1%	$1,797	402	0.1%	$2,289	127,554	16.9%	$2,185
$100,000 ~ $124,999	10,115	1.3%	$1,870	691	0.1%	$2,106	253	0.0%	$1,846	330	0.0%	$2,300	82,632	11.0%	$2,166
>= $125,000	11,354	1.5%	$1,993	950	0.1%	$2,633	315	0.0%	$1,825	411	0.1%	$2,222	121,265	16.1%	$2,419
ALL	87,192	11.6%	$1,782	6,401	0.8%	$2,028	2,120	0.3%	$1,690	2,356	0.3%	$2,040	754,406	100.0%	$1,980

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Hot
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$421	91	0.0%	$2,540	4,568	0.9%	$1,083	17,774	3.4%	$844	31,627	6.1%	$845
$15,000 ~ $19,999	.	.	.	25	0.0%	$2,709	1,448	0.3%	$1,596	5,802	1.1%	$1,181	9,941	1.9%	$1,099
$20,000 ~ $29,999	2	0.0%	$896	71	0.0%	$2,580	4,146	0.8%	$1,315	16,094	3.1%	$1,001	28,862	5.6%	$962
$30,000 ~ $39,999	3	0.0%	$542	80	0.0%	$2,842	3,278	0.6%	$1,493	13,976	2.7%	$1,117	25,781	5.0%	$1,039
$40,000 ~ $49,999	6	0.0%	$1,821	63	0.0%	$3,073	3,201	0.6%	$1,432	12,315	2.4%	$1,120	23,306	4.5%	$1,036
$50,000 ~ $74,999	2	0.0%	$396	125	0.0%	$3,437	5,342	1.0%	$1,842	20,972	4.0%	$1,336	40,473	7.8%	$1,189
$75,000 ~ $99,999	3	0.0%	$582	64	0.0%	$3,119	3,141	0.6%	$2,041	10,846	2.1%	$1,471	20,589	4.0%	$1,253
$100,000 ~ $124,999	.	.	.	34	0.0%	$3,517	1,847	0.4%	$1,987	6,517	1.3%	$1,438	11,330	2.2%	$1,254
>= $125,000	2	0.0%	$1,050	54	0.0%	$3,657	2,496	0.5%	$2,012	8,069	1.6%	$1,353	13,455	2.6%	$1,197
ALL	23	0.0%	$917	607	0.1%	$3,047	29,467	5.7%	$1,599	112,365	21.7%	$1,171	205,364	39.6%	$1,074

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	21,040	4.1%	$889	2,721	0.5%	$798	225	0.0%	$818	72	0.0%	$822	121	0.0%	$1,078	78,244	15.1%	$871
$15,000 ~ $19,999	7,654	1.5%	$1,048	905	0.2%	$977	79	0.0%	$1,006	40	0.0%	$1,010	39	0.0%	$1,263	25,933	5.0%	$1,127
$20,000 ~ $29,999	20,855	4.0%	$976	2,635	0.5%	$868	212	0.0%	$854	72	0.0%	$940	124	0.0%	$1,047	73,073	14.1%	$993
$30,000 ~ $39,999	19,068	3.7%	$1,015	2,176	0.4%	$913	177	0.0%	$1,013	68	0.0%	$1,194	113	0.0%	$1,200	64,720	12.5%	$1,070
$40,000 ~ $49,999	17,497	3.4%	$1,020	2,092	0.4%	$925	186	0.0%	$925	62	0.0%	$936	93	0.0%	$1,184	58,821	11.3%	$1,069
$50,000 ~ $74,999	31,255	6.0%	$1,118	3,529	0.7%	$1,063	313	0.1%	$1,171	109	0.0%	$1,270	149	0.0%	$1,352	102,269	19.7%	$1,230
$75,000 ~ $99,999	15,393	3.0%	$1,172	1,659	0.3%	$1,214	129	0.0%	$1,256	51	0.0%	$1,493	94	0.0%	$1,363	51,969	10.0%	$1,323
$100,000 ~ $124,999	8,272	1.6%	$1,158	868	0.2%	$1,169	79	0.0%	$1,288	35	0.0%	$984	43	0.0%	$1,838	29,025	5.6%	$1,315
>= $125,000	9,166	1.8%	$1,132	988	0.2%	$1,108	88	0.0%	$1,414	46	0.0%	$1,275	66	0.0%	$1,375	34,430	6.6%	$1,277
ALL	150,200	29.0%	$1,047	17,573	3.4%	$975	1,488	0.3%	$1,042	555	0.1%	$1,106	842	0.2%	$1,252	518,484	100.0%	$1,116

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Hot
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2	0.0%	$4	33	0.0%	$6,677	1,537	0.5%	$1,264	6,207	2.1%	$830	8,645	2.9%	$920	5,682	1.9%	$1,124
$15,000 ~ $19,999	1	0.0%	$8	22	0.0%	$6,665	1,213	0.4%	$2,026	4,879	1.6%	$1,326	8,218	2.8%	$1,350	7,615	2.6%	$1,452
$20,000 ~ $29,999	3	0.0%	$607	43	0.0%	$4,786	2,350	0.8%	$1,544	9,329	3.2%	$1,074	15,090	5.1%	$1,159	12,214	4.1%	$1,328
$30,000 ~ $39,999	6	0.0%	$301	47	0.0%	$6,310	1,930	0.7%	$2,039	8,424	2.8%	$1,276	14,487	4.9%	$1,353	13,156	4.4%	$1,464
$40,000 ~ $49,999	2	0.0%	$3,951	35	0.0%	$4,968	1,518	0.5%	$1,873	6,130	2.1%	$1,281	10,919	3.7%	$1,323	10,460	3.5%	$1,465
$50,000 ~ $74,999	7	0.0%	$832	75	0.0%	$7,010	2,808	0.9%	$2,273	11,100	3.7%	$1,623	21,991	7.4%	$1,625	23,797	8.0%	$1,666
$75,000 ~ $99,999	2	0.0%	$5	26	0.0%	$5,340	1,119	0.4%	$2,853	3,650	1.2%	$1,952	7,528	2.5%	$1,827	8,250	2.8%	$1,791
$100,000 ~ $124,999	1	0.0%	$2	22	0.0%	$7,950	925	0.3%	$3,256	2,707	0.9%	$1,943	5,369	1.8%	$1,803	5,854	2.0%	$1,747
>= $125,000	3	0.0%	$802	48	0.0%	$10,864	1,824	0.6%	$3,712	4,255	1.4%	$2,038	7,525	2.5%	$1,841	8,163	2.8%	$1,793
ALL	27	0.0%	$733	351	0.1%	$6,850	15,224	5.1%	$2,244	56,681	19.1%	$1,399	99,772	33.7%	$1,439	95,191	32.2%	$1,550

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1,235	0.4%	$1,293	112	0.0%	$1,276	38	0.0%	$857	30	0.0%	$1,524	23,521	7.9%	$998
$15,000 ~ $19,999	2,112	0.7%	$1,594	184	0.1%	$1,643	47	0.0%	$1,335	43	0.0%	$1,730	24,334	8.2%	$1,439
$20,000 ~ $29,999	3,262	1.1%	$1,458	245	0.1%	$1,350	72	0.0%	$1,246	69	0.0%	$1,335	42,677	14.4%	$1,238
$30,000 ~ $39,999	3,508	1.2%	$1,605	228	0.1%	$1,400	74	0.0%	$1,401	81	0.0%	$1,606	41,941	14.2%	$1,431
$40,000 ~ $49,999	2,747	0.9%	$1,571	197	0.1%	$1,522	62	0.0%	$1,278	55	0.0%	$1,510	32,125	10.9%	$1,414
$50,000 ~ $74,999	7,023	2.4%	$1,730	418	0.1%	$1,916	155	0.1%	$1,600	157	0.1%	$1,828	67,531	22.8%	$1,685
$75,000 ~ $99,999	2,153	0.7%	$1,815	153	0.1%	$2,057	61	0.0%	$1,514	57	0.0%	$1,718	22,999	7.8%	$1,887
$100,000 ~ $124,999	1,640	0.6%	$1,784	102	0.0%	$1,822	52	0.0%	$1,553	46	0.0%	$2,551	16,718	5.6%	$1,894
>= $125,000	2,057	0.7%	$1,875	160	0.1%	$2,705	64	0.0%	$1,616	83	0.0%	$2,158	24,182	8.2%	$2,027
ALL	25,737	8.7%	$1,651	1,799	0.6%	$1,739	625	0.2%	$1,428	621	0.2%	$1,782	296,028	100.0%	$1,536

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Hot
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$4	22	0.0%	$8,370	545	0.3%	$2,040	1,735	0.9%	$1,271	2,777	1.4%	$1,376	2,477	1.3%	$1,558
$15,000 ~ $19,999	1	0.0%	$8	15	0.0%	$8,405	719	0.4%	$2,503	2,527	1.3%	$1,643	4,732	2.4%	$1,627	5,023	2.6%	$1,696
$20,000 ~ $29,999	2	0.0%	$14	29	0.0%	$5,920	1,102	0.6%	$2,054	3,822	2.0%	$1,407	6,856	3.5%	$1,509	6,850	3.5%	$1,634
$30,000 ~ $39,999	5	0.0%	$88	33	0.0%	$7,766	1,181	0.6%	$2,464	4,484	2.3%	$1,515	8,388	4.3%	$1,629	8,956	4.6%	$1,691
$40,000 ~ $49,999	1	0.0%	$1,585	27	0.0%	$5,591	889	0.5%	$2,246	3,167	1.6%	$1,531	6,143	3.2%	$1,587	6,905	3.6%	$1,703
$50,000 ~ $74,999	7	0.0%	$832	63	0.0%	$7,901	1,987	1.0%	$2,515	7,281	3.7%	$1,841	15,573	8.0%	$1,828	18,951	9.7%	$1,814
$75,000 ~ $99,999	2	0.0%	$5	23	0.0%	$5,702	853	0.4%	$3,159	2,604	1.3%	$2,230	5,785	3.0%	$2,034	6,927	3.6%	$1,919
$100,000 ~ $124,999	1	0.0%	$2	16	0.0%	$9,311	728	0.4%	$3,661	1,952	1.0%	$2,220	4,151	2.1%	$1,995	5,022	2.6%	$1,859
>= $125,000	2	0.0%	$1,055	44	0.0%	$11,636	1,564	0.8%	$4,050	3,192	1.6%	$2,329	5,984	3.1%	$2,029	7,037	3.6%	$1,905
ALL	22	0.0%	$455	272	0.1%	$8,011	9,568	4.9%	$2,798	30,764	15.8%	$1,767	60,389	31.1%	$1,754	68,148	35.1%	$1,774

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	814	0.4%	$1,581	88	0.0%	$1,483	24	0.0%	$855	19	0.0%	$1,469	8,502	4.4%	$1,488
$15,000 ~ $19,999	1,836	0.9%	$1,705	155	0.1%	$1,770	39	0.0%	$1,386	35	0.0%	$1,964	15,082	7.8%	$1,712
$20,000 ~ $29,999	2,575	1.3%	$1,633	191	0.1%	$1,554	52	0.0%	$1,475	47	0.0%	$1,567	21,526	11.1%	$1,580
$30,000 ~ $39,999	3,048	1.6%	$1,712	186	0.1%	$1,508	56	0.0%	$1,443	69	0.0%	$1,647	26,406	13.6%	$1,684
$40,000 ~ $49,999	2,357	1.2%	$1,682	159	0.1%	$1,623	52	0.0%	$1,356	44	0.0%	$1,616	19,744	10.2%	$1,665
$50,000 ~ $74,999	6,528	3.4%	$1,787	371	0.2%	$1,992	139	0.1%	$1,634	140	0.1%	$1,898	51,040	26.3%	$1,854
$75,000 ~ $99,999	2,023	1.0%	$1,862	140	0.1%	$2,101	55	0.0%	$1,593	50	0.0%	$1,825	18,462	9.5%	$2,055
$100,000 ~ $124,999	1,553	0.8%	$1,830	94	0.0%	$1,904	49	0.0%	$1,585	43	0.0%	$2,433	13,609	7.0%	$2,055
>= $125,000	1,938	1.0%	$1,918	155	0.1%	$2,758	57	0.0%	$1,618	72	0.0%	$2,242	20,045	10.3%	$2,206
ALL	22,672	11.7%	$1,755	1,539	0.8%	$1,871	523	0.3%	$1,505	519	0.3%	$1,885	194,416	100.0%	$1,824

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Hot
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$4	11	0.0%	$3,290	992	1.0%	$837	4,472	4.4%	$659	5,868	5.8%	$705
$15,000 ~ $19,999	.	.	.	7	0.0%	$2,937	494	0.5%	$1,332	2,352	2.3%	$985	3,486	3.4%	$972
$20,000 ~ $29,999	1	0.0%	$1,792	14	0.0%	$2,436	1,248	1.2%	$1,094	5,507	5.4%	$843	8,234	8.1%	$868
$30,000 ~ $39,999	1	0.0%	$1,363	14	0.0%	$2,878	749	0.7%	$1,370	3,940	3.9%	$1,004	6,099	6.0%	$972
$40,000 ~ $49,999	1	0.0%	$6,316	8	0.0%	$2,865	629	0.6%	$1,347	2,963	2.9%	$1,013	4,776	4.7%	$983
$50,000 ~ $74,999	.	.	.	12	0.0%	$2,335	821	0.8%	$1,686	3,819	3.8%	$1,208	6,418	6.3%	$1,133
$75,000 ~ $99,999	.	.	.	3	0.0%	$2,558	266	0.3%	$1,870	1,046	1.0%	$1,260	1,743	1.7%	$1,138
$100,000 ~ $124,999	.	.	.	6	0.0%	$4,322	197	0.2%	$1,759	755	0.7%	$1,226	1,218	1.2%	$1,147
>= $125,000	1	0.0%	$295	4	0.0%	$2,365	260	0.3%	$1,678	1,063	1.0%	$1,162	1,541	1.5%	$1,110
ALL	5	0.0%	$1,954	79	0.1%	$2,850	5,656	5.6%	$1,307	25,917	25.5%	$963	39,383	38.8%	$956

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	3,205	3.2%	$789	421	0.4%	$737	24	0.0%	$516	14	0.0%	$860	11	0.0%	$1,618	15,019	14.8%	$721
$15,000 ~ $19,999	2,592	2.6%	$979	276	0.3%	$860	29	0.0%	$965	8	0.0%	$1,085	8	0.0%	$706	9,252	9.1%	$995
$20,000 ~ $29,999	5,364	5.3%	$937	687	0.7%	$805	54	0.1%	$626	20	0.0%	$651	22	0.0%	$840	21,151	20.8%	$891
$30,000 ~ $39,999	4,200	4.1%	$982	460	0.5%	$893	42	0.0%	$921	18	0.0%	$1,271	12	0.0%	$1,372	15,535	15.3%	$1,002
$40,000 ~ $49,999	3,555	3.5%	$1,003	390	0.4%	$902	38	0.0%	$1,102	10	0.0%	$874	11	0.0%	$1,087	12,381	12.2%	$1,014
$50,000 ~ $74,999	4,846	4.8%	$1,089	495	0.5%	$980	47	0.0%	$1,314	16	0.0%	$1,304	17	0.0%	$1,246	16,491	16.2%	$1,162
$75,000 ~ $99,999	1,323	1.3%	$1,120	130	0.1%	$1,083	13	0.0%	$1,580	6	0.0%	$787	7	0.0%	$952	4,537	4.5%	$1,204
$100,000 ~ $124,999	832	0.8%	$1,071	87	0.1%	$959	8	0.0%	$857	3	0.0%	$1,038	3	0.0%	$4,255	3,109	3.1%	$1,188
>= $125,000	1,126	1.1%	$1,095	119	0.1%	$1,175	5	0.0%	$1,081	7	0.0%	$1,599	11	0.0%	$1,606	4,137	4.1%	$1,160
ALL	27,043	26.6%	$986	3,065	3.0%	$885	260	0.3%	$959	102	0.1%	$1,032	102	0.1%	$1,261	101,612	100.0%	$985

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Cool
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	7	0.0%	$5,837	219	0.0%	$9,485	5,152	0.8%	$874	22,957	3.5%	$474	7,889	1.2%	$832
$15,000 ~ $19,999	2	0.0%	$8,280	135	0.0%	$9,092	2,631	0.4%	$1,444	11,333	1.7%	$613	6,432	1.0%	$961
$20,000 ~ $29,999	7	0.0%	$5,146	276	0.0%	$8,725	5,268	0.8%	$1,083	24,430	3.7%	$531	10,926	1.6%	$897
$30,000 ~ $39,999	5	0.0%	$371	244	0.0%	$9,645	4,514	0.7%	$1,323	21,688	3.3%	$604	12,722	1.9%	$952
$40,000 ~ $49,999	8	0.0%	$3,480	271	0.0%	$9,560	4,638	0.7%	$1,136	20,413	3.1%	$563	10,811	1.6%	$917
$50,000 ~ $74,999	10	0.0%	$10,571	716	0.1%	$8,915	12,361	1.9%	$1,636	58,781	8.9%	$657	41,016	6.2%	$988
$75,000 ~ $99,999	17	0.0%	$2,593	582	0.1%	$8,561	11,505	1.7%	$1,842	44,273	6.7%	$752	37,805	5.7%	$1,028
$100,000 ~ $124,999	7	0.0%	$5,041	386	0.1%	$8,562	8,012	1.2%	$1,624	32,079	4.8%	$691	22,966	3.5%	$1,007
>= $125,000	10	0.0%	$5,376	1,717	0.3%	$7,281	24,339	3.7%	$2,043	69,568	10.5%	$781	54,698	8.2%	$1,043
ALL	73	0.0%	$4,959	4,546	0.7%	$8,322	78,420	11.8%	$1,650	305,522	46.1%	$667	205,265	30.9%	$994

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1,691	0.3%	$1,062	83	0.0%	$874	59	0.0%	$370	45	0.0%	$511	31	0.0%	$707	38,133	5.7%	$682
$15,000 ~ $19,999	1,962	0.3%	$1,117	72	0.0%	$1,173	19	0.0%	$752	37	0.0%	$516	27	0.0%	$742	22,650	3.4%	$905
$20,000 ~ $29,999	2,954	0.4%	$1,094	129	0.0%	$760	76	0.0%	$591	60	0.0%	$496	35	0.0%	$778	44,161	6.7%	$778
$30,000 ~ $39,999	3,973	0.6%	$1,110	135	0.0%	$1,268	61	0.0%	$589	56	0.0%	$582	53	0.0%	$1,180	43,451	6.5%	$880
$40,000 ~ $49,999	3,032	0.5%	$1,107	102	0.0%	$1,229	57	0.0%	$466	59	0.0%	$393	45	0.0%	$709	39,436	5.9%	$833
$50,000 ~ $74,999	13,516	2.0%	$1,126	357	0.1%	$1,064	199	0.0%	$746	200	0.0%	$631	142	0.0%	$967	127,298	19.2%	$957
$75,000 ~ $99,999	13,371	2.0%	$1,134	308	0.0%	$975	205	0.0%	$831	160	0.0%	$716	127	0.0%	$845	108,353	16.3%	$1,054
$100,000 ~ $124,999	7,563	1.1%	$1,127	181	0.0%	$1,064	97	0.0%	$628	101	0.0%	$623	90	0.0%	$855	71,482	10.8%	$987
>= $125,000	16,885	2.5%	$1,131	518	0.1%	$1,135	286	0.0%	$809	228	0.0%	$761	220	0.0%	$923	168,469	25.4%	$1,151
ALL	64,947	9.8%	$1,124	1,885	0.3%	$1,067	1,059	0.2%	$713	946	0.1%	$639	770	0.1%	$894	663,433	100.0%	$984

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Cool
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$4,078	56	0.0%	$2,253	4,948	2.5%	$496	22,593	11.5%	$344	5,567	2.8%	$574	154	0.1%	$537
$15,000 ~ $19,999	.	.	.	21	0.0%	$2,860	1,075	0.5%	$792	4,296	2.2%	$458	1,788	0.9%	$644	44	0.0%	$928
$20,000 ~ $29,999	3	0.0%	$2,378	48	0.0%	$2,215	3,630	1.8%	$637	16,264	8.2%	$400	5,447	2.8%	$610	166	0.1%	$706
$30,000 ~ $39,999	2	0.0%	$979	47	0.0%	$2,688	2,673	1.4%	$720	11,212	5.7%	$439	4,609	2.3%	$633	133	0.1%	$710
$40,000 ~ $49,999	1	0.0%	$5	49	0.0%	$2,555	2,668	1.4%	$721	11,155	5.7%	$442	4,951	2.5%	$624	153	0.1%	$853
$50,000 ~ $74,999	3	0.0%	$976	144	0.1%	$3,126	5,252	2.7%	$931	19,412	9.8%	$500	11,258	5.7%	$654	393	0.2%	$862
$75,000 ~ $99,999	4	0.0%	$7,191	84	0.0%	$3,042	3,316	1.7%	$988	11,200	5.7%	$516	7,082	3.6%	$664	253	0.1%	$967
$100,000 ~ $124,999	.	.	.	51	0.0%	$2,371	2,169	1.1%	$907	7,509	3.8%	$486	4,011	2.0%	$658	148	0.1%	$933
>= $125,000	4	0.0%	$4,807	100	0.1%	$2,880	3,313	1.7%	$881	11,467	5.8%	$460	5,373	2.7%	$651	199	0.1%	$975
ALL	22	0.0%	$3,655	600	0.3%	$2,764	29,044	14.7%	$775	115,108	58.4%	$439	50,086	25.4%	$637	1,643	0.8%	$841

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	49	0.0%	$347	29	0.0%	$409	24	0.0%	$339	15	0.0%	$320	33,440	17.0%	$410
$15,000 ~ $19,999	9	0.0%	$440	5	0.0%	$291	6	0.0%	$538	4	0.0%	$232	7,248	3.7%	$563
$20,000 ~ $29,999	33	0.0%	$604	21	0.0%	$454	19	0.0%	$306	4	0.0%	$394	25,635	13.0%	$484
$30,000 ~ $39,999	21	0.0%	$434	21	0.0%	$330	25	0.0%	$425	11	0.0%	$652	18,754	9.5%	$534
$40,000 ~ $49,999	23	0.0%	$503	30	0.0%	$361	16	0.0%	$306	6	0.0%	$425	19,052	9.7%	$537
$50,000 ~ $74,999	47	0.0%	$523	35	0.0%	$374	39	0.0%	$448	15	0.0%	$905	36,598	18.6%	$624
$75,000 ~ $99,999	31	0.0%	$691	19	0.0%	$370	25	0.0%	$418	11	0.0%	$511	22,025	11.2%	$651
$100,000 ~ $124,999	17	0.0%	$449	20	0.0%	$408	11	0.0%	$495	6	0.0%	$649	13,942	7.1%	$612
>= $125,000	26	0.0%	$836	24	0.0%	$398	19	0.0%	$361	3	0.0%	$146	20,528	10.4%	$596
ALL	256	0.1%	$535	204	0.1%	$385	184	0.1%	$396	75	0.0%	$541	197,222	100.0%	$549

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Cool
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	41	0.0%	$5,943	2,330	1.1%	$716	11,651	5.7%	$390	3,049	1.5%	$757
$15,000 ~ $19,999	.	.	.	37	0.0%	$7,310	1,219	0.6%	$1,438	5,438	2.7%	$608	3,218	1.6%	$923
$20,000 ~ $29,999	3	0.0%	$119	65	0.0%	$5,737	2,548	1.3%	$1,057	12,858	6.3%	$512	5,760	2.8%	$861
$30,000 ~ $39,999	2	0.0%	$15	58	0.0%	$6,907	2,263	1.1%	$1,399	11,699	5.8%	$612	7,181	3.5%	$926
$40,000 ~ $49,999	3	0.0%	$31	67	0.0%	$5,500	1,882	0.9%	$1,299	9,943	4.9%	$573	5,848	2.9%	$895
$50,000 ~ $74,999	2	0.0%	$72	161	0.1%	$5,911	4,627	2.3%	$1,670	21,142	10.4%	$677	15,737	7.7%	$964
$75,000 ~ $99,999	6	0.0%	$109	82	0.0%	$6,989	2,246	1.1%	$1,859	8,190	4.0%	$760	7,101	3.5%	$999
$100,000 ~ $124,999	1	0.0%	$13,545	82	0.0%	$6,315	1,791	0.9%	$1,875	6,013	3.0%	$768	5,114	2.5%	$1,007
>= $125,000	4	0.0%	$7,395	292	0.1%	$7,007	3,959	1.9%	$2,069	10,991	5.4%	$780	8,983	4.4%	$1,030
ALL	21	0.0%	$2,114	885	0.4%	$6,491	22,865	11.2%	$1,539	97,925	48.1%	$623	61,991	30.5%	$948

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	524	0.3%	$1,050	37	0.0%	$681	31	0.0%	$314	18	0.0%	$482	16	0.0%	$435	17,697	8.7%	$529
$15,000 ~ $19,999	914	0.4%	$1,134	37	0.0%	$788	10	0.0%	$615	17	0.0%	$380	15	0.0%	$641	10,905	5.4%	$861
$20,000 ~ $29,999	1,418	0.7%	$1,099	61	0.0%	$769	32	0.0%	$692	23	0.0%	$548	18	0.0%	$1,022	22,786	11.2%	$714
$30,000 ~ $39,999	2,205	1.1%	$1,115	64	0.0%	$842	37	0.0%	$566	35	0.0%	$551	19	0.0%	$1,773	23,563	11.6%	$847
$40,000 ~ $49,999	1,613	0.8%	$1,122	38	0.0%	$869	27	0.0%	$322	18	0.0%	$328	21	0.0%	$986	19,460	9.6%	$803
$50,000 ~ $74,999	4,885	2.4%	$1,130	125	0.1%	$1,227	82	0.0%	$763	72	0.0%	$663	49	0.0%	$796	46,882	23.0%	$938
$75,000 ~ $99,999	2,353	1.2%	$1,143	51	0.0%	$947	44	0.0%	$719	31	0.0%	$700	14	0.0%	$640	20,118	9.9%	$1,037
$100,000 ~ $124,999	1,611	0.8%	$1,144	43	0.0%	$862	21	0.0%	$614	17	0.0%	$563	15	0.0%	$891	14,708	7.2%	$1,059
>= $125,000	2,830	1.4%	$1,140	97	0.0%	$1,185	50	0.0%	$729	41	0.0%	$769	30	0.0%	$669	27,277	13.4%	$1,156
ALL	18,353	9.0%	$1,127	553	0.3%	$980	334	0.2%	$632	272	0.1%	$601	197	0.1%	$867	203,396	100.0%	$897

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Cool
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	31	0.0%	$7,362	832	0.5%	$1,231	4,739	3.0%	$521	2,012	1.3%	$875
$15,000 ~ $19,999	.	.	.	32	0.0%	$7,856	825	0.5%	$1,759	3,740	2.4%	$679	2,640	1.7%	$985
$20,000 ~ $29,999	3	0.0%	$119	55	0.0%	$6,344	1,336	0.9%	$1,450	7,210	4.6%	$616	4,242	2.7%	$949
$30,000 ~ $39,999	2	0.0%	$15	47	0.0%	$8,006	1,460	0.9%	$1,769	8,000	5.1%	$694	5,902	3.8%	$988
$40,000 ~ $49,999	3	0.0%	$31	53	0.0%	$6,341	1,170	0.7%	$1,616	6,648	4.3%	$642	4,663	3.0%	$963
$50,000 ~ $74,999	1	0.0%	$1	135	0.1%	$6,631	3,562	2.3%	$1,894	16,698	10.7%	$726	13,756	8.8%	$1,009
$75,000 ~ $99,999	5	0.0%	$115	79	0.1%	$7,174	1,855	1.2%	$2,051	6,699	4.3%	$818	6,288	4.0%	$1,044
$100,000 ~ $124,999	1	0.0%	$13,545	77	0.0%	$6,603	1,485	0.9%	$2,075	4,830	3.1%	$841	4,582	2.9%	$1,048
>= $125,000	2	0.0%	$10,905	279	0.2%	$7,211	3,517	2.2%	$2,221	9,262	5.9%	$843	8,287	5.3%	$1,061
ALL	17	0.0%	$2,142	788	0.5%	$7,009	16,042	10.3%	$1,891	67,826	43.4%	$719	52,372	33.5%	$1,007

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	493	0.3%	$1,093	22	0.0%	$891	18	0.0%	$262	13	0.0%	$502	10	0.0%	$523	8,170	5.2%	$741
$15,000 ~ $19,999	902	0.6%	$1,140	32	0.0%	$855	9	0.0%	$664	14	0.0%	$383	11	0.0%	$789	8,205	5.2%	$965
$20,000 ~ $29,999	1,365	0.9%	$1,118	48	0.0%	$863	30	0.0%	$727	17	0.0%	$619	16	0.0%	$1,108	14,322	9.2%	$864
$30,000 ~ $39,999	2,171	1.4%	$1,122	58	0.0%	$895	30	0.0%	$624	23	0.0%	$617	18	0.0%	$1,870	17,711	11.3%	$954
$40,000 ~ $49,999	1,585	1.0%	$1,125	34	0.0%	$940	22	0.0%	$357	14	0.0%	$344	19	0.0%	$1,061	14,211	9.1%	$903
$50,000 ~ $74,999	4,836	3.1%	$1,133	120	0.1%	$1,260	72	0.0%	$803	64	0.0%	$692	46	0.0%	$826	39,290	25.1%	$1,003
$75,000 ~ $99,999	2,337	1.5%	$1,144	48	0.0%	$982	41	0.0%	$755	30	0.0%	$717	14	0.0%	$640	17,396	11.1%	$1,104
$100,000 ~ $124,999	1,598	1.0%	$1,147	41	0.0%	$871	18	0.0%	$662	16	0.0%	$555	13	0.0%	$962	12,661	8.1%	$1,135
>= $125,000	2,815	1.8%	$1,142	92	0.1%	$1,149	48	0.0%	$736	39	0.0%	$798	29	0.0%	$691	24,370	15.6%	$1,225
ALL	18,102	11.6%	$1,133	495	0.3%	$1,034	288	0.2%	$677	230	0.1%	$640	176	0.1%	$937	156,336	100.0%	$1,016

Average Yearly Bill is calculated from the Treatment 1 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #1)
Climate Zone:Cool
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	10	0.0%	$1,545	1,498	3.2%	$430	6,912	14.7%	$300	1,037	2.2%	$529	31	0.1%	$365
$15,000 ~ $19,999	.	.	.	5	0.0%	$3,813	394	0.8%	$768	1,698	3.6%	$452	578	1.2%	$637	12	0.0%	$669
$20,000 ~ $29,999	.	.	.	10	0.0%	$2,394	1,212	2.6%	$624	5,648	12.0%	$380	1,518	3.2%	$614	53	0.1%	$613
$30,000 ~ $39,999	.	.	.	11	0.0%	$2,211	803	1.7%	$726	3,699	7.9%	$437	1,279	2.7%	$639	34	0.1%	$651
$40,000 ~ $49,999	.	.	.	14	0.0%	$2,317	712	1.5%	$778	3,295	7.0%	$433	1,185	2.5%	$628	28	0.1%	$978
$50,000 ~ $74,999	1	0.0%	$142	26	0.1%	$2,172	1,065	2.3%	$921	4,444	9.4%	$490	1,981	4.2%	$649	49	0.1%	$820
$75,000 ~ $99,999	1	0.0%	$78	3	0.0%	$2,115	391	0.8%	$946	1,491	3.2%	$499	813	1.7%	$654	16	0.0%	$934
$100,000 ~ $124,999	.	.	.	5	0.0%	$1,887	306	0.7%	$905	1,183	2.5%	$469	532	1.1%	$656	13	0.0%	$734
>= $125,000	2	0.0%	$3,885	13	0.0%	$2,644	442	0.9%	$859	1,729	3.7%	$441	696	1.5%	$657	15	0.0%	$714
ALL	4	0.0%	$1,998	97	0.2%	$2,287	6,823	14.5%	$710	30,099	64.0%	$408	9,619	20.4%	$627	251	0.5%	$704

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	15	0.0%	$374	13	0.0%	$385	5	0.0%	$431	6	0.0%	$288	9,527	20.2%	$348
$15,000 ~ $19,999	5	0.0%	$353	1	0.0%	$179	3	0.0%	$363	4	0.0%	$232	2,700	5.7%	$544
$20,000 ~ $29,999	13	0.0%	$421	2	0.0%	$172	6	0.0%	$348	2	0.0%	$340	8,464	18.0%	$461
$30,000 ~ $39,999	6	0.0%	$320	7	0.0%	$315	12	0.0%	$424	1	0.0%	$34	5,852	12.4%	$525
$40,000 ~ $49,999	4	0.0%	$264	5	0.0%	$164	4	0.0%	$273	2	0.0%	$265	5,249	11.2%	$531
$50,000 ~ $74,999	5	0.0%	$418	10	0.0%	$473	8	0.0%	$429	3	0.0%	$343	7,592	16.1%	$600
$75,000 ~ $99,999	3	0.0%	$398	3	0.0%	$233	1	0.0%	$192	.	.	.	2,722	5.8%	$613
$100,000 ~ $124,999	2	0.0%	$672	3	0.0%	$326	1	0.0%	$692	2	0.0%	$431	2,047	4.3%	$588
>= $125,000	5	0.0%	$1,849	2	0.0%	$551	2	0.0%	$205	1	0.0%	$8	2,907	6.2%	$572
ALL	58	0.1%	$512	46	0.1%	$349	42	0.1%	$387	21	0.0%	$276	47,060	100.0%	$502

Average Yearly Bill is calculated from the Treatment 1 dataset

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3, ATTACHMENT B

BILL COMPARISON RESULTS CONTROL GROUP VS. PILOT RATE 2

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone: ALL
Senior Category: All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	13	0.0%	$3,282	631	0.0%	$8,001	15,949	0.6%	$1,194	47,257	1.9%	$739	30,560	1.2%	$1,121	16,938	0.7%	$1,437
$15,000 ~ $19,999	9	0.0%	$6,560	497	0.0%	$7,595	9,702	0.4%	$1,863	30,195	1.2%	$1,004	27,524	1.1%	$1,352	18,235	0.7%	$1,616
$20,000 ~ $29,999	18	0.0%	$4,567	752	0.0%	$7,340	16,919	0.7%	$1,235	55,381	2.2%	$787	41,738	1.6%	$1,182	24,371	1.0%	$1,493
$30,000 ~ $39,999	16	0.0%	$1,736	840	0.0%	$7,671	16,832	0.7%	$1,534	58,129	2.3%	$895	51,791	2.0%	$1,272	33,344	1.3%	$1,539
$40,000 ~ $49,999	19	0.0%	$5,120	806	0.0%	$8,233	15,299	0.6%	$1,372	49,004	1.9%	$839	40,667	1.6%	$1,222	25,311	1.0%	$1,532
$50,000 ~ $74,999	36	0.0%	$4,641	2,075	0.1%	$7,858	39,246	1.5%	$1,786	150,534	5.9%	$977	149,853	5.9%	$1,347	99,973	3.9%	$1,616
$75,000 ~ $99,999	25	0.0%	$7,080	1,700	0.1%	$8,092	34,303	1.4%	$2,176	113,716	4.5%	$1,167	135,122	5.3%	$1,457	93,899	3.7%	$1,687
$100,000 ~ $124,999	19	0.0%	$5,187	1,253	0.0%	$8,161	26,859	1.1%	$2,071	86,758	3.4%	$1,087	92,562	3.6%	$1,421	63,767	2.5%	$1,672
>= $125,000	43	0.0%	$8,914	5,573	0.2%	$7,977	84,747	3.3%	$2,782	189,688	7.5%	$1,259	208,735	8.2%	$1,440	133,079	5.2%	$1,631
ALL	198	0.0%	$5,732	14,127	0.6%	$7,940	259,856	10.2%	$2,082	780,662	30.7%	$1,044	778,552	30.7%	$1,371	508,917	20.0%	$1,619

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	6,521	0.3%	$1,538	1,116	0.0%	$1,361	291	0.0%	$1,153	183	0.0%	$1,118	119,459	4.7%	$1,086
$15,000 ~ $19,999	7,326	0.3%	$1,718	1,128	0.0%	$1,599	259	0.0%	$1,339	229	0.0%	$1,449	95,104	3.7%	$1,409
$20,000 ~ $29,999	10,081	0.4%	$1,581	1,616	0.1%	$1,391	342	0.0%	$1,097	254	0.0%	$1,227	151,472	6.0%	$1,153
$30,000 ~ $39,999	13,400	0.5%	$1,625	1,930	0.1%	$1,462	383	0.0%	$1,344	353	0.0%	$1,221	177,018	7.0%	$1,283
$40,000 ~ $49,999	10,469	0.4%	$1,610	1,648	0.1%	$1,420	342	0.0%	$1,177	245	0.0%	$1,134	143,810	5.7%	$1,232
$50,000 ~ $74,999	37,637	1.5%	$1,711	5,265	0.2%	$1,602	1,070	0.0%	$1,328	985	0.0%	$1,390	486,674	19.2%	$1,382
$75,000 ~ $99,999	28,862	1.1%	$1,834	3,619	0.1%	$1,845	917	0.0%	$1,570	975	0.0%	$1,522	413,138	16.3%	$1,547
$100,000 ~ $124,999	20,317	0.8%	$1,816	2,468	0.1%	$1,779	658	0.0%	$1,537	715	0.0%	$1,500	295,376	11.6%	$1,495
>= $125,000	28,610	1.1%	$1,825	3,807	0.1%	$1,910	1,167	0.0%	$1,526	1,466	0.1%	$1,372	656,915	25.9%	$1,675
ALL	163,223	6.4%	$1,738	22,597	0.9%	$1,660	5,429	0.2%	$1,405	5,405	0.2%	$1,386	2,538,966	100.0%	$1,456

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone: ALL
Senior Category: All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	11	0.0%	$3,213	196	0.0%	$2,443	20,618	2.1%	$601	57,601	5.9%	$545	39,724	4.1%	$798
$15,000 ~ $19,999	4	0.0%	$4,232	78	0.0%	$2,993	5,270	0.5%	$966	15,354	1.6%	$770	13,049	1.3%	$1,008
$20,000 ~ $29,999	7	0.0%	$1,301	197	0.0%	$2,462	16,025	1.6%	$768	48,073	4.9%	$647	37,268	3.8%	$893
$30,000 ~ $39,999	4	0.0%	$3,300	183	0.0%	$2,763	12,151	1.2%	$897	37,663	3.9%	$736	32,851	3.4%	$961
$40,000 ~ $49,999	6	0.0%	$5,232	166	0.0%	$2,850	11,237	1.2%	$893	34,643	3.5%	$729	30,520	3.1%	$946
$50,000 ~ $74,999	11	0.0%	$4,651	437	0.0%	$3,121	20,678	2.1%	$1,113	65,266	6.7%	$820	60,878	6.2%	$1,034
$75,000 ~ $99,999	7	0.0%	$8,307	275	0.0%	$3,016	12,259	1.3%	$1,245	37,755	3.9%	$858	35,774	3.7%	$1,049
$100,000 ~ $124,999	2	0.0%	$107	177	0.0%	$3,024	8,617	0.9%	$1,108	25,789	2.6%	$798	21,447	2.2%	$1,030
>= $125,000	8	0.0%	$4,586	301	0.0%	$3,034	13,554	1.4%	$1,097	38,008	3.9%	$742	28,832	3.0%	$981
ALL	60	0.0%	$4,203	2,010	0.2%	$2,894	120,409	12.3%	$942	360,152	36.9%	$727	300,343	30.8%	$964

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	20,394	2.1%	$883	4,482	0.5%	$811	625	0.1%	$700	115	0.0%	$677	52	0.0%	$767	143,818	14.7%	$683
$15,000 ~ $19,999	7,616	0.8%	$1,059	1,841	0.2%	$951	214	0.0%	$869	50	0.0%	$892	24	0.0%	$1,123	43,500	4.5%	$928
$20,000 ~ $29,999	20,323	2.1%	$974	4,777	0.5%	$883	595	0.1%	$761	126	0.0%	$741	40	0.0%	$823	127,431	13.1%	$799
$30,000 ~ $39,999	18,733	1.9%	$1,020	4,291	0.4%	$927	529	0.1%	$873	100	0.0%	$830	37	0.0%	$996	106,542	10.9%	$886
$40,000 ~ $49,999	17,180	1.8%	$1,027	4,065	0.4%	$940	469	0.0%	$808	106	0.0%	$694	40	0.0%	$842	98,432	10.1%	$880
$50,000 ~ $74,999	32,241	3.3%	$1,129	7,220	0.7%	$1,047	834	0.1%	$973	148	0.0%	$958	96	0.0%	$1,103	187,809	19.2%	$990
$75,000 ~ $99,999	16,775	1.7%	$1,180	3,489	0.4%	$1,153	405	0.0%	$1,144	73	0.0%	$760	60	0.0%	$1,365	106,872	10.9%	$1,034
$100,000 ~ $124,999	9,298	1.0%	$1,165	1,898	0.2%	$1,116	196	0.0%	$1,151	51	0.0%	$969	37	0.0%	$1,634	67,512	6.9%	$978
>= $125,000	11,151	1.1%	$1,130	2,077	0.2%	$1,091	264	0.0%	$1,048	60	0.0%	$946	43	0.0%	$1,027	94,298	9.7%	$929
ALL	153,711	15.7%	$1,056	34,140	3.5%	$977	4,131	0.4%	$894	829	0.1%	$815	429	0.0%	$1,079	976,214	100.0%	$893

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Hot
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$273	163	0.0%	$6,688	3,555	0.5%	$1,907	7,540	1.0%	$1,499	10,982	1.5%	$1,441	10,623	1.4%	$1,547
$15,000 ~ $19,999	4	0.0%	$7,952	107	0.0%	$7,631	2,392	0.3%	$2,639	5,940	0.8%	$1,872	9,348	1.2%	$1,822	10,471	1.4%	$1,800
$20,000 ~ $29,999	8	0.0%	$2,272	211	0.0%	$6,153	4,039	0.5%	$1,868	9,421	1.2%	$1,521	14,512	1.9%	$1,563	15,117	2.0%	$1,630
$30,000 ~ $39,999	10	0.0%	$1,902	232	0.0%	$6,398	4,495	0.6%	$2,145	10,935	1.4%	$1,614	17,950	2.4%	$1,663	19,599	2.6%	$1,692
$40,000 ~ $49,999	8	0.0%	$2,176	235	0.0%	$6,677	3,928	0.5%	$1,975	8,944	1.2%	$1,555	14,388	1.9%	$1,603	15,957	2.1%	$1,674
$50,000 ~ $74,999	12	0.0%	$1,268	458	0.1%	$7,348	9,042	1.2%	$2,414	24,403	3.2%	$1,901	44,105	5.8%	$1,890	52,912	7.0%	$1,845
$75,000 ~ $99,999	6	0.0%	$1,483	300	0.0%	$8,203	7,244	1.0%	$3,101	17,502	2.3%	$2,468	33,113	4.4%	$2,247	40,870	5.4%	$2,041
$100,000 ~ $124,999	3	0.0%	$15	178	0.0%	$8,662	4,432	0.6%	$3,282	10,916	1.4%	$2,436	20,977	2.8%	$2,217	26,486	3.5%	$2,027
>= $125,000	14	0.0%	$3,591	450	0.1%	$9,261	11,325	1.5%	$4,090	19,908	2.6%	$2,710	31,285	4.1%	$2,311	35,287	4.7%	$2,060
ALL	70	0.0%	$2,317	2,334	0.3%	$7,624	50,452	6.7%	$2,838	115,509	15.3%	$2,064	196,660	26.1%	$1,958	227,322	30.1%	$1,879

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5,874	0.8%	$1,573	994	0.1%	$1,453	201	0.0%	$1,358	103	0.0%	$1,380	40,040	5.3%	$1,562
$15,000 ~ $19,999	6,570	0.9%	$1,758	1,018	0.1%	$1,648	185	0.0%	$1,496	131	0.0%	$1,557	36,166	4.8%	$1,877
$20,000 ~ $29,999	9,098	1.2%	$1,627	1,428	0.2%	$1,472	234	0.0%	$1,292	148	0.0%	$1,482	54,216	7.2%	$1,622
$30,000 ~ $39,999	11,987	1.6%	$1,666	1,711	0.2%	$1,539	285	0.0%	$1,533	224	0.0%	$1,457	67,428	8.9%	$1,708
$40,000 ~ $49,999	9,632	1.3%	$1,639	1,502	0.2%	$1,489	245	0.0%	$1,413	128	0.0%	$1,460	54,967	7.3%	$1,666
$50,000 ~ $74,999	33,352	4.4%	$1,761	4,657	0.6%	$1,685	665	0.1%	$1,587	536	0.1%	$1,768	170,142	22.6%	$1,888
$75,000 ~ $99,999	24,471	3.2%	$1,908	3,019	0.4%	$1,944	541	0.1%	$1,967	489	0.1%	$1,971	127,555	16.9%	$2,199
$100,000 ~ $124,999	16,860	2.2%	$1,899	2,051	0.3%	$1,867	364	0.0%	$1,891	366	0.0%	$1,923	82,633	11.0%	$2,180
>= $125,000	19,459	2.6%	$1,964	2,642	0.4%	$2,113	436	0.1%	$1,936	461	0.1%	$1,810	121,267	16.1%	$2,432
ALL	137,303	18.2%	$1,799	19,022	2.5%	$1,746	3,156	0.4%	$1,675	2,586	0.3%	$1,751	754,414	100.0%	$1,991

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Hot
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	3	0.0%	$227	97	0.0%	$2,624	5,694	1.1%	$994	19,362	3.7%	$819	28,619	5.5%	$869
$15,000 ~ $19,999	.	.	.	23	0.0%	$3,182	1,826	0.4%	$1,438	5,975	1.2%	$1,144	8,849	1.7%	$1,138
$20,000 ~ $29,999	2	0.0%	$898	79	0.0%	$2,618	5,083	1.0%	$1,207	17,316	3.3%	$970	26,029	5.0%	$989
$30,000 ~ $39,999	2	0.0%	$5,701	88	0.0%	$2,935	4,086	0.8%	$1,353	14,791	2.9%	$1,083	23,208	4.5%	$1,063
$40,000 ~ $49,999	4	0.0%	$2,355	69	0.0%	$3,146	3,794	0.7%	$1,337	13,069	2.5%	$1,086	21,044	4.1%	$1,055
$50,000 ~ $74,999	4	0.0%	$1,135	139	0.0%	$3,484	6,252	1.2%	$1,700	21,587	4.2%	$1,297	36,438	7.0%	$1,215
$75,000 ~ $99,999	1	0.0%	$206	72	0.0%	$3,168	3,465	0.7%	$1,921	10,989	2.1%	$1,427	18,532	3.6%	$1,284
$100,000 ~ $124,999	1	0.0%	$1	38	0.0%	$3,507	2,067	0.4%	$1,847	6,526	1.3%	$1,397	10,245	2.0%	$1,288
>= $125,000	2	0.0%	$1,050	61	0.0%	$3,463	2,849	0.5%	$1,864	8,103	1.6%	$1,319	11,972	2.3%	$1,231
ALL	19	0.0%	$1,587	666	0.1%	$3,103	35,116	6.8%	$1,465	117,718	22.7%	$1,131	184,936	35.7%	$1,101

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	19,346	3.7%	$896	4,399	0.8%	$817	592	0.1%	$715	92	0.0%	$759	41	0.0%	$832	78,245	15.1%	$870
$15,000 ~ $19,999	7,195	1.4%	$1,070	1,802	0.3%	$953	202	0.0%	$895	43	0.0%	$914	18	0.0%	$1,195	25,933	5.0%	$1,129
$20,000 ~ $29,999	19,210	3.7%	$988	4,662	0.9%	$890	561	0.1%	$782	105	0.0%	$761	27	0.0%	$891	73,074	14.1%	$993
$30,000 ~ $39,999	17,747	3.4%	$1,033	4,200	0.8%	$934	492	0.1%	$899	78	0.0%	$945	28	0.0%	$1,104	64,720	12.5%	$1,071
$40,000 ~ $49,999	16,325	3.1%	$1,039	3,972	0.8%	$949	431	0.1%	$844	84	0.0%	$759	29	0.0%	$976	58,821	11.3%	$1,069
$50,000 ~ $74,999	29,872	5.8%	$1,146	7,039	1.4%	$1,054	756	0.1%	$1,009	120	0.0%	$1,023	64	0.0%	$1,254	102,271	19.7%	$1,232
$75,000 ~ $99,999	15,090	2.9%	$1,200	3,369	0.6%	$1,164	366	0.1%	$1,210	43	0.0%	$924	42	0.0%	$1,499	51,969	10.0%	$1,326
$100,000 ~ $124,999	8,102	1.6%	$1,191	1,815	0.4%	$1,124	171	0.0%	$1,243	37	0.0%	$1,104	24	0.0%	$2,048	29,026	5.6%	$1,318
>= $125,000	9,218	1.8%	$1,156	1,943	0.4%	$1,102	220	0.0%	$1,085	36	0.0%	$1,141	26	0.0%	$1,338	34,430	6.6%	$1,280
ALL	142,105	27.4%	$1,069	33,201	6.4%	$984	3,791	0.7%	$925	638	0.1%	$895	299	0.1%	$1,224	518,489	100.0%	$1,117

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Hot
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2	0.0%	$4	46	0.0%	$5,456	2,100	0.7%	$1,059	6,529	2.2%	$818	7,425	2.5%	$956	5,142	1.7%	$1,122
$15,000 ~ $19,999	.	.	.	30	0.0%	$5,073	1,615	0.5%	$1,699	5,076	1.7%	$1,297	7,094	2.4%	$1,402	6,634	2.2%	$1,463
$20,000 ~ $29,999	4	0.0%	$456	63	0.0%	$3,396	3,105	1.0%	$1,331	9,879	3.3%	$1,052	12,931	4.4%	$1,209	10,914	3.7%	$1,322
$30,000 ~ $39,999	3	0.0%	$1	77	0.0%	$4,295	2,558	0.9%	$1,735	8,770	3.0%	$1,251	12,558	4.2%	$1,391	11,596	3.9%	$1,475
$40,000 ~ $49,999	4	0.0%	$1,974	65	0.0%	$3,388	1,906	0.6%	$1,602	6,506	2.2%	$1,254	9,560	3.2%	$1,370	9,170	3.1%	$1,473
$50,000 ~ $74,999	3	0.0%	$15	120	0.0%	$4,895	3,514	1.2%	$1,941	11,335	3.8%	$1,604	19,124	6.5%	$1,679	20,766	7.0%	$1,685
$75,000 ~ $99,999	2	0.0%	$1	33	0.0%	$5,126	1,312	0.4%	$2,495	3,716	1.3%	$1,914	6,486	2.2%	$1,870	7,316	2.5%	$1,844
$100,000 ~ $124,999	2	0.0%	$2	28	0.0%	$7,140	1,064	0.4%	$2,893	2,742	0.9%	$1,885	4,692	1.6%	$1,864	5,050	1.7%	$1,799
>= $125,000	3	0.0%	$793	65	0.0%	$8,770	2,021	0.7%	$3,326	4,293	1.5%	$1,988	6,541	2.2%	$1,924	7,154	2.4%	$1,838
ALL	23	0.0%	$529	527	0.2%	$5,113	19,195	6.5%	$1,901	58,846	19.9%	$1,367	86,411	29.2%	$1,491	83,742	28.3%	$1,567

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1,880	0.6%	$1,259	303	0.1%	$1,168	61	0.0%	$988	33	0.0%	$1,092	23,521	7.9%	$999
$15,000 ~ $19,999	3,282	1.1%	$1,571	470	0.2%	$1,422	87	0.0%	$1,216	46	0.0%	$1,380	24,334	8.2%	$1,444
$20,000 ~ $29,999	4,895	1.7%	$1,425	696	0.2%	$1,354	123	0.0%	$1,179	67	0.0%	$1,308	42,677	14.4%	$1,241
$30,000 ~ $39,999	5,488	1.9%	$1,564	699	0.2%	$1,452	109	0.0%	$1,340	84	0.0%	$1,488	41,942	14.2%	$1,435
$40,000 ~ $49,999	4,218	1.4%	$1,552	546	0.2%	$1,415	88	0.0%	$1,123	62	0.0%	$1,368	32,125	10.9%	$1,418
$50,000 ~ $74,999	10,991	3.7%	$1,712	1,307	0.4%	$1,645	197	0.1%	$1,565	175	0.1%	$1,808	67,532	22.8%	$1,692
$75,000 ~ $99,999	3,564	1.2%	$1,798	394	0.1%	$1,792	94	0.0%	$1,790	82	0.0%	$1,728	22,999	7.8%	$1,896
$100,000 ~ $124,999	2,711	0.9%	$1,756	315	0.1%	$1,777	54	0.0%	$1,508	60	0.0%	$2,146	16,718	5.6%	$1,903
>= $125,000	3,522	1.2%	$1,871	416	0.1%	$1,905	72	0.0%	$1,596	95	0.0%	$1,827	24,182	8.2%	$2,036
ALL	40,551	13.7%	$1,633	5,146	1.7%	$1,547	885	0.3%	$1,389	704	0.2%	$1,644	296,030	100.0%	$1,541

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Hot
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$4	35	0.0%	$6,135	688	0.4%	$1,701	1,759	0.9%	$1,259	2,375	1.2%	$1,431	2,213	1.1%	$1,568
$15,000 ~ $19,999	.	.	.	23	0.0%	$5,618	895	0.5%	$2,136	2,634	1.4%	$1,613	4,064	2.1%	$1,686	4,280	2.2%	$1,725
$20,000 ~ $29,999	3	0.0%	$10	47	0.0%	$3,678	1,403	0.7%	$1,774	3,942	2.0%	$1,386	5,850	3.0%	$1,580	5,949	3.1%	$1,644
$30,000 ~ $39,999	3	0.0%	$1	61	0.0%	$4,601	1,473	0.8%	$2,146	4,652	2.4%	$1,487	7,242	3.7%	$1,674	7,690	4.0%	$1,722
$40,000 ~ $49,999	3	0.0%	$528	53	0.0%	$3,622	1,083	0.6%	$1,921	3,297	1.7%	$1,502	5,378	2.8%	$1,651	5,925	3.0%	$1,726
$50,000 ~ $74,999	3	0.0%	$15	107	0.1%	$5,164	2,420	1.2%	$2,149	7,430	3.8%	$1,819	13,485	6.9%	$1,894	16,144	8.3%	$1,853
$75,000 ~ $99,999	2	0.0%	$1	28	0.0%	$5,368	988	0.5%	$2,757	2,653	1.4%	$2,188	4,909	2.5%	$2,095	6,071	3.1%	$1,990
$100,000 ~ $124,999	1	0.0%	$2	22	0.0%	$7,908	817	0.4%	$3,279	1,967	1.0%	$2,154	3,619	1.9%	$2,072	4,265	2.2%	$1,925
>= $125,000	2	0.0%	$1,043	61	0.0%	$9,228	1,694	0.9%	$3,679	3,221	1.7%	$2,273	5,205	2.7%	$2,121	6,009	3.1%	$1,978
ALL	18	0.0%	$209	437	0.2%	$5,559	11,461	5.9%	$2,412	31,555	16.2%	$1,733	52,127	26.8%	$1,820	58,546	30.1%	$1,814

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1,166	0.6%	$1,596	200	0.1%	$1,435	43	0.0%	$1,087	22	0.0%	$1,076	8,502	4.4%	$1,492
$15,000 ~ $19,999	2,679	1.4%	$1,730	397	0.2%	$1,552	69	0.0%	$1,322	41	0.0%	$1,423	15,082	7.8%	$1,719
$20,000 ~ $29,999	3,645	1.9%	$1,631	545	0.3%	$1,535	86	0.0%	$1,438	56	0.0%	$1,491	21,526	11.1%	$1,586
$30,000 ~ $39,999	4,541	2.3%	$1,704	580	0.3%	$1,579	86	0.0%	$1,412	79	0.0%	$1,480	26,407	13.6%	$1,690
$40,000 ~ $49,999	3,432	1.8%	$1,694	449	0.2%	$1,536	69	0.0%	$1,224	55	0.0%	$1,404	19,744	10.2%	$1,671
$50,000 ~ $74,999	9,930	5.1%	$1,790	1,187	0.6%	$1,710	172	0.1%	$1,632	163	0.1%	$1,859	51,041	26.3%	$1,863
$75,000 ~ $99,999	3,281	1.7%	$1,865	361	0.2%	$1,847	90	0.0%	$1,843	79	0.0%	$1,756	18,462	9.5%	$2,066
$100,000 ~ $124,999	2,513	1.3%	$1,819	297	0.2%	$1,828	50	0.0%	$1,572	58	0.0%	$2,022	13,609	7.0%	$2,066
>= $125,000	3,297	1.7%	$1,923	399	0.2%	$1,941	67	0.0%	$1,631	90	0.0%	$1,795	20,045	10.3%	$2,216
ALL	34,484	17.7%	$1,763	4,415	2.3%	$1,667	732	0.4%	$1,505	643	0.3%	$1,680	194,418	100.0%	$1,832

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Hot
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$4	11	0.0%	$3,297	1,412	1.4%	$745	4,770	4.7%	$655	5,050	5.0%	$732
$15,000 ~ $19,999	.	.	.	7	0.0%	$3,284	720	0.7%	$1,156	2,442	2.4%	$957	3,030	3.0%	$1,022
$20,000 ~ $29,999	1	0.0%	$1,796	16	0.0%	$2,569	1,702	1.7%	$965	5,937	5.8%	$830	7,081	7.0%	$903
$30,000 ~ $39,999	.	.	.	16	0.0%	$3,131	1,085	1.1%	$1,177	4,118	4.1%	$984	5,316	5.2%	$1,005
$40,000 ~ $49,999	1	0.0%	$6,313	12	0.0%	$2,355	823	0.8%	$1,182	3,209	3.2%	$999	4,182	4.1%	$1,009
$50,000 ~ $74,999	.	.	.	13	0.0%	$2,682	1,094	1.1%	$1,480	3,905	3.8%	$1,195	5,639	5.5%	$1,167
$75,000 ~ $99,999	.	.	.	5	0.0%	$3,771	324	0.3%	$1,697	1,063	1.0%	$1,229	1,577	1.6%	$1,170
$100,000 ~ $124,999	1	0.0%	$1	6	0.0%	$4,325	247	0.2%	$1,615	775	0.8%	$1,200	1,073	1.1%	$1,162
>= $125,000	1	0.0%	$294	4	0.0%	$1,779	327	0.3%	$1,497	1,072	1.1%	$1,132	1,336	1.3%	$1,155
ALL	5	0.0%	$1,682	90	0.1%	$2,950	7,734	7.6%	$1,142	27,291	26.9%	$944	34,284	33.7%	$991

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,929	2.9%	$786	714	0.7%	$709	103	0.1%	$650	18	0.0%	$751	11	0.0%	$1,126	15,019	14.8%	$720
$15,000 ~ $19,999	2,354	2.3%	$987	603	0.6%	$862	73	0.1%	$712	18	0.0%	$808	5	0.0%	$1,027	9,252	9.1%	$995
$20,000 ~ $29,999	4,965	4.9%	$937	1,250	1.2%	$824	151	0.1%	$701	37	0.0%	$576	11	0.0%	$377	21,151	20.8%	$890
$30,000 ~ $39,999	3,906	3.8%	$989	947	0.9%	$892	119	0.1%	$829	23	0.0%	$1,069	5	0.0%	$1,620	15,535	15.3%	$1,002
$40,000 ~ $49,999	3,245	3.2%	$1,011	786	0.8%	$934	97	0.1%	$855	19	0.0%	$758	7	0.0%	$1,084	12,381	12.2%	$1,014
$50,000 ~ $74,999	4,622	4.5%	$1,099	1,061	1.0%	$982	120	0.1%	$997	25	0.0%	$1,104	12	0.0%	$1,111	16,491	16.2%	$1,163
$75,000 ~ $99,999	1,245	1.2%	$1,136	283	0.3%	$1,023	33	0.0%	$1,189	4	0.0%	$610	3	0.0%	$993	4,537	4.5%	$1,205
$100,000 ~ $124,999	785	0.8%	$1,112	198	0.2%	$961	18	0.0%	$935	4	0.0%	$708	2	0.0%	$5,764	3,109	3.1%	$1,189
>= $125,000	1,145	1.1%	$1,101	225	0.2%	$1,112	17	0.0%	$1,050	5	0.0%	$1,133	5	0.0%	$2,402	4,137	4.1%	$1,160
ALL	25,196	24.8%	$994	6,067	6.0%	$891	731	0.7%	$821	153	0.2%	$829	61	0.1%	$1,266	101,612	100.0%	$985

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Cool
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$8,081	261	0.0%	$8,219	6,624	1.0%	$767	21,606	3.3%	$487	8,008	1.2%	$808
$15,000 ~ $19,999	3	0.0%	$5,464	197	0.0%	$7,103	3,213	0.5%	$1,252	10,938	1.6%	$630	6,517	1.0%	$943
$20,000 ~ $29,999	6	0.0%	$6,909	347	0.1%	$7,401	6,642	1.0%	$948	23,296	3.5%	$544	11,219	1.7%	$880
$30,000 ~ $39,999	2	0.0%	$658	303	0.0%	$8,134	5,760	0.9%	$1,152	20,969	3.2%	$622	12,836	1.9%	$940
$40,000 ~ $49,999	8	0.0%	$6,418	313	0.0%	$8,635	5,890	0.9%	$1,005	19,564	2.9%	$575	10,950	1.7%	$904
$50,000 ~ $74,999	15	0.0%	$7,518	892	0.1%	$7,739	15,272	2.3%	$1,416	57,216	8.6%	$673	41,273	6.2%	$978
$75,000 ~ $99,999	11	0.0%	$6,252	724	0.1%	$7,345	13,488	2.0%	$1,650	43,111	6.5%	$768	37,857	5.7%	$1,016
$100,000 ~ $124,999	7	0.0%	$8,862	477	0.1%	$7,428	9,513	1.4%	$1,453	30,896	4.7%	$705	23,171	3.5%	$991
>= $125,000	9	0.0%	$5,976	2,076	0.3%	$6,563	27,466	4.1%	$1,851	67,329	10.1%	$798	54,444	8.2%	$1,029
ALL	66	0.0%	$6,792	5,590	0.8%	$7,275	93,868	14.1%	$1,454	294,925	44.5%	$683	206,275	31.1%	$981

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1,454	0.2%	$1,031	60	0.0%	$869	43	0.0%	$335	35	0.0%	$585	37	0.0%	$698	38,133	5.7%	$679
$15,000 ~ $19,999	1,637	0.2%	$1,109	68	0.0%	$1,221	22	0.0%	$712	24	0.0%	$504	32	0.0%	$741	22,651	3.4%	$902
$20,000 ~ $29,999	2,401	0.4%	$1,077	85	0.0%	$707	67	0.0%	$616	55	0.0%	$405	42	0.0%	$724	44,160	6.7%	$774
$30,000 ~ $39,999	3,310	0.5%	$1,101	115	0.0%	$1,172	58	0.0%	$583	36	0.0%	$617	64	0.0%	$668	43,453	6.5%	$876
$40,000 ~ $49,999	2,487	0.4%	$1,086	80	0.0%	$1,270	46	0.0%	$427	40	0.0%	$344	57	0.0%	$586	39,435	5.9%	$829
$50,000 ~ $74,999	11,776	1.8%	$1,120	341	0.1%	$966	188	0.0%	$749	157	0.0%	$702	168	0.0%	$710	127,298	19.2%	$954
$75,000 ~ $99,999	12,419	1.9%	$1,129	283	0.0%	$997	170	0.0%	$940	134	0.0%	$734	159	0.0%	$765	108,356	16.3%	$1,051
$100,000 ~ $124,999	6,980	1.1%	$1,122	155	0.0%	$1,037	87	0.0%	$719	78	0.0%	$706	119	0.0%	$727	71,483	10.8%	$984
>= $125,000	16,009	2.4%	$1,125	444	0.1%	$1,191	248	0.0%	$842	202	0.0%	$836	243	0.0%	$858	168,470	25.4%	$1,148
ALL	58,473	8.8%	$1,117	1,631	0.2%	$1,062	929	0.1%	$750	761	0.1%	$688	921	0.1%	$751	663,439	100.0%	$980

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Cool
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$5,577	63	0.0%	$2,099	8,398	4.3%	$415	19,852	10.1%	$360	4,884	2.5%	$553	180	0.1%	$555
$15,000 ~ $19,999	1	0.0%	$8,052	24	0.0%	$2,522	1,622	0.8%	$660	3,974	2.0%	$470	1,558	0.8%	$640	52	0.0%	$925
$20,000 ~ $29,999	2	0.0%	$3,303	63	0.0%	$2,169	5,834	3.0%	$526	14,866	7.5%	$415	4,620	2.3%	$602	205	0.1%	$693
$30,000 ~ $39,999	1	0.0%	$1,798	56	0.0%	$2,475	4,024	2.0%	$609	10,550	5.3%	$455	3,945	2.0%	$623	126	0.1%	$695
$40,000 ~ $49,999	.	.	.	60	0.0%	$2,454	3,941	2.0%	$612	10,564	5.4%	$456	4,265	2.2%	$616	169	0.1%	$821
$50,000 ~ $74,999	5	0.0%	$4,874	177	0.1%	$2,790	7,190	3.6%	$795	18,774	9.5%	$513	9,948	5.0%	$649	409	0.2%	$835
$75,000 ~ $99,999	4	0.0%	$9,844	100	0.1%	$2,767	4,299	2.2%	$857	10,876	5.5%	$530	6,391	3.2%	$659	294	0.1%	$922
$100,000 ~ $124,999	.	.	.	66	0.0%	$2,229	2,949	1.5%	$770	7,173	3.6%	$502	3,547	1.8%	$652	172	0.1%	$869
>= $125,000	4	0.0%	$5,922	124	0.1%	$2,629	4,512	2.3%	$737	10,811	5.5%	$477	4,795	2.4%	$647	229	0.1%	$905
ALL	22	0.0%	$5,990	733	0.4%	$2,536	42,769	21.7%	$643	107,440	54.5%	$456	43,953	22.3%	$629	1,836	0.9%	$809

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	24	0.0%	$372	17	0.0%	$427	12	0.0%	$268	6	0.0%	$346	33,441	17.0%	$407
$15,000 ~ $19,999	5	0.0%	$421	6	0.0%	$293	4	0.0%	$566	3	0.0%	$360	7,249	3.7%	$560
$20,000 ~ $29,999	19	0.0%	$500	12	0.0%	$230	7	0.0%	$895	7	0.0%	$927	25,635	13.0%	$481
$30,000 ~ $39,999	13	0.0%	$393	20	0.0%	$475	13	0.0%	$427	6	0.0%	$664	18,754	9.5%	$531
$40,000 ~ $49,999	15	0.0%	$299	24	0.0%	$360	10	0.0%	$355	5	0.0%	$62	19,053	9.7%	$533
$50,000 ~ $74,999	35	0.0%	$619	32	0.0%	$464	15	0.0%	$433	13	0.0%	$784	36,598	18.6%	$621
$75,000 ~ $99,999	25	0.0%	$518	16	0.0%	$457	14	0.0%	$373	6	0.0%	$372	22,025	11.2%	$648
$100,000 ~ $124,999	9	0.0%	$625	16	0.0%	$358	6	0.0%	$496	5	0.0%	$796	13,943	7.1%	$610
>= $125,000	19	0.0%	$895	20	0.0%	$431	6	0.0%	$381	8	0.0%	$361	20,528	10.4%	$593
ALL	164	0.1%	$533	163	0.1%	$407	87	0.0%	$435	59	0.0%	$563	197,226	100.0%	$547

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Cool
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	56	0.0%	$4,912	4,058	2.0%	$544	10,181	5.0%	$412	2,894	1.4%	$746
$15,000 ~ $19,999	1	0.0%	$0	65	0.0%	$5,215	1,742	0.9%	$1,128	5,247	2.6%	$630	3,078	1.5%	$938
$20,000 ~ $29,999	1	0.0%	$3	98	0.0%	$4,383	4,073	2.0%	$814	12,026	5.9%	$536	5,402	2.7%	$876
$30,000 ~ $39,999	1	0.0%	$15	82	0.0%	$5,433	3,379	1.7%	$1,109	11,358	5.6%	$633	6,880	3.4%	$938
$40,000 ~ $49,999	2	0.0%	$1	83	0.0%	$4,963	2,838	1.4%	$1,024	9,627	4.7%	$591	5,628	2.8%	$912
$50,000 ~ $74,999	3	0.0%	$48	236	0.1%	$4,967	6,173	3.0%	$1,376	20,806	10.2%	$695	15,398	7.6%	$969
$75,000 ~ $99,999	3	0.0%	$6,780	110	0.1%	$5,698	2,840	1.4%	$1,593	8,036	4.0%	$774	6,976	3.4%	$1,002
$100,000 ~ $124,999	2	0.0%	$6,721	109	0.1%	$5,450	2,226	1.1%	$1,617	5,894	2.9%	$781	5,024	2.5%	$1,012
>= $125,000	4	0.0%	$7,340	383	0.2%	$6,036	4,712	2.3%	$1,795	10,812	5.3%	$798	8,749	4.3%	$1,031
ALL	17	0.0%	$3,724	1,222	0.6%	$5,406	32,041	15.8%	$1,224	93,987	46.2%	$646	60,029	29.5%	$956

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	433	0.2%	$987	27	0.0%	$795	24	0.0%	$351	11	0.0%	$529	13	0.0%	$523	17,697	8.7%	$526
$15,000 ~ $19,999	705	0.3%	$1,127	26	0.0%	$776	14	0.0%	$665	10	0.0%	$381	17	0.0%	$640	10,905	5.4%	$856
$20,000 ~ $29,999	1,071	0.5%	$1,087	43	0.0%	$797	31	0.0%	$716	22	0.0%	$444	18	0.0%	$970	22,785	11.2%	$709
$30,000 ~ $39,999	1,718	0.8%	$1,104	66	0.0%	$812	36	0.0%	$558	20	0.0%	$601	24	0.0%	$545	23,564	11.6%	$842
$40,000 ~ $49,999	1,189	0.6%	$1,109	37	0.0%	$1,011	20	0.0%	$251	13	0.0%	$402	22	0.0%	$901	19,459	9.6%	$798
$50,000 ~ $74,999	3,954	1.9%	$1,122	131	0.1%	$1,140	70	0.0%	$809	47	0.0%	$657	64	0.0%	$665	46,882	23.0%	$934
$75,000 ~ $99,999	2,016	1.0%	$1,138	54	0.0%	$939	39	0.0%	$787	24	0.0%	$853	20	0.0%	$549	20,118	9.9%	$1,033
$100,000 ~ $124,999	1,365	0.7%	$1,131	35	0.0%	$925	18	0.0%	$787	12	0.0%	$682	23	0.0%	$614	14,708	7.2%	$1,054
>= $125,000	2,391	1.2%	$1,140	100	0.0%	$1,297	56	0.0%	$753	29	0.0%	$774	41	0.0%	$591	27,277	13.4%	$1,151
ALL	14,842	7.3%	$1,119	519	0.3%	$1,019	308	0.2%	$677	188	0.1%	$631	242	0.1%	$661	203,395	100.0%	$893

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Cool
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	46	0.0%	$5,618	1,162	0.7%	$1,001	4,544	2.9%	$537	1,966	1.3%	$871
$15,000 ~ $19,999	1	0.0%	$0	57	0.0%	$5,520	1,072	0.7%	$1,451	3,711	2.4%	$699	2,611	1.7%	$990
$20,000 ~ $29,999	1	0.0%	$3	85	0.1%	$4,691	1,830	1.2%	$1,202	7,047	4.5%	$633	4,242	2.7%	$950
$30,000 ~ $39,999	1	0.0%	$15	68	0.0%	$6,126	1,971	1.3%	$1,482	7,988	5.1%	$709	5,866	3.8%	$992
$40,000 ~ $49,999	2	0.0%	$1	65	0.0%	$5,727	1,624	1.0%	$1,326	6,604	4.2%	$657	4,674	3.0%	$971
$50,000 ~ $74,999	2	0.0%	$1	200	0.1%	$5,492	4,507	2.9%	$1,608	16,646	10.6%	$744	13,734	8.8%	$1,008
$75,000 ~ $99,999	3	0.0%	$6,780	104	0.1%	$5,916	2,240	1.4%	$1,810	6,649	4.3%	$829	6,274	4.0%	$1,041
$100,000 ~ $124,999	2	0.0%	$6,721	102	0.1%	$5,714	1,754	1.1%	$1,855	4,807	3.1%	$849	4,561	2.9%	$1,048
>= $125,000	3	0.0%	$7,196	365	0.2%	$6,220	4,040	2.6%	$1,979	9,214	5.9%	$857	8,160	5.2%	$1,058
ALL	15	0.0%	$3,693	1,092	0.7%	$5,795	20,200	12.9%	$1,611	67,210	43.0%	$735	52,088	33.3%	$1,007

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	398	0.3%	$1,043	17	0.0%	$1,052	17	0.0%	$338	9	0.0%	$605	11	0.0%	$599	8,170	5.2%	$737
$15,000 ~ $19,999	696	0.4%	$1,133	23	0.0%	$823	11	0.0%	$748	9	0.0%	$410	14	0.0%	$700	8,205	5.2%	$960
$20,000 ~ $29,999	1,014	0.6%	$1,112	39	0.0%	$801	28	0.0%	$773	19	0.0%	$433	16	0.0%	$1,049	14,321	9.2%	$859
$30,000 ~ $39,999	1,695	1.1%	$1,109	58	0.0%	$871	25	0.0%	$614	18	0.0%	$632	22	0.0%	$577	17,712	11.3%	$948
$40,000 ~ $49,999	1,158	0.7%	$1,115	36	0.0%	$1,034	15	0.0%	$288	10	0.0%	$433	22	0.0%	$901	14,210	9.1%	$898
$50,000 ~ $74,999	3,911	2.5%	$1,126	121	0.1%	$1,169	62	0.0%	$846	46	0.0%	$663	61	0.0%	$693	39,290	25.1%	$999
$75,000 ~ $99,999	1,995	1.3%	$1,142	52	0.0%	$971	37	0.0%	$817	22	0.0%	$906	20	0.0%	$549	17,396	11.1%	$1,099
$100,000 ~ $124,999	1,353	0.9%	$1,134	33	0.0%	$939	16	0.0%	$862	11	0.0%	$683	22	0.0%	$642	12,661	8.1%	$1,130
>= $125,000	2,370	1.5%	$1,144	97	0.1%	$1,247	54	0.0%	$762	29	0.0%	$774	38	0.0%	$632	24,370	15.6%	$1,220
ALL	14,590	9.3%	$1,126	476	0.3%	$1,050	265	0.2%	$728	173	0.1%	$656	226	0.1%	$695	156,335	100.0%	$1,012

Average Yearly Bill is calculated from the Treatment 2 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #2)
Climate Zone:Cool
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	10	0.0%	$1,665	2,896	6.2%	$361	5,637	12.0%	$311	928	2.0%	$482	35	0.1%	$355
$15,000 ~ $19,999	.	.	.	8	0.0%	$3,043	670	1.4%	$612	1,536	3.3%	$464	467	1.0%	$644	9	0.0%	$621
$20,000 ~ $29,999	.	.	.	13	0.0%	$2,366	2,243	4.8%	$497	4,979	10.6%	$398	1,160	2.5%	$604	57	0.1%	$639
$30,000 ~ $39,999	.	.	.	14	0.0%	$2,069	1,408	3.0%	$587	3,370	7.2%	$453	1,014	2.2%	$629	23	0.0%	$726
$40,000 ~ $49,999	.	.	.	18	0.0%	$2,204	1,214	2.6%	$621	3,023	6.4%	$447	954	2.0%	$623	31	0.1%	$855
$50,000 ~ $74,999	1	0.0%	$142	36	0.1%	$2,047	1,666	3.5%	$749	4,160	8.8%	$501	1,664	3.5%	$644	43	0.1%	$770
$75,000 ~ $99,999	.	.	.	6	0.0%	$1,907	600	1.3%	$783	1,387	2.9%	$508	702	1.5%	$650	21	0.0%	$776
$100,000 ~ $124,999	.	.	.	7	0.0%	$1,596	472	1.0%	$733	1,087	2.3%	$481	463	1.0%	$659	12	0.0%	$763
>= $125,000	1	0.0%	$7,774	18	0.0%	$2,309	672	1.4%	$690	1,598	3.4%	$456	589	1.3%	$654	21	0.0%	$719
ALL	2	0.0%	$3,958	130	0.3%	$2,141	11,841	25.2%	$564	26,777	56.9%	$424	7,941	16.9%	$617	252	0.5%	$680

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	10	0.0%	$358	7	0.0%	$380	2	0.0%	$186	2	0.0%	$105	9,527	20.2%	$344
$15,000 ~ $19,999	3	0.0%	$415	3	0.0%	$363	1	0.0%	$121	3	0.0%	$360	2,700	5.7%	$540
$20,000 ~ $29,999	4	0.0%	$753	3	0.0%	$185	3	0.0%	$511	2	0.0%	$341	8,464	18.0%	$457
$30,000 ~ $39,999	8	0.0%	$385	11	0.0%	$430	2	0.0%	$315	2	0.0%	$191	5,852	12.4%	$521
$40,000 ~ $49,999	1	0.0%	$162	5	0.0%	$140	3	0.0%	$299	.	.	.	5,249	11.2%	$527
$50,000 ~ $74,999	10	0.0%	$787	8	0.0%	$524	1	0.0%	$425	3	0.0%	$106	7,592	16.1%	$596
$75,000 ~ $99,999	2	0.0%	$101	2	0.0%	$222	2	0.0%	$270	.	.	.	2,722	5.8%	$610
$100,000 ~ $124,999	2	0.0%	$693	2	0.0%	$181	1	0.0%	$680	1	0.0%	$15	2,047	4.3%	$584
>= $125,000	3	0.0%	$2,917	2	0.0%	$495	.	.	.	3	0.0%	$74	2,907	6.2%	$568
ALL	43	0.1%	$681	43	0.1%	$366	15	0.0%	$346	16	0.0%	$182	47,060	100.0%	$498

Average Yearly Bill is calculated from the Treatment 2 dataset

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3, ATTACHMENT C

BILL COMPARISON RESULTS CONTROL GROUP VS. PILOT RATE 3

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone: ALL
Senior Category: All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	34	0.0%	$1,077	604	0.0%	$7,670	10,337	0.4%	$1,738	44,987	1.8%	$708	38,524	1.5%	$1,079	21,250	0.8%	$1,348
$15,000 ~ $19,999	26	0.0%	$715	431	0.0%	$7,969	7,310	0.3%	$2,514	28,042	1.1%	$996	33,117	1.3%	$1,333	22,786	0.9%	$1,507
$20,000 ~ $29,999	44	0.0%	$1,194	664	0.0%	$7,590	10,947	0.4%	$1,757	51,822	2.0%	$772	51,176	2.0%	$1,150	31,692	1.2%	$1,400
$30,000 ~ $39,999	63	0.0%	$593	758	0.0%	$7,728	11,790	0.5%	$2,119	53,999	2.1%	$883	62,184	2.4%	$1,247	42,311	1.7%	$1,461
$40,000 ~ $49,999	39	0.0%	$1,473	735	0.0%	$8,228	10,454	0.4%	$1,930	46,113	1.8%	$830	49,685	2.0%	$1,203	31,797	1.3%	$1,431
$50,000 ~ $74,999	106	0.0%	$614	1,766	0.1%	$8,105	28,953	1.1%	$2,432	137,080	5.4%	$985	174,839	6.9%	$1,334	128,388	5.1%	$1,506
$75,000 ~ $99,999	65	0.0%	$1,575	1,464	0.1%	$8,403	28,046	1.1%	$2,800	104,293	4.1%	$1,225	152,103	6.0%	$1,446	115,702	4.6%	$1,536
$100,000 ~ $124,999	39	0.0%	$1,184	1,088	0.0%	$8,429	20,629	0.8%	$2,739	79,526	3.1%	$1,127	106,723	4.2%	$1,402	79,214	3.1%	$1,533
>= $125,000	85	0.0%	$1,775	4,812	0.2%	$8,569	73,020	2.9%	$3,289	173,579	6.8%	$1,299	228,907	9.0%	$1,418	161,979	6.4%	$1,492
ALL	501	0.0%	$1,132	12,322	0.5%	$8,281	201,486	7.9%	$2,712	719,441	28.3%	$1,061	897,258	35.3%	$1,348	635,119	25.0%	$1,494

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,862	0.1%	$1,392	461	0.0%	$1,059	217	0.0%	$1,091	184	0.0%	$1,270	119,460	4.7%	$1,086
$15,000 ~ $19,999	2,604	0.1%	$1,557	392	0.0%	$1,584	197	0.0%	$1,161	197	0.0%	$1,697	95,102	3.7%	$1,404
$20,000 ~ $29,999	4,009	0.2%	$1,409	593	0.0%	$1,085	267	0.0%	$1,016	257	0.0%	$1,379	151,471	6.0%	$1,152
$30,000 ~ $39,999	4,633	0.2%	$1,474	653	0.0%	$1,258	296	0.0%	$1,330	326	0.0%	$1,351	177,013	7.0%	$1,279
$40,000 ~ $49,999	3,910	0.2%	$1,442	580	0.0%	$1,239	272	0.0%	$987	223	0.0%	$1,345	143,808	5.7%	$1,229
$50,000 ~ $74,999	12,010	0.5%	$1,594	1,732	0.1%	$1,464	902	0.0%	$1,231	892	0.0%	$1,581	486,668	19.2%	$1,378
$75,000 ~ $99,999	8,366	0.3%	$1,783	1,413	0.1%	$1,723	867	0.0%	$1,350	810	0.0%	$1,703	413,129	16.3%	$1,540
$100,000 ~ $124,999	5,911	0.2%	$1,702	968	0.0%	$1,565	628	0.0%	$1,408	646	0.0%	$1,763	295,372	11.6%	$1,490
>= $125,000	10,052	0.4%	$1,844	1,965	0.1%	$1,719	1,182	0.0%	$1,318	1,323	0.1%	$1,641	656,904	25.9%	$1,673
ALL	54,357	2.1%	$1,634	8,757	0.3%	$1,502	4,828	0.2%	$1,268	4,858	0.2%	$1,598	2,538,927	100.0%	$1,452

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone: ALL
Senior Category: All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	11	0.0%	$838	318	0.0%	$1,635	11,388	1.2%	$851	60,747	6.2%	$541	52,496	5.4%	$770	16,254	1.7%	$778
$15,000 ~ $19,999	3	0.0%	$499	92	0.0%	$2,370	3,604	0.4%	$1,301	16,125	1.7%	$782	17,550	1.8%	$962	5,292	0.5%	$944
$20,000 ~ $29,999	4	0.0%	$83	285	0.0%	$1,672	10,334	1.1%	$1,071	49,879	5.1%	$654	49,315	5.1%	$857	15,116	1.5%	$852
$30,000 ~ $39,999	8	0.0%	$1,039	260	0.0%	$1,983	8,566	0.9%	$1,215	39,281	4.0%	$749	43,367	4.4%	$920	13,022	1.3%	$903
$40,000 ~ $49,999	10	0.0%	$3,572	252	0.0%	$1,980	8,171	0.8%	$1,187	35,912	3.7%	$745	40,287	4.1%	$911	11,854	1.2%	$909
$50,000 ~ $74,999	10	0.0%	$1,069	428	0.0%	$2,895	15,896	1.6%	$1,453	67,318	6.9%	$852	80,214	8.2%	$981	20,815	2.1%	$1,018
$75,000 ~ $99,999	10	0.0%	$4,109	288	0.0%	$2,609	10,204	1.0%	$1,574	38,019	3.9%	$900	46,142	4.7%	$988	10,676	1.1%	$1,068
$100,000 ~ $124,999	2	0.0%	$2,519	183	0.0%	$2,520	6,322	0.6%	$1,494	25,717	2.6%	$825	28,268	2.9%	$963	6,157	0.6%	$1,056
>= $125,000	9	0.0%	$2,798	264	0.0%	$3,060	9,466	1.0%	$1,460	37,229	3.8%	$757	38,549	3.9%	$923	7,615	0.8%	$1,020
ALL	67	0.0%	$2,046	2,370	0.2%	$2,316	83,951	8.6%	$1,286	370,227	37.9%	$743	396,188	40.6%	$917	106,801	10.9%	$935

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,104	0.2%	$710	251	0.0%	$669	98	0.0%	$654	149	0.0%	$939	143,816	14.7%	$681
$15,000 ~ $19,999	651	0.1%	$857	87	0.0%	$945	48	0.0%	$972	47	0.0%	$1,141	43,499	4.5%	$923
$20,000 ~ $29,999	2,008	0.2%	$793	234	0.0%	$718	119	0.0%	$713	135	0.0%	$974	127,429	13.1%	$795
$30,000 ~ $39,999	1,599	0.2%	$833	207	0.0%	$834	112	0.0%	$864	121	0.0%	$1,121	106,543	10.9%	$880
$40,000 ~ $49,999	1,529	0.2%	$828	207	0.0%	$726	108	0.0%	$805	100	0.0%	$1,069	98,430	10.1%	$874
$50,000 ~ $74,999	2,425	0.2%	$939	346	0.0%	$992	172	0.0%	$938	183	0.0%	$1,215	187,807	19.2%	$983
$75,000 ~ $99,999	1,147	0.1%	$1,098	172	0.0%	$969	99	0.0%	$1,042	115	0.0%	$1,210	106,872	10.9%	$1,027
$100,000 ~ $124,999	620	0.1%	$1,023	118	0.0%	$861	57	0.0%	$866	66	0.0%	$1,446	67,510	6.9%	$974
>= $125,000	842	0.1%	$1,036	150	0.0%	$1,047	96	0.0%	$922	78	0.0%	$1,217	94,298	9.7%	$927
ALL	12,925	1.3%	$873	1,772	0.2%	$852	909	0.1%	$860	994	0.1%	$1,126	976,204	100.0%	$888

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Hot
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	13	0.0%	$872	229	0.0%	$4,775	3,818	0.5%	$2,316	8,943	1.2%	$1,417	14,184	1.9%	$1,403	10,159	1.3%	$1,487
$15,000 ~ $19,999	12	0.0%	$93	137	0.0%	$6,501	2,718	0.4%	$3,078	7,093	0.9%	$1,735	13,228	1.8%	$1,724	10,531	1.4%	$1,731
$20,000 ~ $29,999	26	0.0%	$808	251	0.0%	$5,437	4,216	0.6%	$2,265	11,411	1.5%	$1,455	19,412	2.6%	$1,511	15,126	2.0%	$1,587
$30,000 ~ $39,999	28	0.0%	$59	278	0.0%	$5,684	4,869	0.6%	$2,545	13,352	1.8%	$1,514	24,469	3.2%	$1,595	20,026	2.7%	$1,655
$40,000 ~ $49,999	19	0.0%	$1,046	273	0.0%	$5,590	4,210	0.6%	$2,384	11,068	1.5%	$1,479	19,860	2.6%	$1,558	15,719	2.1%	$1,613
$50,000 ~ $74,999	44	0.0%	$394	526	0.1%	$6,089	10,510	1.4%	$2,884	31,156	4.1%	$1,765	63,087	8.4%	$1,776	53,790	7.1%	$1,779
$75,000 ~ $99,999	24	0.0%	$1,934	376	0.0%	$6,475	9,464	1.3%	$3,485	24,047	3.2%	$2,238	47,861	6.3%	$2,027	38,805	5.1%	$1,912
$100,000 ~ $124,999	11	0.0%	$348	221	0.0%	$7,155	5,768	0.8%	$3,576	14,951	2.0%	$2,227	30,895	4.1%	$2,008	26,137	3.5%	$1,902
>= $125,000	24	0.0%	$1,547	583	0.1%	$8,443	14,703	1.9%	$4,144	25,783	3.4%	$2,385	43,484	5.8%	$2,058	30,598	4.1%	$1,922
ALL	201	0.0%	$794	2,874	0.4%	$6,471	60,276	8.0%	$3,219	147,804	19.6%	$1,906	276,480	36.6%	$1,818	220,891	29.3%	$1,785

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,174	0.3%	$1,439	302	0.0%	$1,254	111	0.0%	$1,461	108	0.0%	$1,606	40,041	5.3%	$1,535
$15,000 ~ $19,999	1,963	0.3%	$1,627	284	0.0%	$1,737	101	0.0%	$1,465	98	0.0%	$2,065	36,165	4.8%	$1,842
$20,000 ~ $29,999	3,101	0.4%	$1,488	379	0.1%	$1,254	145	0.0%	$1,289	148	0.0%	$1,666	54,215	7.2%	$1,593
$30,000 ~ $39,999	3,596	0.5%	$1,535	440	0.1%	$1,458	163	0.0%	$1,648	203	0.0%	$1,631	67,424	8.9%	$1,678
$40,000 ~ $49,999	3,149	0.4%	$1,494	407	0.1%	$1,405	134	0.0%	$1,327	127	0.0%	$1,697	54,966	7.3%	$1,636
$50,000 ~ $74,999	9,045	1.2%	$1,678	1,087	0.1%	$1,719	414	0.1%	$1,640	482	0.1%	$1,951	170,141	22.6%	$1,851
$75,000 ~ $99,999	5,461	0.7%	$1,986	754	0.1%	$2,082	374	0.0%	$1,774	388	0.1%	$2,298	127,554	16.9%	$2,152
$100,000 ~ $124,999	3,578	0.5%	$1,903	497	0.1%	$1,883	259	0.0%	$1,840	315	0.0%	$2,269	82,632	11.0%	$2,132
>= $125,000	4,669	0.6%	$2,172	730	0.1%	$2,285	299	0.0%	$1,744	391	0.1%	$2,211	121,264	16.1%	$2,382
ALL	36,736	4.9%	$1,746	4,880	0.6%	$1,763	2,000	0.3%	$1,642	2,260	0.3%	$2,027	754,402	100.0%	$1,951

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Hot
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$768	246	0.0%	$1,389	5,865	1.1%	$1,125	22,257	4.3%	$848	33,221	6.4%	$858
$15,000 ~ $19,999	1	0.0%	$210	56	0.0%	$1,771	2,008	0.4%	$1,569	7,388	1.4%	$1,122	11,102	2.1%	$1,101
$20,000 ~ $29,999	.	.	.	201	0.0%	$1,371	5,864	1.1%	$1,326	20,652	4.0%	$978	30,953	6.0%	$971
$30,000 ~ $39,999	6	0.0%	$876	189	0.0%	$1,817	4,971	1.0%	$1,462	18,270	3.5%	$1,063	27,980	5.4%	$1,040
$40,000 ~ $49,999	7	0.0%	$1,854	180	0.0%	$1,685	4,776	0.9%	$1,418	16,451	3.2%	$1,061	25,292	4.9%	$1,039
$50,000 ~ $74,999	6	0.0%	$1,600	224	0.0%	$2,451	8,367	1.6%	$1,744	28,687	5.5%	$1,242	45,060	8.7%	$1,163
$75,000 ~ $99,999	3	0.0%	$569	157	0.0%	$1,910	4,951	1.0%	$1,916	14,922	2.9%	$1,344	22,504	4.3%	$1,216
$100,000 ~ $124,999	.	.	.	86	0.0%	$2,181	2,774	0.5%	$1,892	8,565	1.7%	$1,330	12,470	2.4%	$1,216
>= $125,000	3	0.0%	$695	89	0.0%	$2,779	3,525	0.7%	$1,902	10,200	2.0%	$1,270	14,722	2.8%	$1,169
ALL	31	0.0%	$1,151	1,428	0.3%	$1,854	43,101	8.3%	$1,568	147,392	28.4%	$1,114	223,304	43.1%	$1,067

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	14,336	2.8%	$788	1,944	0.4%	$725	196	0.0%	$734	59	0.0%	$827	115	0.0%	$1,080	78,244	15.1%	$860
$15,000 ~ $19,999	4,631	0.9%	$955	603	0.1%	$862	73	0.0%	$984	34	0.0%	$1,046	37	0.0%	$1,241	25,933	5.0%	$1,113
$20,000 ~ $29,999	13,159	2.5%	$866	1,875	0.4%	$803	182	0.0%	$770	73	0.0%	$878	114	0.0%	$1,056	73,073	14.1%	$979
$30,000 ~ $39,999	11,487	2.2%	$916	1,488	0.3%	$841	166	0.0%	$905	64	0.0%	$1,204	100	0.0%	$1,194	64,721	12.5%	$1,055
$40,000 ~ $49,999	10,387	2.0%	$927	1,424	0.3%	$836	154	0.0%	$819	68	0.0%	$989	82	0.0%	$1,172	58,821	11.3%	$1,053
$50,000 ~ $74,999	17,219	3.3%	$1,042	2,218	0.4%	$956	254	0.0%	$1,147	96	0.0%	$1,182	138	0.0%	$1,351	102,269	19.7%	$1,211
$75,000 ~ $99,999	8,177	1.6%	$1,102	1,015	0.2%	$1,125	107	0.0%	$1,158	48	0.0%	$1,417	85	0.0%	$1,370	51,969	10.0%	$1,302
$100,000 ~ $124,999	4,464	0.9%	$1,095	527	0.1%	$1,047	66	0.0%	$1,055	31	0.0%	$1,023	42	0.0%	$1,811	29,025	5.6%	$1,296
>= $125,000	5,035	1.0%	$1,055	668	0.1%	$1,054	85	0.0%	$1,234	46	0.0%	$1,251	57	0.0%	$1,353	34,430	6.6%	$1,260
ALL	88,895	17.1%	$950	11,762	2.3%	$884	1,283	0.2%	$952	519	0.1%	$1,086	770	0.1%	$1,249	518,485	100.0%	$1,100

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Hot
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$1,772	58	0.0%	$4,487	1,729	0.6%	$1,355	7,026	2.4%	$822	9,179	3.1%	$949	4,592	1.6%	$1,118
$15,000 ~ $19,999	7	0.0%	$32	46	0.0%	$3,573	1,490	0.5%	$2,190	5,696	1.9%	$1,205	9,533	3.2%	$1,369	6,325	2.1%	$1,513
$20,000 ~ $29,999	14	0.0%	$1,206	89	0.0%	$2,385	2,824	1.0%	$1,656	11,101	3.7%	$1,024	16,691	5.6%	$1,194	9,879	3.3%	$1,360
$30,000 ~ $39,999	9	0.0%	$200	94	0.0%	$3,867	2,503	0.8%	$2,077	9,826	3.3%	$1,174	16,621	5.6%	$1,371	10,972	3.7%	$1,526
$40,000 ~ $49,999	6	0.0%	$1,317	73	0.0%	$2,694	1,892	0.6%	$1,971	7,475	2.5%	$1,180	12,955	4.4%	$1,361	8,201	2.8%	$1,510
$50,000 ~ $74,999	11	0.0%	$530	149	0.1%	$4,063	3,752	1.3%	$2,389	13,606	4.6%	$1,474	26,686	9.0%	$1,606	19,835	6.7%	$1,717
$75,000 ~ $99,999	3	0.0%	$4	58	0.0%	$3,564	1,514	0.5%	$2,917	4,624	1.6%	$1,753	9,250	3.1%	$1,771	6,503	2.2%	$1,812
$100,000 ~ $124,999	3	0.0%	$6	41	0.0%	$5,067	1,208	0.4%	$3,237	3,442	1.2%	$1,738	6,399	2.2%	$1,730	4,828	1.6%	$1,786
>= $125,000	6	0.0%	$392	76	0.0%	$8,318	2,300	0.8%	$3,597	5,163	1.7%	$1,822	9,209	3.1%	$1,770	6,342	2.1%	$1,826
ALL	64	0.0%	$686	684	0.2%	$4,165	19,212	6.5%	$2,331	67,959	23.0%	$1,294	116,523	39.4%	$1,448	77,477	26.2%	$1,592

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	771	0.3%	$1,104	98	0.0%	$891	35	0.0%	$819	28	0.0%	$1,557	23,521	7.9%	$988
$15,000 ~ $19,999	1,004	0.3%	$1,371	148	0.0%	$1,605	43	0.0%	$1,271	42	0.0%	$1,651	24,334	8.2%	$1,424
$20,000 ~ $29,999	1,741	0.6%	$1,271	201	0.1%	$1,105	72	0.0%	$1,305	65	0.0%	$1,229	42,677	14.4%	$1,224
$30,000 ~ $39,999	1,580	0.5%	$1,457	178	0.1%	$1,146	78	0.0%	$1,361	80	0.0%	$1,582	41,941	14.2%	$1,415
$40,000 ~ $49,999	1,261	0.4%	$1,389	155	0.1%	$1,322	56	0.0%	$1,108	51	0.0%	$1,520	32,125	10.9%	$1,396
$50,000 ~ $74,999	2,855	1.0%	$1,670	340	0.1%	$1,664	145	0.0%	$1,516	152	0.1%	$1,880	67,531	22.8%	$1,664
$75,000 ~ $99,999	803	0.3%	$1,845	128	0.0%	$1,898	60	0.0%	$1,500	56	0.0%	$1,700	22,999	7.8%	$1,861
$100,000 ~ $124,999	616	0.2%	$1,810	79	0.0%	$1,653	55	0.0%	$1,502	47	0.0%	$2,517	16,718	5.6%	$1,869
>= $125,000	819	0.3%	$2,034	129	0.0%	$2,035	60	0.0%	$1,497	78	0.0%	$2,164	24,182	8.2%	$2,001
ALL	11,450	3.9%	$1,530	1,456	0.5%	$1,482	604	0.2%	$1,370	599	0.2%	$1,778	296,028	100.0%	$1,517

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Hot
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	5	0.0%	$1,772	37	0.0%	$5,912	633	0.3%	$2,140	2,038	1.0%	$1,237	3,035	1.6%	$1,377
$15,000 ~ $19,999	6	0.0%	$3	29	0.0%	$4,617	894	0.5%	$2,754	2,921	1.5%	$1,473	5,607	2.9%	$1,612
$20,000 ~ $29,999	14	0.0%	$1,206	57	0.0%	$3,018	1,308	0.7%	$2,262	4,499	2.3%	$1,314	7,898	4.1%	$1,514
$30,000 ~ $39,999	8	0.0%	$56	68	0.0%	$4,521	1,421	0.7%	$2,634	5,213	2.7%	$1,380	9,926	5.1%	$1,615
$40,000 ~ $49,999	5	0.0%	$305	52	0.0%	$3,100	1,069	0.5%	$2,456	3,836	2.0%	$1,399	7,558	3.9%	$1,601
$50,000 ~ $74,999	11	0.0%	$530	120	0.1%	$4,633	2,551	1.3%	$2,735	8,953	4.6%	$1,661	19,304	9.9%	$1,783
$75,000 ~ $99,999	3	0.0%	$4	49	0.0%	$4,035	1,137	0.6%	$3,288	3,332	1.7%	$1,987	7,229	3.7%	$1,941
$100,000 ~ $124,999	3	0.0%	$6	32	0.0%	$5,608	955	0.5%	$3,636	2,519	1.3%	$1,954	5,045	2.6%	$1,888
>= $125,000	5	0.0%	$410	71	0.0%	$8,772	1,971	1.0%	$3,919	3,925	2.0%	$2,050	7,411	3.8%	$1,929
ALL	60	0.0%	$594	515	0.3%	$4,950	11,939	6.1%	$2,936	37,236	19.2%	$1,605	73,013	37.6%	$1,720

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,226	1.1%	$1,569	417	0.2%	$1,474	71	0.0%	$1,026	24	0.0%	$794	16	0.0%	$1,585	8,502	4.4%	$1,471
$15,000 ~ $19,999	4,641	2.4%	$1,735	795	0.4%	$1,537	122	0.1%	$1,747	33	0.0%	$1,213	34	0.0%	$1,878	15,082	7.8%	$1,693
$20,000 ~ $29,999	6,293	3.2%	$1,660	1,210	0.6%	$1,497	148	0.1%	$1,282	53	0.0%	$1,561	46	0.0%	$1,379	21,526	11.1%	$1,561
$30,000 ~ $39,999	8,272	4.3%	$1,730	1,236	0.6%	$1,631	135	0.1%	$1,225	57	0.0%	$1,439	70	0.0%	$1,606	26,406	13.6%	$1,665
$40,000 ~ $49,999	6,039	3.1%	$1,720	976	0.5%	$1,553	125	0.1%	$1,449	44	0.0%	$1,142	40	0.0%	$1,633	19,744	10.2%	$1,644
$50,000 ~ $74,999	17,042	8.8%	$1,832	2,499	1.3%	$1,772	293	0.2%	$1,727	133	0.1%	$1,569	134	0.1%	$1,931	51,040	26.3%	$1,831
$75,000 ~ $99,999	5,778	3.0%	$1,911	713	0.4%	$1,934	118	0.1%	$1,943	53	0.0%	$1,589	50	0.0%	$1,795	18,462	9.5%	$2,026
$100,000 ~ $124,999	4,332	2.2%	$1,873	556	0.3%	$1,910	71	0.0%	$1,773	53	0.0%	$1,520	43	0.0%	$2,425	13,609	7.0%	$2,027
>= $125,000	5,690	2.9%	$1,915	730	0.4%	$2,143	122	0.1%	$2,056	50	0.0%	$1,532	70	0.0%	$2,221	20,045	10.3%	$2,177
ALL	60,313	31.0%	$1,790	9,132	4.7%	$1,710	1,205	0.6%	$1,605	500	0.3%	$1,448	503	0.3%	$1,866	194,416	100.0%	$1,801

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Hot
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	.	.	.	21	0.0%	$1,976	1,096	1.1%	$902	4,988	4.9%	$653	6,144	6.0%	$738
$15,000 ~ $19,999	1	0.0%	$210	17	0.0%	$1,791	596	0.6%	$1,344	2,775	2.7%	$922	3,926	3.9%	$1,022
$20,000 ~ $29,999	.	.	.	32	0.0%	$1,258	1,516	1.5%	$1,134	6,602	6.5%	$827	8,793	8.7%	$907
$30,000 ~ $39,999	1	0.0%	$1,353	26	0.0%	$2,156	1,082	1.1%	$1,345	4,613	4.5%	$941	6,695	6.6%	$1,009
$40,000 ~ $49,999	1	0.0%	$6,379	21	0.0%	$1,688	823	0.8%	$1,341	3,639	3.6%	$950	5,397	5.3%	$1,024
$50,000 ~ $74,999	.	.	.	29	0.0%	$1,703	1,201	1.2%	$1,653	4,653	4.6%	$1,113	7,382	7.3%	$1,145
$75,000 ~ $99,999	.	.	.	9	0.0%	$1,000	377	0.4%	$1,801	1,292	1.3%	$1,150	2,021	2.0%	$1,163
$100,000 ~ $124,999	.	.	.	9	0.0%	$3,144	253	0.2%	$1,731	923	0.9%	$1,148	1,354	1.3%	$1,141
>= $125,000	1	0.0%	$301	5	0.0%	$1,878	329	0.3%	$1,667	1,238	1.2%	$1,099	1,798	1.8%	$1,114
ALL	4	0.0%	$2,061	169	0.2%	$1,774	7,273	7.2%	$1,336	30,723	30.2%	$917	43,510	42.8%	$992

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2,366	2.3%	$694	354	0.3%	$668	27	0.0%	$535	11	0.0%	$873	12	0.0%	$1,518	15,019	14.8%	$715
$15,000 ~ $19,999	1,684	1.7%	$900	209	0.2%	$738	26	0.0%	$940	10	0.0%	$1,461	8	0.0%	$688	9,252	9.1%	$986
$20,000 ~ $29,999	3,586	3.5%	$833	531	0.5%	$756	53	0.1%	$613	19	0.0%	$593	19	0.0%	$866	21,151	20.8%	$881
$30,000 ~ $39,999	2,700	2.7%	$899	344	0.3%	$829	43	0.0%	$899	21	0.0%	$1,150	10	0.0%	$1,412	15,535	15.3%	$991
$40,000 ~ $49,999	2,162	2.1%	$924	285	0.3%	$827	30	0.0%	$794	12	0.0%	$982	11	0.0%	$1,109	12,381	12.2%	$1,002
$50,000 ~ $74,999	2,793	2.7%	$1,016	356	0.4%	$953	47	0.0%	$1,276	12	0.0%	$929	18	0.0%	$1,497	16,491	16.2%	$1,148
$75,000 ~ $99,999	725	0.7%	$1,025	90	0.1%	$1,146	10	0.0%	$1,366	7	0.0%	$825	6	0.0%	$911	4,537	4.5%	$1,189
$100,000 ~ $124,999	496	0.5%	$1,029	60	0.1%	$887	8	0.0%	$590	2	0.0%	$1,010	4	0.0%	$3,500	3,109	3.1%	$1,176
>= $125,000	652	0.6%	$1,052	89	0.1%	$1,145	7	0.0%	$1,668	10	0.0%	$1,318	8	0.0%	$1,661	4,137	4.1%	$1,148
ALL	17,164	16.9%	$894	2,318	2.3%	$824	251	0.2%	$892	104	0.1%	$996	96	0.1%	$1,314	101,612	100.0%	$975

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Cool
Senior Category:All ages
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)														
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	11	0.0%	$1,773	194	0.0%	$9,731	3,270	0.5%	$1,076	19,270	2.9%	$419	10,497	1.6%	$751
$15,000 ~ $19,999	4	0.0%	$4,164	135	0.0%	$8,601	1,843	0.3%	$1,737	8,813	1.3%	$569	7,094	1.1%	$873
$20,000 ~ $29,999	10	0.0%	$2,345	263	0.0%	$8,442	3,373	0.5%	$1,346	19,791	3.0%	$486	13,232	2.0%	$802
$30,000 ~ $39,999	26	0.0%	$967	234	0.0%	$9,023	3,071	0.5%	$1,610	16,727	2.5%	$564	14,098	2.1%	$862
$40,000 ~ $49,999	14	0.0%	$788	257	0.0%	$9,443	3,073	0.5%	$1,405	16,225	2.4%	$517	12,437	1.9%	$824
$50,000 ~ $74,999	33	0.0%	$749	662	0.1%	$8,948	8,918	1.3%	$1,939	43,822	6.6%	$626	42,189	6.4%	$902
$75,000 ~ $99,999	23	0.0%	$356	559	0.1%	$8,295	8,653	1.3%	$2,112	32,090	4.8%	$751	36,601	5.5%	$960
$100,000 ~ $124,999	12	0.0%	$1,370	362	0.1%	$8,435	5,680	0.9%	$1,960	24,039	3.6%	$666	23,348	3.5%	$924
>= $125,000	31	0.0%	$2,273	1,615	0.2%	$7,178	19,306	2.9%	$2,304	52,008	7.8%	$793	54,002	8.1%	$984
ALL	164	0.0%	$1,314	4,281	0.6%	$8,179	57,187	8.6%	$1,953	232,785	35.1%	$641	213,498	32.2%	$913

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)															TOTAL		
	5% ~ 10%			10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	4,514	0.7%	$1,058	224	0.0%	$1,002	72	0.0%	$511	47	0.0%	$521	34	0.0%	$726	38,133	5.7%	$694
$15,000 ~ $19,999	4,500	0.7%	$1,109	168	0.0%	$1,149	21	0.0%	$956	40	0.0%	$477	32	0.0%	$746	22,650	3.4%	$920
$20,000 ~ $29,999	7,004	1.1%	$1,073	285	0.0%	$933	99	0.0%	$668	64	0.0%	$513	40	0.0%	$779	44,161	6.7%	$791
$30,000 ~ $39,999	8,836	1.3%	$1,100	272	0.0%	$1,229	73	0.0%	$641	60	0.0%	$612	54	0.0%	$798	43,451	6.5%	$894
$40,000 ~ $49,999	7,008	1.1%	$1,089	233	0.0%	$1,044	75	0.0%	$855	63	0.0%	$455	49	0.0%	$676	39,434	5.9%	$847
$50,000 ~ $74,999	30,297	4.6%	$1,113	767	0.1%	$1,133	250	0.0%	$827	205	0.0%	$672	154	0.0%	$958	127,297	19.2%	$973
$75,000 ~ $99,999	29,085	4.4%	$1,119	788	0.1%	$1,115	235	0.0%	$908	181	0.0%	$769	138	0.0%	$868	108,353	16.3%	$1,071
$100,000 ~ $124,999	17,232	2.6%	$1,111	469	0.1%	$1,109	129	0.0%	$783	112	0.0%	$678	98	0.0%	$858	71,481	10.8%	$1,003
>= $125,000	39,645	6.0%	$1,117	1,032	0.2%	$1,162	345	0.1%	$865	249	0.0%	$781	236	0.0%	$919	168,469	25.4%	$1,168
ALL	148,121	22.3%	$1,109	4,238	0.6%	$1,116	1,299	0.2%	$811	1,021	0.2%	$675	835	0.1%	$867	663,429	100.0%	$999

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Cool
Senior Category:All ages
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	4	0.0%	$211	42	0.0%	$2,781	2,968	1.5%	$524	19,821	10.1%	$315	9,728	4.9%	$563	719	0.4%	$654
$15,000 ~ $19,999	.	.	.	17	0.0%	$2,990	716	0.4%	$898	3,428	1.7%	$431	2,863	1.5%	$629	195	0.1%	$824
$20,000 ~ $29,999	2	0.0%	$21	42	0.0%	$2,189	2,241	1.1%	$723	13,629	6.9%	$372	8,927	4.5%	$591	694	0.4%	$710
$30,000 ~ $39,999	1	0.0%	$3,049	42	0.0%	$2,352	1,714	0.9%	$821	9,069	4.6%	$416	7,334	3.7%	$612	496	0.3%	$718
$40,000 ~ $49,999	1	0.0%	$5	44	0.0%	$2,529	1,703	0.9%	$820	8,920	4.5%	$419	7,703	3.9%	$606	581	0.3%	$726
$50,000 ~ $74,999	2	0.0%	$203	123	0.1%	$3,231	3,654	1.9%	$1,066	15,094	7.7%	$491	16,162	8.2%	$634	1,389	0.7%	$801
$75,000 ~ $99,999	4	0.0%	$3,303	63	0.0%	$3,589	2,403	1.2%	$1,121	8,534	4.3%	$515	10,035	5.1%	$640	871	0.4%	$836
$100,000 ~ $124,999	1	0.0%	$5	44	0.0%	$2,224	1,475	0.7%	$1,059	5,900	3.0%	$472	5,934	3.0%	$633	520	0.3%	$820
>= $125,000	3	0.0%	$4,073	85	0.0%	$3,077	2,245	1.1%	$1,014	9,039	4.6%	$443	8,350	4.2%	$624	703	0.4%	$826
ALL	18	0.0%	$1,654	502	0.3%	$2,894	19,119	9.7%	$892	93,434	47.4%	$416	77,036	39.1%	$614	6,168	3.1%	$770

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	79	0.0%	$443	31	0.0%	$425	27	0.0%	$400	21	0.0%	$339	33,440	17.0%	$416
$15,000 ~ $19,999	12	0.0%	$478	5	0.0%	$247	7	0.0%	$545	5	0.0%	$192	7,248	3.7%	$572
$20,000 ~ $29,999	49	0.0%	$621	22	0.0%	$509	21	0.0%	$346	8	0.0%	$411	25,635	13.0%	$492
$30,000 ~ $39,999	40	0.0%	$629	18	0.0%	$338	28	0.0%	$405	12	0.0%	$682	18,754	9.5%	$543
$40,000 ~ $49,999	41	0.0%	$699	34	0.0%	$408	19	0.0%	$358	6	0.0%	$429	19,052	9.7%	$545
$50,000 ~ $74,999	71	0.0%	$566	43	0.0%	$440	40	0.0%	$440	20	0.0%	$760	36,598	18.6%	$633
$75,000 ~ $99,999	52	0.0%	$777	25	0.0%	$477	24	0.0%	$407	14	0.0%	$516	22,025	11.2%	$660
$100,000 ~ $124,999	23	0.0%	$616	26	0.0%	$422	12	0.0%	$596	7	0.0%	$582	13,942	7.1%	$621
>= $125,000	53	0.0%	$842	25	0.0%	$376	19	0.0%	$409	6	0.0%	$380	20,528	10.4%	$605
ALL	420	0.2%	$629	229	0.1%	$423	197	0.1%	$418	99	0.1%	$514	197,222	100.0%	$558

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Cool
Senior Category:Senior [65+]
All Customers

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	2	0.0%	$4	41	0.0%	$5,169	1,501	0.7%	$841	10,413	5.1%	$350	4,305	2.1%	$690	1,298	0.6%	$1,032
$15,000 ~ $19,999	1	0.0%	$1	38	0.0%	$6,588	887	0.4%	$1,665	4,263	2.1%	$579	3,637	1.8%	$840	1,983	1.0%	$1,114
$20,000 ~ $29,999	7	0.0%	$55	70	0.0%	$4,257	1,751	0.9%	$1,243	10,657	5.2%	$479	7,023	3.5%	$774	3,094	1.5%	$1,080
$30,000 ~ $39,999	10	0.0%	$1,048	60	0.0%	$6,015	1,657	0.8%	$1,597	8,990	4.4%	$583	8,171	4.0%	$840	4,477	2.2%	$1,108
$40,000 ~ $49,999	6	0.0%	$33	69	0.0%	$4,988	1,367	0.7%	$1,501	7,738	3.8%	$539	6,765	3.3%	$806	3,368	1.7%	$1,101
$50,000 ~ $74,999	14	0.0%	$18	150	0.1%	$5,685	3,569	1.8%	$1,881	15,908	7.8%	$656	16,235	8.0%	$887	10,575	5.2%	$1,115
$75,000 ~ $99,999	9	0.0%	$73	85	0.0%	$6,300	1,782	0.9%	$2,051	6,221	3.1%	$768	6,959	3.4%	$938	4,863	2.4%	$1,123
$100,000 ~ $124,999	1	0.0%	$5	80	0.0%	$6,107	1,409	0.7%	$2,127	4,551	2.2%	$767	5,092	2.5%	$946	3,439	1.7%	$1,126
>= $125,000	10	0.0%	$2,969	283	0.1%	$6,770	3,208	1.6%	$2,288	8,414	4.1%	$801	8,846	4.3%	$971	6,235	3.1%	$1,127
ALL	60	0.0%	$694	876	0.4%	$6,003	17,131	8.4%	$1,770	77,155	37.9%	$597	67,033	33.0%	$867	39,332	19.3%	$1,111

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	64	0.0%	$790	36	0.0%	$348	21	0.0%	$511	16	0.0%	$479	17,697	8.7%	$537
$15,000 ~ $19,999	50	0.0%	$917	10	0.0%	$791	19	0.0%	$395	17	0.0%	$568	10,905	5.4%	$874
$20,000 ~ $29,999	101	0.0%	$919	38	0.0%	$695	26	0.0%	$568	19	0.0%	$1,008	22,786	11.2%	$724
$30,000 ~ $39,999	106	0.1%	$967	39	0.0%	$639	35	0.0%	$547	18	0.0%	$584	23,563	11.6%	$859
$40,000 ~ $49,999	77	0.0%	$1,036	28	0.0%	$450	18	0.0%	$417	22	0.0%	$942	19,458	9.6%	$814
$50,000 ~ $74,999	213	0.1%	$1,282	91	0.0%	$720	73	0.0%	$688	53	0.0%	$794	46,881	23.0%	$952
$75,000 ~ $99,999	99	0.0%	$1,257	51	0.0%	$837	33	0.0%	$718	16	0.0%	$695	20,118	9.9%	$1,052
$100,000 ~ $124,999	79	0.0%	$1,065	23	0.0%	$702	19	0.0%	$600	15	0.0%	$899	14,708	7.2%	$1,074
>= $125,000	152	0.1%	$1,182	55	0.0%	$891	42	0.0%	$754	32	0.0%	$693	27,277	13.4%	$1,170
ALL	941	0.5%	$1,097	371	0.2%	$695	286	0.1%	$618	208	0.1%	$753	203,393	100.0%	$910

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Cool
Senior Category:Senior [65+]
Non-CARE

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$7	33	0.0%	$6,088	573	0.4%	$1,508	3,887	2.5%	$469	2,407	1.5%	$802	1,186	0.8%	$1,075
$15,000 ~ $19,999	1	0.0%	$1	34	0.0%	$6,841	630	0.4%	$1,997	2,861	1.8%	$655	2,665	1.7%	$913	1,934	1.2%	$1,124
$20,000 ~ $29,999	7	0.0%	$55	60	0.0%	$4,614	982	0.6%	$1,681	5,666	3.6%	$586	4,512	2.9%	$871	2,935	1.9%	$1,102
$30,000 ~ $39,999	10	0.0%	$1,048	53	0.0%	$6,518	1,128	0.7%	$1,960	5,928	3.8%	$672	6,035	3.9%	$917	4,389	2.8%	$1,116
$40,000 ~ $49,999	6	0.0%	$33	54	0.0%	$5,796	895	0.6%	$1,830	5,053	3.2%	$605	4,798	3.1%	$888	3,273	2.1%	$1,111
$50,000 ~ $74,999	13	0.0%	$8	128	0.1%	$6,310	2,813	1.8%	$2,105	12,348	7.9%	$708	13,197	8.4%	$945	10,393	6.6%	$1,120
$75,000 ~ $99,999	8	0.0%	$72	82	0.1%	$6,453	1,504	1.0%	$2,236	5,024	3.2%	$832	5,781	3.7%	$1,001	4,806	3.1%	$1,126
$100,000 ~ $124,999	.	.	.	75	0.0%	$6,425	1,198	0.8%	$2,313	3,595	2.3%	$852	4,273	2.7%	$1,006	3,394	2.2%	$1,130
>= $125,000	8	0.0%	$2,747	270	0.2%	$6,981	2,911	1.9%	$2,419	6,994	4.5%	$878	7,753	5.0%	$1,020	6,164	3.9%	$1,131
ALL	54	0.0%	$625	789	0.5%	$6,429	12,634	8.1%	$2,115	51,356	32.9%	$704	51,421	32.9%	$944	38,474	24.6%	$1,120

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	40	0.0%	$1,013	20	0.0%	$279	14	0.0%	$514	9	0.0%	$566	8,170	5.2%	$753
$15,000 ~ $19,999	44	0.0%	$979	8	0.0%	$924	16	0.0%	$402	12	0.0%	$725	8,205	5.2%	$980
$20,000 ~ $29,999	89	0.1%	$985	34	0.0%	$706	20	0.0%	$634	17	0.0%	$1,087	14,322	9.2%	$876
$30,000 ~ $39,999	96	0.1%	$1,017	32	0.0%	$716	23	0.0%	$611	17	0.0%	$617	17,711	11.3%	$967
$40,000 ~ $49,999	74	0.0%	$1,011	22	0.0%	$526	14	0.0%	$458	20	0.0%	$1,009	14,209	9.1%	$916
$50,000 ~ $74,999	200	0.1%	$1,331	82	0.1%	$751	66	0.0%	$712	49	0.0%	$833	39,289	25.1%	$1,018
$75,000 ~ $99,999	97	0.1%	$1,275	46	0.0%	$889	32	0.0%	$734	16	0.0%	$695	17,396	11.1%	$1,119
$100,000 ~ $124,999	76	0.0%	$1,084	19	0.0%	$769	18	0.0%	$595	13	0.0%	$969	12,661	8.1%	$1,151
>= $125,000	146	0.1%	$1,165	53	0.0%	$904	40	0.0%	$782	31	0.0%	$715	24,370	15.6%	$1,241
ALL	862	0.6%	$1,144	316	0.2%	$748	243	0.2%	$655	184	0.1%	$813	156,333	100.0%	$1,031

Average Yearly Bill is calculated from the Treatment 3 dataset

Chapter 3 – Bill Impacts (Control Group vs. Pilot Rates #3)
Climate Zone:Cool
Senior Category:Senior [65+]
CARE/FERA

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)																	
	< -25%			-25% ~ -15%			-15% ~ -5%			-5% ~ -0%			0% ~ 5%			5% ~ 10%		
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	1	0.0%	$1	8	0.0%	$1,379	928	2.0%	$429	6,526	13.9%	$279	1,898	4.0%	$547	112	0.2%	$575
$15,000 ~ $19,999	.	.	.	4	0.0%	$4,438	257	0.5%	$851	1,402	3.0%	$424	972	2.1%	$637	49	0.1%	$716
$20,000 ~ $29,999	.	.	.	10	0.0%	$2,119	769	1.6%	$684	4,991	10.6%	$357	2,511	5.3%	$601	159	0.3%	$673
$30,000 ~ $39,999	.	.	.	7	0.0%	$2,212	529	1.1%	$824	3,062	6.5%	$411	2,136	4.5%	$622	88	0.2%	$735
$40,000 ~ $49,999	.	.	.	15	0.0%	$2,080	472	1.0%	$878	2,685	5.7%	$414	1,967	4.2%	$606	95	0.2%	$742
$50,000 ~ $74,999	1	0.0%	$142	22	0.0%	$2,050	756	1.6%	$1,050	3,560	7.6%	$476	3,038	6.5%	$634	182	0.4%	$774
$75,000 ~ $99,999	1	0.0%	$78	3	0.0%	$2,132	278	0.6%	$1,050	1,197	2.5%	$499	1,178	2.5%	$633	57	0.1%	$836
$100,000 ~ $124,999	1	0.0%	$5	5	0.0%	$1,339	211	0.4%	$1,074	956	2.0%	$448	819	1.7%	$630	45	0.1%	$839
>= $125,000	2	0.0%	$3,859	13	0.0%	$2,400	297	0.6%	$1,000	1,420	3.0%	$420	1,093	2.3%	$627	71	0.2%	$793
ALL	6	0.0%	$1,324	87	0.2%	$2,139	4,497	9.6%	$801	25,799	54.8%	$383	15,612	33.2%	$612	858	1.8%	$728

INCOME	PERCENT CHANGE IN BILL (Negative percentage means bill decreased)												TOTAL		
	10% ~ 15%			15% ~ 20%			20% ~ 25%			>25%					
	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill	# cust	% cust	avg yr bill
<= $14,999	24	0.1%	$417	16	0.0%	$435	7	0.0%	$504	7	0.0%	$366	9,527	20.2%	$352
$15,000 ~ $19,999	6	0.0%	$467	2	0.0%	$258	3	0.0%	$363	5	0.0%	$192	2,700	5.7%	$552
$20,000 ~ $29,999	12	0.0%	$429	4	0.0%	$607	6	0.0%	$348	2	0.0%	$340	8,464	18.0%	$467
$30,000 ~ $39,999	10	0.0%	$486	7	0.0%	$287	12	0.0%	$424	1	0.0%	$34	5,852	12.4%	$532
$40,000 ~ $49,999	3	0.0%	$1,645	6	0.0%	$169	4	0.0%	$273	2	0.0%	$266	5,249	11.2%	$539
$50,000 ~ $74,999	13	0.0%	$516	9	0.0%	$434	7	0.0%	$458	4	0.0%	$316	7,592	16.1%	$608
$75,000 ~ $99,999	2	0.0%	$389	5	0.0%	$363	1	0.0%	$192	.	.	.	2,722	5.8%	$621
$100,000 ~ $124,999	3	0.0%	$584	4	0.0%	$384	1	0.0%	$692	2	0.0%	$443	2,047	4.3%	$596
>= $125,000	6	0.0%	$1,609	2	0.0%	$557	2	0.0%	$205	1	0.0%	$8	2,907	6.2%	$580
ALL	79	0.2%	$590	55	0.1%	$387	43	0.1%	$405	24	0.1%	$289	47,060	100.0%	$509

Average Yearly Bill is calculated from the Treatment 3 dataset

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3, ATTACHMENT D

ELECTRICITY BURDENS

Chapter 3 – Electricity Burden (Control Group)
Climate Zone: Cool

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	88,502	17,942	268,339	73,825	57,935	18,885	525,428
1% to 2%	37,596	9,831	128,859	36,836	44,498	12,935	270,555
2% to 3%	15,847	4,281	47,415	15,036	21,643	6,475	110,697
3% to 4%	8,330	2,370	22,145	8,164	11,425	3,545	55,979
4% to 5%	4,907	1,385	12,117	5,055	6,600	1,946	32,010
5% to 6%	2,993	948	7,509	3,324	4,186	1,115	20,075
6% to 7%	2,154	552	5,001	2,236	2,683	705	13,331
7% to 8%	1,455	391	3,316	1,554	1,829	432	8,977
8% to 9%	1,080	287	2,456	1,075	1,268	286	6,452
9% to 10%	812	203	1,843	828	947	225	4,858
10% to 15%	1,937	373	4,312	1,618	2,083	377	10,700
Over 15%	1,979	159	3,794	614	1,243	134	7,923
TOTAL	167,592	38,722	507,106	150,165	156,340	47,060	1,066,985

Chapter 3 – Electricity Burden (Control Group)
Climate Zone: Moderate

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	107,788	20,416	380,811	94,707	66,611	21,247	691,580
1% to 2%	53,271	13,966	266,964	53,000	75,938	16,808	479,947
2% to 3%	22,728	5,887	99,279	21,365	41,990	8,422	199,671
3% to 4%	11,380	3,130	44,524	11,251	22,614	4,760	97,659
4% to 5%	6,808	1,839	23,647	6,856	13,268	2,646	55,064
5% to 6%	4,285	1,189	14,515	4,482	8,099	1,656	34,226
6% to 7%	2,960	751	9,636	2,969	5,389	967	22,672
7% to 8%	2,079	497	6,898	2,023	3,697	603	15,797
8% to 9%	1,479	321	5,016	1,356	2,681	408	11,261
9% to 10%	1,065	195	3,691	1,014	1,979	269	8,213
10% to 15%	2,632	445	9,180	2,123	4,600	573	19,553
Over 15%	2,432	157	7,098	774	2,995	218	13,674
TOTAL	218,907	48,793	871,259	201,920	249,861	58,577	1,649,317

Chapter 3 – Electricity Burden (Control Group)
Climate Zone: Hot

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	43,800	16,035	88,179	73,830	26,172	15,199	263,215
1% to 2%	32,921	27,450	147,900	112,802	40,463	25,126	386,662
2% to 3%	23,246	19,441	110,774	72,319	35,424	18,701	279,905
3% to 4%	15,490	11,623	65,950	42,531	25,283	12,220	173,097
4% to 5%	10,361	7,463	39,077	26,882	16,935	8,246	108,964
5% to 6%	7,242	4,929	24,583	18,369	11,741	5,722	72,586
6% to 7%	5,433	3,595	16,435	13,492	8,232	4,034	51,221
7% to 8%	3,871	2,652	11,835	10,392	6,120	2,945	37,815
8% to 9%	2,877	2,099	8,968	8,156	4,445	2,107	28,652
9% to 10%	2,339	1,722	6,892	6,599	3,564	1,583	22,699
10% to 15%	6,580	4,594	20,300	19,154	9,496	3,840	63,964
Over 15%	6,290	2,798	19,107	12,352	6,546	1,887	48,980
TOTAL	160,450	104,401	560,000	416,878	194,421	101,610	1,537,760

Chapter 3 – Electricity Burden (Control Group)
Climate Zone: ALL

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	240,090	54,393	737,329	242,362	150,718	55,331	1,480,223
1% to 2%	123,788	51,247	543,723	202,638	160,899	54,869	1,137,164
2% to 3%	61,821	29,609	257,468	108,720	99,057	33,598	590,273
3% to 4%	35,200	17,123	132,619	61,946	59,322	20,525	326,735
4% to 5%	22,076	10,687	74,841	38,793	36,803	12,838	196,038
5% to 6%	14,520	7,066	46,607	26,175	24,026	8,493	126,887
6% to 7%	10,547	4,898	31,072	18,697	16,304	5,706	87,224
7% to 8%	7,405	3,540	22,049	13,969	11,646	3,980	62,589
8% to 9%	5,436	2,707	16,440	10,587	8,394	2,801	46,365
9% to 10%	4,216	2,120	12,426	8,441	6,490	2,077	35,770
10% to 15%	11,149	5,412	33,792	22,895	16,179	4,790	94,217
Over 15%	10,701	3,114	29,999	13,740	10,784	2,239	70,577
TOTAL	546,949	191,916	1,938,365	768,963	600,622	207,247	4,254,062

Chapter 3 – Electricity Burden (Pilot Rates #1 Group)
Climate Zone: Cool

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	89,132	18,230	267,358	74,674	57,715	19,242	526,351
1% to 2%	37,588	9,891	131,157	37,059	44,405	13,026	273,126
2% to 3%	15,974	4,238	48,160	14,841	22,062	6,396	111,671
3% to 4%	8,350	2,324	21,636	8,003	11,558	3,434	55,305
4% to 5%	4,795	1,296	11,673	4,834	6,679	1,908	31,185
5% to 6%	2,985	868	7,193	3,167	4,180	1,043	19,436
6% to 7%	2,003	539	4,767	2,139	2,547	670	12,665
7% to 8%	1,426	369	3,310	1,497	1,851	421	8,874
8% to 9%	1,045	277	2,382	1,061	1,288	258	6,311
9% to 10%	716	195	1,797	815	947	205	4,675
10% to 15%	1,834	371	4,329	1,574	2,036	357	10,501
Over 15%	1,772	124	3,407	513	1,092	101	7,009
TOTAL	167,620	38,722	507,169	150,177	156,360	47,061	1,067,109

Chapter 3 – Electricity Burden (Pilot Rates #1 Group)
Climate Zone: Moderate

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	108,076	20,696	372,546	95,139	65,495	21,561	683,513
1% to 2%	52,971	13,940	271,923	53,398	74,723	16,807	483,762
2% to 3%	23,024	5,923	103,334	21,360	42,928	8,418	204,987
3% to 4%	11,593	3,066	45,000	11,089	23,212	4,713	98,673
4% to 5%	6,824	1,829	23,461	6,631	13,688	2,613	55,046
5% to 6%	4,301	1,087	14,151	4,348	8,318	1,570	33,775
6% to 7%	2,953	710	9,376	2,854	5,445	922	22,260
7% to 8%	2,029	485	6,522	1,987	3,709	590	15,322
8% to 9%	1,378	297	4,987	1,349	2,740	378	11,129
9% to 10%	1,053	200	3,597	992	1,965	286	8,093
10% to 15%	2,552	445	9,622	2,096	4,820	532	20,067
Over 15%	2,174	120	6,793	686	2,833	192	12,798
TOTAL	218,928	48,798	871,312	201,929	249,876	58,582	1,649,425

Chapter 3 – Electricity Burden (Pilot Rates #1 Group)
Climate Zone: Hot

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	43,731	15,581	82,074	69,999	24,673	14,609	250,667
1% to 2%	31,556	26,843	139,716	110,840	38,185	24,509	371,649
2% to 3%	22,944	19,533	113,268	73,946	34,723	18,704	283,118
3% to 4%	15,784	12,059	70,220	43,832	25,725	12,576	180,196
4% to 5%	10,712	7,673	41,798	27,565	17,898	8,338	113,984
5% to 6%	7,578	4,979	26,068	18,779	12,322	5,948	75,674
6% to 7%	5,669	3,620	17,289	13,658	8,768	4,128	53,132
7% to 8%	4,142	2,638	12,268	10,428	6,439	3,107	39,022
8% to 9%	2,993	2,110	9,107	8,223	4,671	2,154	29,258
9% to 10%	2,408	1,622	6,971	6,649	3,715	1,620	22,985
10% to 15%	6,648	4,775	20,997	19,810	10,280	3,950	66,460
Over 15%	6,305	2,975	20,278	13,179	7,073	1,991	51,801
TOTAL	160,470	104,408	560,054	416,908	194,472	101,634	1,537,946

Chapter 3 – Electricity Burden (Pilot Rates #1 Group)
Climate Zone: ALL

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	240,939	54,507	721,978	239,812	147,883	55,412	1,460,531
1% to 2%	122,115	50,674	542,796	201,297	157,313	54,342	1,128,537
2% to 3%	61,942	29,694	264,762	110,147	99,713	33,518	599,776
3% to 4%	35,727	17,449	136,856	62,924	60,495	20,723	334,174
4% to 5%	22,331	10,798	76,932	39,030	38,265	12,859	200,215
5% to 6%	14,864	6,934	47,412	26,294	24,820	8,561	128,885
6% to 7%	10,625	4,869	31,432	18,651	16,760	5,720	88,057
7% to 8%	7,597	3,492	22,100	13,912	11,999	4,118	63,218
8% to 9%	5,416	2,684	16,476	10,633	8,699	2,790	46,698
9% to 10%	4,177	2,017	12,365	8,456	6,627	2,111	35,753
10% to 15%	11,034	5,591	34,948	23,480	17,136	4,839	97,028
Over 15%	10,251	3,219	30,478	14,378	10,998	2,284	71,608
TOTAL	547,018	191,928	1,938,535	769,014	600,708	207,277	4,254,480

Chapter 3 – Electricity Burden (Pilot Rates #2 Group)
Climate Zone: Cool

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	89,370	18,309	267,830	74,918	57,952	19,381	527,760
1% to 2%	37,557	9,891	131,051	37,025	44,428	13,027	272,979
2% to 3%	15,934	4,212	48,078	14,807	22,015	6,377	111,423
3% to 4%	8,294	2,305	21,601	7,959	11,498	3,403	55,060
4% to 5%	4,788	1,298	11,577	4,835	6,676	1,885	31,059
5% to 6%	2,949	857	7,190	3,133	4,125	1,004	19,258
6% to 7%	2,011	524	4,732	2,106	2,542	683	12,598
7% to 8%	1,406	375	3,304	1,495	1,811	396	8,787
8% to 9%	1,029	280	2,350	1,049	1,285	258	6,251
9% to 10%	725	190	1,796	809	946	208	4,674
10% to 15%	1,799	359	4,297	1,543	2,004	343	10,345
Over 15%	1,756	123	3,371	502	1,073	96	6,921
TOTAL	167,618	38,723	507,177	150,181	156,355	47,061	1,067,115

Chapter 3 – Electricity Burden (Pilot Rates #2 Group)
Climate Zone: Moderate

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	108,307	20,777	372,220	95,438	65,693	21,706	684,141
1% to 2%	52,899	13,942	272,141	53,326	74,748	16,800	483,856
2% to 3%	23,026	5,892	103,457	21,322	42,910	8,413	205,020
3% to 4%	11,556	3,061	45,078	11,017	23,185	4,658	98,555
4% to 5%	6,836	1,804	23,457	6,623	13,632	2,608	54,960
5% to 6%	4,256	1,083	14,140	4,334	8,293	1,541	33,647
6% to 7%	2,914	711	9,348	2,843	5,428	899	22,143
7% to 8%	2,024	479	6,510	1,955	3,689	587	15,244
8% to 9%	1,382	299	4,982	1,335	2,742	380	11,120
9% to 10%	1,064	196	3,591	998	1,940	284	8,073
10% to 15%	2,524	440	9,620	2,064	4,800	515	19,963
Over 15%	2,149	114	6,777	676	2,821	191	12,728
TOTAL	218,937	48,798	871,321	201,931	249,881	58,582	1,649,450

Chapter 3 – Electricity Burden (Pilot Rates #2 Group)
Climate Zone: Hot

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	43,781	15,554	81,182	69,748	24,556	14,579	249,400
1% to 2%	31,379	26,868	138,484	110,767	37,913	24,492	369,903
2% to 3%	22,942	19,534	113,474	74,127	34,672	18,750	283,499
3% to 4%	15,776	12,116	70,814	43,837	25,834	12,567	180,944
4% to 5%	10,747	7,653	42,124	27,655	17,914	8,347	114,440
5% to 6%	7,597	4,983	26,401	18,786	12,392	5,973	76,132
6% to 7%	5,700	3,628	17,397	13,716	8,811	4,125	53,377
7% to 8%	4,146	2,625	12,428	10,386	6,461	3,134	39,180
8% to 9%	3,016	2,101	9,199	8,288	4,689	2,099	29,392
9% to 10%	2,403	1,622	6,992	6,649	3,751	1,627	23,044
10% to 15%	6,688	4,771	21,081	19,805	10,345	3,977	66,667
Over 15%	6,294	2,954	20,483	13,147	7,133	1,964	51,975
TOTAL	160,469	104,409	560,059	416,911	194,471	101,634	1,537,953

Chapter 3 – Electricity Burden (Pilot Rates #2 Group)
Climate Zone: ALL

Electric Burden	NUMBER OF CUSTOMERS						TOTAL
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	
0% to 1%	241,458	54,640	721,232	240,104	148,201	55,666	1,461,301
1% to 2%	121,835	50,701	541,676	201,118	157,089	54,319	1,126,738
2% to 3%	61,902	29,638	265,009	110,256	99,597	33,540	599,942
3% to 4%	35,626	17,482	137,493	62,813	60,517	20,628	334,559
4% to 5%	22,371	10,755	77,158	39,113	38,222	12,840	200,459
5% to 6%	14,802	6,923	47,731	26,253	24,810	8,518	129,037
6% to 7%	10,625	4,863	31,477	18,665	16,781	5,707	88,118
7% to 8%	7,576	3,479	22,242	13,836	11,961	4,117	63,211
8% to 9%	5,427	2,680	16,531	10,672	8,716	2,737	46,763
9% to 10%	4,192	2,008	12,379	8,456	6,637	2,119	35,791
10% to 15%	11,011	5,570	34,998	23,412	17,149	4,835	96,975
Over 15%	10,199	3,191	30,631	14,325	11,027	2,251	71,624
TOTAL	547,024	191,930	1,938,557	769,023	600,707	207,277	4,254,518

Chapter 3 – Electricity Burden (Pilot Rates #3 Group)
Climate Zone: Cool

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	88,047	18,042	263,601	73,752	56,862	19,014	519,318
1% to 2%	37,826	9,899	132,560	37,368	44,327	13,039	275,019
2% to 3%	16,178	4,298	49,035	15,041	22,309	6,451	113,312
3% to 4%	8,558	2,325	22,068	8,034	11,724	3,466	56,175
4% to 5%	4,872	1,307	11,914	4,861	6,758	1,907	31,619
5% to 6%	3,040	895	7,291	3,204	4,280	1,070	19,780
6% to 7%	2,026	544	4,873	2,203	2,648	710	13,004
7% to 8%	1,453	395	3,407	1,535	1,896	407	9,093
8% to 9%	1,102	268	2,477	1,100	1,315	288	6,550
9% to 10%	742	202	1,887	856	966	221	4,874
10% to 15%	1,947	407	4,525	1,678	2,151	379	11,087
Over 15%	1,825	140	3,530	545	1,121	109	7,270
TOTAL	167,616	38,722	507,168	150,177	156,357	47,061	1,067,101

Chapter 3 – Electricity Burden (Pilot Rates #3 Group)
Climate Zone: Moderate

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	107,148	20,572	370,214	94,694	65,215	21,456	679,299
1% to 2%	53,090	13,918	272,501	53,454	74,589	16,781	484,333
2% to 3%	23,211	5,899	103,753	21,388	42,934	8,436	205,621
3% to 4%	11,703	3,131	45,242	11,152	23,316	4,709	99,253
4% to 5%	6,940	1,828	23,753	6,670	13,724	2,604	55,519
5% to 6%	4,365	1,111	14,285	4,350	8,330	1,621	34,062
6% to 7%	3,024	728	9,456	2,930	5,514	920	22,572
7% to 8%	2,068	489	6,651	1,982	3,735	601	15,526
8% to 9%	1,423	315	4,983	1,382	2,763	408	11,274
9% to 10%	1,076	229	3,739	1,017	1,998	281	8,340
10% to 15%	2,639	446	9,774	2,186	4,879	562	20,486
Over 15%	2,238	132	6,958	724	2,880	203	13,135
TOTAL	218,925	48,798	871,309	201,929	249,877	58,582	1,649,420

Chapter 3 – Electricity Burden (Pilot Rates #3 Group)
Climate Zone: Hot

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	43,792	15,814	83,829	71,515	25,103	14,856	254,909
1% to 2%	31,985	27,233	142,597	112,395	38,857	24,807	377,874
2% to 3%	22,983	19,490	113,011	73,604	34,991	18,716	282,795
3% to 4%	15,742	11,934	68,974	43,167	25,519	12,405	177,741
4% to 5%	10,680	7,524	40,985	27,061	17,684	8,355	112,289
5% to 6%	7,477	4,908	25,453	18,441	12,135	5,812	74,226
6% to 7%	5,615	3,605	16,952	13,521	8,601	4,102	52,396
7% to 8%	4,028	2,621	12,100	10,313	6,357	3,061	38,480
8% to 9%	3,034	2,056	8,944	8,102	4,621	2,094	28,851
9% to 10%	2,394	1,640	6,847	6,682	3,695	1,624	22,882
10% to 15%	6,574	4,735	20,692	19,495	10,014	3,879	65,389
Over 15%	6,165	2,848	19,666	12,613	6,895	1,923	50,110
TOTAL	160,469	104,408	560,050	416,909	194,472	101,634	1,537,942

Chapter 3 – Electricity Burden (Pilot Rates #3 Group)
Climate Zone: ALL

Electric Burden	NUMBER OF CUSTOMERS						
	No Age Data		Non-Senior Head of Household		65+ Senior Head of Household		
	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	Non-CARE	CARE or FERA	TOTAL
0% to 1%	238,987	54,428	717,644	239,961	147,180	55,326	1,453,526
1% to 2%	122,901	51,050	547,658	203,217	157,773	54,627	1,137,226
2% to 3%	62,372	29,687	265,799	110,033	100,234	33,603	601,728
3% to 4%	36,003	17,390	136,284	62,353	60,559	20,580	333,169
4% to 5%	22,492	10,659	76,652	38,592	38,166	12,866	199,427
5% to 6%	14,882	6,914	47,029	25,995	24,745	8,503	128,068
6% to 7%	10,665	4,877	31,281	18,654	16,763	5,732	87,972
7% to 8%	7,549	3,505	22,158	13,830	11,988	4,069	63,099
8% to 9%	5,559	2,639	16,404	10,584	8,699	2,790	46,675
9% to 10%	4,212	2,071	12,473	8,555	6,659	2,126	36,096
10% to 15%	11,160	5,588	34,991	23,359	17,044	4,820	96,962
Over 15%	10,228	3,120	30,154	13,882	10,896	2,235	70,515
TOTAL	547,010	191,928	1,938,527	769,015	600,706	207,277	4,254,463

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 4

CUSTOMERS EXCLUDED FROM PILOT RECRUITMENT

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CHAPTER 4
CUSTOMERS EXCLUDED FROM PILOT RECRUITMENT

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
CUSTOMERS EXCLUDED FROM PILOT RECRUITMENT

A. Introduction

This chapter describes: (1) the statutory exclusions for default TOU under Public Utilities Code (Pub. Util. Code) Section 745; and (2) the types of customers that Pacific Gas and Electric Company (PG&E) proposes to exclude from recruitment for its Opt-In TOU Pilot beginning in 2016.

Certain customers are legally required to be excluded from default TOU under Pub. Util. Code Section 745. Since the purpose of this Opt-In TOU Pilot is to inform and prepare for the ultimate roll-out of default TOU targeted for 2019, PG&E and the TOU Working Group began the process of assessing what customers would be excluded from recruitment for the Opt-In TOU Pilot by identifying those customers who would ultimately need to be excluded from default TOU. The TOU Working Group was mindful, however that because this pilot is an Opt-In TOU Pilot, and given the short time available to prepare for roll-out of this Opt-In TOU Pilot (targeted from June 1, 2016), if there were practical implementation issues due to time-constraints, it would not be necessary to utilize the exact same method of achieving these exclusions as might be used for the default TOU pilot in 2018 or for default TOU itself, which the CPUC has targeted for 2019.

The TOU Working Group's discussions about and approach to the topic of exclusions from the Opt-In TOU pilot is set forth in Section 3.5 of the TOU Opt-In Pilot Design Report dated December 17, 2015, prepared by Dr. Stephen George and the team at Nexant, Inc., attached hereto as Appendix A.[1]

B. Customers Excluded From Being Defaulted to Residential TOU Under the Requirements of Pub. Util. Code Section 745

There are three already-defined types of residential customers that, by law, are categorically required to be excluded from the full roll-out to default TOU, starting on or after January 1, 2018, per the requirements of Pub. Util. Code Section 745(c)(1):

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[1] PG&E agrees with the Nexant Report's discussion, and incorporates it here by reference, but expands upon it to provide additional detail and PG&E-specific considerations.

1. "Customers receiving a **medical baseline allowance** pursuant to subdivision (c) of Section 739;"
2. "Customers **requesting third-party notification** pursuant to subdivision (c) of Section 779.1;" and
3. "Customers **who the Commission has ordered cannot be disconnected from service without an in-person visit from a utility representative** (Decision 12-03-054 (March 22, 2012), Decision on Phase II Issues: Adoption of Practices to Reduce the Number of Gas and Electric Service Disconnections, Order 2 (b) at page 55)."[2] (Pub. Util. Code Section 745(c)(1), emphasis added).

Furthermore, a fourth provision in Section 745(c)(1) allows for potential eventually be "other customers designated by the California Public Utilities Commission (CPUC or Commission) in its discretion shall not be subject to default TOU rates without their affirmative consent."[3]

Finally, the legislature added one more requirement, in Section 745(c)(4), pursuant to which **a residential customer who would otherwise be eligible**

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2 D.12-03-054 describes the customers who cannot be disconnected without an in-person visit as including: Medical Baseline customers, Life Support customers (who also qualify qualifies for Medical Baseline), and a third, broader group of vulnerable customers, defined as follows (p. 30):

> [C]**ustomers who certify that they <u>have a serious illness or condition that could become life threatening if service is disconnected</u>**. We do not require the customer to produce a physician's statement in support of the certification; i.e., customers may self-certify as to the illness or condition.

D.12-03-054 specifically notes that this group of customers is broader than those who are eligible for Medical Baseline allowances, stating:

> …the Medical Baseline designation alone may not be adequate to protect at-risk customers. As CforAT [the Center for Accessible Technologies] points out, there are many households containing disabled individuals who are not enrolled in programs such as Medical Baseline because they are unaware of them or because their disability does not cause them to use above-average levels of energy. 'The fact that they are not enrolled in these programs…does not mean that they would not be subject to severe harm if they were disconnected.'

3 PG&E assumes that the Commission will, in or about 2018, exercise its discretion to assess whether any additional types of customers should be excluded from default TOU rates from the first—after it receives the Investor-Owned Utilities' Default TOU proposals and can review them in the context of the data gathered through the TOU Pilots required under D.15-07-001. However, it cannot be known now whether there will be any such further exclusions added by the CPUC, so no such exclusions can be factored into the Opt-In Pilot based on this provision in Pub. Util. Code Section 745(c)(1).

for default TOU "may not be defaulted until they have been provided with one-year of interval usage data from an advanced meter, and associated customer education."

PG&E has not finalized its plans for how it will be identifying customers for exclusion from the eventual roll-out of Default TOU. Given the very compressed schedule for preparing operationally to implement an Opt-In TOU Pilot expected to begin June 1, 2016, PG&E has identified the following information relative to the above-mentioned three categorical exclusions required under Section 745(c)(1):

1. Medical Baseline:

   PG&E has long provided a Medical Baseline Program, pursuant to Pub. Util. Code Section 739(c)(1), which allows eligible customers to receive additional baseline allotments as necessary to cover their additional medically-necessary electrical needs. Identification of such customers is already provided for in PG&E's Customer Care and Billing (CC&B) system, which includes a designation for customers who participate in the medical baseline rate program (specifically, a Service Agreement (SA) characteristic type for Medical allotments).

2. Third-Party Notification:

   PG&E has long provided the option for a customer at a specific residence to have someone else, such as a third party who receives notification of each delinquent notice, among other things.

   PG&E's CC&B system includes a field identifying those accounts for which the Residential SA names at least one Not-Main-Customer on the Account as "Receives Notification." PG&E notifies the third party of any delinquent payments to ensure that the third party is aware of any pending service interruption.

3. In-Person Utility Visit Required before Disconnection:

   Since March 22, 2012, pursuant to D.12-03-054, Order 2 (b) at page 55, when any customer becomes subject to disconnection of service, PG&E provides them with the opportunity to attest that they are eligible for an in-person utility visit before they may be disconnected. Customers on Medical Baseline are automatically included, and those non-medical baseline customers who identify themselves as eligible (e.g., on life-support or having another

eligible medical condition, or customers who certify that they have a serious illness or condition that could become life threatening if service were disconnected.)

PG&E's CC&B system includes fields that identify:

- Residential accounts with SAs that list a Person who has a Medical Flag/Characteristic and/or SAs that have Medical Allotments under the Medical Baseline Program;
- Residential accounts with SAs that list a Person who is flagged as on Life Support/Sensitive Load;
- Residential accounts with SAs that list a Person who is the subject of a Customer Contact for a Vulnerable Customer Letter within the last 90 days and/or Residential SAs that are on Accounts with a "Vulnerable Customer Extension" Account Alert.

Section 745 (c)(4):

- Residential customers who have not been provided with at least one year of interval usage data from an advanced meter:
  - PG&E's CC&B system can identify customers with SA's that have not had a SmartMeter™ for at least a year.

C. Exclusions for TOU Opt-In Pilot Beginning in 2016

PG&E proposes to exclude from recruitment for its Opt-In TOU Pilot, beginning in 2016, the following types of PG&E customers. These exclusions seek to encompass as best possible (1) the exclusions that Pub. Util. Code 745 requires for default TOU in order to help make the Opt-In pilot resemble default as closely as possible, and (2) to address Information Technology, billing system capabilities and implementation issues for the Opt-In Pilot, given the short time available for implementation by mid-2016:

PG&E's Proposed Exclusions from the Opt-In TOU Pilot:

1. All Non-Residential Customers;
2. Residential customers on an opt-in TOU rate (as of the date when PG&E develops its list of customers to solicit for the pilot), such rates as Schedule E-6, E-7, E-TOU-A, E-TOU-B, and EV; or a Master Metered rate, such as Schedules ES, ESR, EM, ET (in other words, to be eligible for this Opt-In TOU pilot, a customer must be on PG&E's standard, tiered E-1 rate at the time of pilot recruitment);
3. Customers on Medical Baseline;

4. Customers on PG&E's SmartRate™ (critical peak pricing) Program;
5. Direct Access and Community Choice Aggregation customers;
6. Net Energy Metering Customers;
7. Customers without a SmartMeter™ or customers with a SmartMeter™ whose interval reads are not yet of billing quality;
8. Customers who have a Home Area Network device;
9. PG&E employees and retirees;
10. Customers who have requested third-party notification; and
11. Customers who have stated that they are eligible for an in-person visit from a utility representative before they can be disconnected from service.

In addition—to address concerns raised at the TOU Working Group meetings by the Center for Accessible Technology—during the enrollment process, customers will be informed through the pilot terms and conditions that by agreeing to participate, they certify that there is no one living in their home who has a medical issue that relies on a constant supply of electricity.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 5

TOU PILOT EXPERIMENTAL DESIGN AND SAMPLE SIZES

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
TOU PILOT EXPERIMENTAL DESIGN AND SAMPLE SIZES

A. Introduction

This chapter describes Pacific Gas and Electric Company's (PG&E) proposed Opt-In Time-of-Use (TOU) Pilot experimental design and sample sizes, which are based on the efforts of the Working Group leading to the experimental design and sample size recommendations set forth in the December 17, 2015 *Time-of-Use Pricing Opt-in Pilot Plan,* by Dr. Stephen George and his team at Nexant, Inc. (Nexant Report). PG&E incorporates the Nexant Report by reference, but adds in this chapter, further discussion, especially of matters specific to PG&E and its Opt-In TOU Pilot proposal.

The California Public Utilities Commission's (CPUC or Commission) decision in the Residential Rates Reform Order Instituting Rulemaking (RROIR; Decision (D.) 15-07-001) required the investor-owned utilities (IOU) to each conduct research through both opt-in and default TOU pilots. The Opt-In TOU Pilots were required to take place starting in 2016 and continue in 2017. However, by statute, the Default TOU Pilots cannot begin until January 1, 2018,[1] which is after the deadline required by the CPUC for the IOUs to file their proposals for default 2019 TOU implementation (which the RROIR Decision required be filed in Rate Design Window filings no later than January 1, 2018).

This chapter will focus on the experimental design that can be implemented for an opt-in TOU pilot in 2016 and 2017 that will be useful to inform a successful implementation of default TOU for PG&E's service territory and customer base in time to inform the default TOU rates to be proposed for implementation in 2019.[2]

Details of the three TOU pilot rates and one control group rate to be studied in the opt-in pilot are provided in Chapter 2 of this advice filing and in Section 4 of the Nexant Report. A discussion of the population of PG&E customers assumed to be excluded from default TOU is included in Chapter 4 of this advice filing along with

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1 The experimental design and sample sizes for the 2018 default TOU pilot will be developed in 2016.

2 D.15-07-001 states: "The immediate goal of default TOU is customer acceptance and education," p. 169.

some additional exclusions required for the pilot sample. A detailed description of PG&E's proposed technology treatments are provided in Chapter 6. The method of recruitment of the sample is discussed in Chapter 7 and Chapter 8.

PG&E incorporates by reference but does not repeat here Sections 3 and 4 of the Nexant Report relating to TOU experimental design and sample sizes. PG&E supports theses sections of the Nexant Report and provides here additional detail specific to PG&E's proposal.

B. Pilot Research Objectives

PG&E supports the objectives agreed upon by the TOU Working Group as summarized in Section 2.1 of the Nexant Report. Pilots are conducted to fill the gaps of information needed to inform a full implementation. These objectives generally fall into three major categories: (1) alternative rate structures with new TOU periods, (2) evaluation of special customers in hot climate zones for "unreasonable hardship," and (3) usefulness of non-rate treatments for customers on TOU rates.

1. New TOU Rate Periods

Future time of use periods will be different than previous time periods, as discussed in the CPUC's recent decision in PG&E's 2015 Rate Design Window (D.15-11-013) adopting optional TOU rates with summer weekday on-peak period at or moving soon to 4 p.m. – 9 p.m. That decision acknowledged PG&E's highest cost hours for generation capacity costs now fall within evening hours (between 4 p.m. – 9 p.m.) as opposed to afternoon hours deemed to be higher-priced hours used to develop historic TOU rate periods (e.g., 12 Noon – 6 p.m. or 1 p.m. – 7 p.m.). This shift of the peak period into the evening hours, caused by the rapid influx of solar generation on PG&E's system in recent years, is also consistent with the California Independent System Operator's analysis based on its own forecast.[3] PG&E believes it is critical to understand how well a wide range of its residential customers might accept and respond to PG&E's future TOU rate periods, all of which utilize the newly updated evening peak periods. For residential customers this may result in a significant

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[3] While a wide variety of TOU pilots have been implemented throughout the United States, the TOU Working Group's consultant determined that none of them have studied peak hours in the evening.

difference in customer acceptance and response to price from prior TOU research given the increase in occupancy and reduced temperatures during the later hours.

PG&E is also seeking to gain a better understanding of the impact of TOU rates on over 50 percent of PG&E customers without air-conditioning, especially in cool climate zones, where little prior research exists.

2. Section 745 "Unreasonable Hardship"

It is critical to understand whether customer segments identified in Public Utilities Code (Pub. Util. Code) Section 745 would experience "unreasonable hardship" under TOU rates. In D.15-07-001, the CPUC found that Senate Bill 1090 requirements which made changes adding Section 745(d) did not require a default pilot[4] because it assumes no change in usage. However, after greater review of the legislative history and discussion by the TOU Working Group, the parties agreed that existing data may not be adequate to address information on hardship for seniors and economically vulnerable customers in hot climate regions, including changes in usage, as is necessary to comply with Pub. Util. Code Section 745(c)(2). Learnings such as these are necessary to inform the default TOU rate structure that PG&E will propose in its Rate Design Window set to be filed by January 1, 2018 and the information needed for the CPUC to make an informed decision in 2018 regarding "unreasonable hardship" as part of its decision on 2019 default residential TOU implementation.

3. Technology and Education Treatments

While PG&E agrees that enabling technology and education are also critical elements to a successful implementation of default TOU, many of these areas are best studied in a true default setting, such as through the upcoming default TOU pilot to begin in 2018. Underlying the widely shared view of the importance of enabling technology and education is the belief that these tools can improve acceptance of and response to TOU among less engaged customers. However, these less engaged customers are also the most difficult to recruit in an opt-in setting. While, as discussed in the Nexant Report and this chapter's subsequent section, the TOU Working Group has designed the

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4 *See* D.15-07-001, mimeo, p. 169.

Opt-In TOU Pilot to recruit as many of these "complacent" customers as possible, a default TOU pilot is necessary to recruit a participant pool that most accurately represents the true population that will be subject to default TOU starting in 2019.

Despite these challenges, PG&E supports the TOU Working Group's proposal to test enabling technologies and education in a limited fashion during the Opt-In TOU Pilot. PG&E's enabling technology and education proposals are generally described in the Nexant Report, and described more specifically in Chapter 6 of PG&E's advice letter proposal.

C. Experimental Design and Sample Size Determination

PG&E supports the experimental design agreed upon by the TOU Working Group and summarized in Chapter 3 of the Nexant Report. Specifically, PG&E agrees that a Randomized Control Trial (RCT) is the best way to address selection bias caused by pilot's opt-in nature and generate internally valid results. RCTs are widely recognized as the "gold standard" for experimental design, within both the broad scientific research community and the community of researchers who study time varying electric rates.[5] This approach would recruit customers for the pilot and then assign customers to one of the three TOU rates or the control.

Furthermore, given the legal ban on defaulting residential customers into the 2016 pilot, PG&E agrees with the Nexant Report that adopting a pay-to-play approach is necessary to recruit "complacent" customers, or customers who would not actively opt-in to TOU but would remain on TOU if defaulted. In addition, PG&E agrees with the Nexant Report (Section 3.2) that the incentive payment should be phased, so as to encourage not only initial participation but retention throughout the duration of the pilot, and, by linking payments to survey participation, to increase the response rates to surveys required to accomplish the pilots' research objectives.

PG&E's final samples for the Opt-In TOU Pilot will be developed in the first Quarter of 2016. Based on the information currently available and working with Nexant, PG&E assumes the pilot sample to total approximately 18,500 customers. This includes a liberal 25 percent oversampling of customers in 2016 to allow for attrition due to customers moving and opt-outs during the pilot resulting in an

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5 *See* Cappers, Peter, Annika Todd, and Charles Goldman. *Smart Grid Investment Grant Consumer Behavior Study Analysis: Summary of Utility Studies*. Lawrence Berkeley National Laboratory, 2013.

adequate sample for the summer 2017 analysis. The allocation of the sample is further discussed by critical segments below. The technology treatment samples are a subset of the rate samples and are discussed in further detail in Chapter 6 of this filing.

1. Climate Segments

The experimental design also required defining subpopulations by climate regions. Specifically, to address Pub. Util. Code 745, a definition of a hot climate was required. PG&E also wanted to differentiate customers in cool climate regions from other segments. As a result, PG&E mapped its baseline territories to three climate regions based on temperature characteristics: Hot (P, R, S, W), Mild (Q, X, Y), and Cool (T, V, Z). Figure 5-1 is a map of the baseline territories.[6] Each climate region represents at least 25 percent of PG&E's residential population. All three pilot TOU rates and a control rate sample will be selected for each of the three climate regions. The sample will be further segmented by CARE/FERA versus Non-CARE/FERA with equal sample allocation of 500 customers[7] to each cell defined by a combination of climate region, CARE/FERA status, and rate/control assignment. This results in 12,000 sample customers, 15,000 with the 25 percent oversampling. This is the primary sample for load impact and survey analysis of customer acceptance and understanding.

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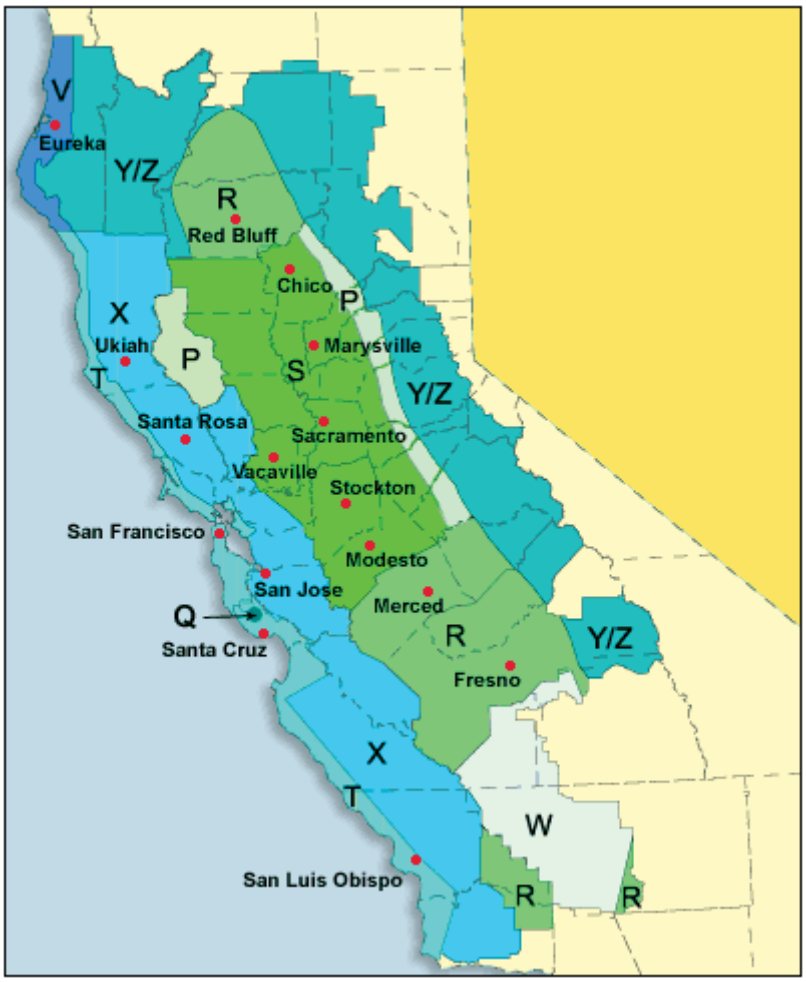
6 PG&E's baseline territory Z covers the higher elevations of the combined Y/Z territories shown in Figure 5-1, and Y covers the lower elevations. For simplicity, the two territories are presented as a single integrated territory.

7 By allocating an equal sample to CARE/FERA and non-CARE/FERA the former is oversampled because it is approximately 30 percent of the population and will be 50 percent of the sample. This will be controlled for in analysis with sample weights.

FIGURE 5-1
PG&E BASELINE TERRITORY MAP



2. Seniors and Income Segments in the Hot Climate Region

Within the hot climate region for Pilot Rate 1, PG&E proposes to select a large enough sample of seniors and economically vulnerable to conduct survey analysis specific to an understanding of potential unreasonable hardship. Age and income are not characteristics PG&E collects on all customers as a function of conducting normal utility business.[8] Due to the need to support recruiting an adequate sample size for this analysis a source of data on customer age and income for PG&E customers is being purchased from a

[8] Designing a sample to represent a larger population requires a common set of sample design variables for the population and the sample.

third-party provider (Experian)[9] to use in sample selection. This is because a simple random sample may not include a large enough sample size to meet the goals of the evaluation.

Using the Experian data, which will also include the number of people in the household, PG&E agrees with the Nexant Report (and the consensus of the Working Group parties) that creating segments above and below 100 percent of Federal Poverty Guidelines, can be added to the senior/non-senior segmentation.[10] This will allow PG&E to oversample seniors and economically vulnerable customers in the hot climate region. The current proposal assumes approximately 2,800 sample customers will be required, 3,500 with the 25 percent oversampling.

D. Additional Sample Considerations

PG&E supports the TOU Working Group's recommendation to recruit adequate samples to generate confidence intervals between 2-3 percent with 90 percent confidence. A 90 percent confidence interval is consistent with historical industry practices[11] and strikes a reasonable balance between precision and practicality.

The Nexant Report notes that "prior to implementation, each utility will estimate the sample sizes required to achieve a similar level of confidence for their customer population by segment and climate region."[12] PG&E will conduct more refined sample size estimation and expects to vary the sample sizes slightly by treatment cell, optimizing for the diverse range of characteristics across PG&E's territory.

For example, prior studies suggest that, customers in PG&E's hot climate region, where there is a much higher penetration of Central Air Conditioning, will provide more load response on a TOU rate than customers in PG&E's cool climate

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9 The Experian data PG&E had on hand, for purposes of the TOU Working Group's analysis for the Nexant Report, and this Advice Letter, was purchased some time ago and does not include all the variables required for the special sample design in support of Pub. Util. Code 745 analysis. PG&E is currently engaged in the process of acquiring updated information from Experian to support more accurate actual sample selection in the first quarter of 2016.

10 *See* Chapter 3 of the Nexant Report.

11 *See*, e.g., SMUD, "SmartPricing Options Interim Evaluation," Appendix C.

12 Nexant Report, Section 4.2, pp. 22-28.

region, where there is a much lower penetration of Central Air Conditioning.[13] A significant percentage of PG&E's overall residential customer population resides in cool climate region, with 25 percent residing its baseline territory T alone. For purposes of designing the default TOU rate, it is important to understand how these customers' load response varies according to each pilot rate. Therefore, it may be prudent for PG&E's pilot recruitment to slightly oversample customers in cool climate region to increase the chances of detecting a load response that is statistically different from zero.[14] PG&E cannot make this determination until after it performs the detailed power analysis in Q1 2016. (*See* Section E below.)

E. Timing and Budget

PG&E will perform two tasks in Q1 2016 to implement the experimental design: (1) refine the power analysis and sampling plan, and (2) generate the customer list with rate treatment assignments. The detailed power analysis and sampling plan will provide the specific customer counts needed in each cell to estimate impacts and measure customer survey response, and the sampling plan will indicate how many seniors and economically vulnerable customers will need to be oversampled in the hot climate region.[15]

PG&E also includes the cost associated with obtaining the customer demographic data necessary to understand the distribution of senior and low-income households in PG&E territory.

F. Conclusion

PG&E is in broad agreement with the TOU Working Group's experimental design and sample size recommendations for the Opt-In TOU Pilot, as discussed in the Nexant Report, Sections 3 and 4. PG&E's proposal is designed to comply with Commission guidance, and to conform with the consensus of the TOU Working Group, in order to address the specific characteristics of PG&E's diverse service territory and residential customer base. Adoption of the pilot experimental design

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13 *See* KEMA, Inc., "2009 California Residential Appliance Saturation Study – Executive Summary," Table ES-1, p. 4.

14 This potential need for oversampling is different from the attrition oversampling discussed above. Whether or not customers in the cool climate region need to be slightly oversampled cannot be determined until PG&E looks at the average demand on peak and standard deviation of the populations, which cannot take place until Q1 2016.

15 PG&E does not anticipate either of these efforts to result in a substantial Increase to the 18,500 total estimated sample size used in this Advice Letter.

and sample sizes that PG&E proposes, which are consistent with the Nexant Report and the TOU Working Group's effort, results in a pilot that is robust enough to provide useful data from an Opt-In TOU Pilot to inform the development and evaluation of default TOU implementation proposals in 2018.

TABLE 5-1
ESTIMATED INCREMENTAL COSTS FOR PG&E'S
TOU PILOT EXPERIMENTAL DESIGN AND SAMPLE SIZES

Description	2015/2016	2017	2018
Update Power Analysis and Sampling Plan	$25,000		
Generate Customer List and Assign Treatments	10,000		
Purchase Customer Demographic Data	125,000	$50,000	
Total	$160,000	$50,000	

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 6

TECHNOLOGY

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CHAPTER 6
TECHNOLOGY

A. Introduction

Pacific Gas and Electric Company (PG&E) proposes that its Opt-In TOU Pilot incorporate two technology assessments: (1) an analysis of smart thermostats, and (2) a smartphone information treatment. For smart thermostats, PG&E's objective is to qualitatively assess their usefulness in households on TOU rates. For the smartphone technology app, PG&E's opt-in pilot research will help determine whether such an app can positively affect customer acceptance and satisfaction with TOU rates, which was a major concern of the California Public Utilities Commission (CPUC or Commission) in D.15-07-001 (*see esp.* pp. 136). PG&E believes its approach complements and expands upon the insights possible under the other two utilities' technology treatments, and taken all together, the three Investor-Owned Utilities' (IOU) pilots will provide critical information that is not available from prior TOU pilots in other jurisdictions. PG&E agrees with, and incorporates by reference, Nexant's *Time-of-Use Pricing Opt-in Pilot Plan* (Nexant Report), which supports this approach to technology evaluation in PG&E's pilot.

B. Relevance of Smart Thermostats and Smartphone Features to the Goals of the TOU Pilot

Both Smart Thermostats and Smartphones are well-aligned with the practical goals of the TOU pilot. In R.12-06-013, CPUC directed the utilities to:

> …take steps toward implementing default TOU rates, including performing the statutorily-required studies and studies that will provide important information about *customer acceptance and response to TOU rates*.

It is reasonable to believe that enabling technologies such as Smart Thermostats and Smartphone apps that make use of advanced technologies such as SmartMeters™ might have a positive influence on customer acceptance of and response to the eventual default TOU rate, therefore PG&E believes that testing these technologies as a part of the pilot is consistent with the goals established by CPUC.

The proposed technologies are also aligned with the CPUC's definition of "enabling technologies." The Assigned Commissioner and Administrative Law

Judge's Ruling of September 24, 2015, entitled "Requiring Utilities to Prepare a Menu of Conventional and Experimental Opt-In Time-of-Use Pilot Rate Designs," states that "enabling technologies" "include, but are not limited to, Programmable Communicating Thermostats (PCT), software packages and apps to control energy use." This broad language is consistent with the Working Group's and the IOUs' discussions with Energy Division this Fall on this topic which has reinforced the conclusion that the CPUC intended the term "enabling technology" to include both of the technologies PG&E will study in this pilot: smart thermostats and a smartphone app.

Smart Thermostats have the potential to lead to large load reductions, but have a significant upfront cost, are primarily relevant to customers with central air conditioning, (for which there is only 44 percent penetration among residential households throughout PG&E's entire service territory), and have not yet achieved significant market penetration. Market penetration of Smart Thermostats is expected to increase over time, helped by adoption of price signals through default TOU rates, and through building code requirements.

In contrast, although Smartphones don't enable automation, an energy-use-related smartphone app can reach a *far larger percentage of customers*. In the four years from 2011-2015, the percent of American adults who own a smartphone has risen from 35 percent to 64 percent.[1] That historical trend, along with demographic indicators, suggests market adoption will only continue to grow. Moreover, smartphones are no longer relevant only to high-income customers; in fact, a significantly higher percentage of low-income households are dependent on their smartphones for internet access than high-income households.[2]

Thus, PG&E's approach of surveying existing Smart Thermostat owners within the pilot recruitment group, and offering the smartphone app to half of the entire pilot population, as described below, will provide useful information to complement the technology treatments being tested by Southern California Edison Company

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1 http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.

2 According to the Pew Research Center report "U.S. Smartphone Use in 2015," ("Pew Report") published on April 1, 2015:

> Some 13 percent of Americans with an annual household income of less than $30,000 per year are smartphone-dependent. Just 1 percent of Americans from households earning more than $75,000 per year rely on their smartphones to a similar degree for online access. (Pew Report, p. 17).

(SCE) and San Diego Gas & Electric Company (SDG&E). PG&E's approach to technology testing as part of the TOU pilot was arrived at collaboratively with the Energy Division and the pilot consultant, Nexant, Inc.

C. Smart Thermostats

1. Smart Thermostat Overview

PG&E supports the proposal described in Nexant Report to understand how Smart Thermostat owners interact with their devices when on a TOU rate. The findings will help inform stakeholders about the extent to which the smart thermostats tested in the pilot can help customers adapt to TOU rates compared to non-smart thermostats.

For the purposes of this pilot, PG&E defines a Smart Thermostat as a device that is: (1) internet-connected and capable of receiving and responding to receiving and reacting to real-time information; or (2) not internet-connected, but internet-capable and equipped with the sensors and software necessary to automatically adjust to customer behavior. Examples include thermostats from companies such as Nest, Honeywell, and Ecobee.

2. Literature Review and Related PG&E Research Efforts

The study of customers' ability (or inability) to operate programmable thermostats[3] has been an active field of behavioral research. In a 2011 literature review on residential programmable thermostat usage, researchers cite multiple studies that indicated: "programmable thermostats are too complicated to use, especially for the elderly."[4] Issues ranged from challenges in setting the current time and date, complex user interfaces, and small buttons and text. Referencing utilities' exploration into time-based pricing programs such as TOU, the authors concluded: "overlaying price-response on the current functionality of programmable thermostats will only increase the complexity of this already misunderstood and underutilized device."

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3 Unlike a Smart Thermostat, a programmable thermostat is not connected to the internet although it can be manually programmed to operate according to the operator's desired schedule.

4 Peffer, Therese, et al. "How People Use Thermostats in Homes: A Review." Building and Environment 46 (2011) pp. 2529-2541, June 3, 2011, at p. 2536.

Yet since the publication of this literature review, a new set of more advanced, and perhaps more user-friendly, Smart Thermostats have entered the market. Smart Thermostats place greater emphasis on user-friendliness by incorporating features such as integrated Smartphone apps, advanced software, sensors, and automation. PG&E estimates that, as of November 2015, at least 100,000 households in its service territory have at least one Smart Thermostat installed in their home.

PG&E is already actively engaged in understanding how these new technologies can positively impact customers' ability to control their energy use. For example, PG&E recently concluded a pilot with a randomized control trial (RCT) experimental design that involved giving treatment customers a Honeywell internet-enabled thermostat together with Opower software accessible on multiple platforms (smartphone app, web portal, and the unit itself).[5] The study found that 65 percent of treatment customers thought they reduced their energy use in response to the smart thermostat system. These customers referenced functionalities unique to smart thermostats, such as their ability to turn off their Heating, Ventilation and Air Conditioning system remotely after having forgotten to do so prior to leaving the house. Despite the treatment customers' conscious understanding of the benefits of Smart Thermostats, and their belief that such devices enabled them to save energy, the load impact analysis performed for the study revealed that customers did not show statistically significant energy savings.

Separately, PG&E is currently in the implementation phase of a technology assessment aimed at estimating the impact of advanced smart thermostats on energy savings. As part of this Emerging Technologies Program effort, approximately 2,000 customers will receive one of two internet-connected Smart Thermostats and installation free of charge. PG&E will estimate energy savings attributable to these devices over the course of a year by analyzing billing data of these 2,000 treatment customers compared to a control group. The findings from this Emerging Technologies Program could potentially inform

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5 PG&E's Emerging Technologies Program. "Findings from the Opower/Honeywell Smart Thermostat Field Assessment," July 24, 2014.

the design and launch of an energy efficiency product rebate offering for a larger PG&E customer base as early as 2017.

Despite PG&E's pre-existing active efforts to evaluate the effect of smart thermostats on customer energy usage, Energy Division and a few Working Group members nonetheless expressed a desire to explore using the Opt-In TOU Pilot to specifically study smart thermostats in the context of TOU rates. The underlying hypothesis is that, independent of what effect Smart Thermostats may have on the behavior of customers on time invariant rates, their impact may be different for customers on TOU rates. That said PG&E agrees with the Nexant Report that because SCE's and SDG&E's pilots will already be providing data on whether smart thermostats increase customer load shift in response to TOU rates, and given the overall high cost of recruiting and supporting the additional customers necessary to estimate statistically significant load impacts, a superior approach is to broaden the research agenda with more than one research design. Therefore PG&E proposes to gain additional qualitative information through a detailed ethnographic study that will reveal how smart thermostat customers' use these devices when on TOU rates (including for load shifting to non-peak hours), what barriers they actually experienced in trying to use the device, or what improved functionality they might desire to make it easier for them to shift or reduce load.

3. Smart Thermostat Experimental Design

PG&E proposes to use the Opt-In TOU Pilot as an opportunity to better understand how customers interact with Smart Thermostats when on a TOU rate. During the pilot enrollment process, PG&E will query all enrollees to determine who has already installed a qualifying smart thermostat. PG&E will also seek to recruit a subset of customers from the pilot with less advanced thermostats, such as non-internet-capable programmable thermostats, to serve as a comparison group.[6] Over the course of the pilot, PG&E will engage with these participants to seek answers to the following types of questions:

- Who in the household interacts with the thermostat?

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6 PG&E does not anticipate needing to pre-screen these customers prior to their enrollment into the pilot, rather they will be recruited during the pilot at the same time as those with smart thermostats.

- How often do they interact with the device and at what times or under what conditions (every day, on hot summer days, or only when certain household members are in the house)?
- What features of the device do they use (and what features don't they use)?
- What could improve their experience with the device, and, specifically, what additional features would they like to see added in the future?
- Does their thermostat give them sufficient control over their energy usage under a TOU rate?
- Does their thermostat make them more comfortable with a TOU rate than a less functional thermostat?
- Similarly, would another type of thermostat or specific features improve their satisfaction with a TOU rate?

By focusing on better understanding customer behavior, preferences, and expectations, stakeholders would gain a nuanced perspective on the value of Smart Thermostats in the context of TOU that would complement the load impacts being measured by other IOUs during the TOU pilot. Together, these qualitative and quantitative insights can help inform the CPUC's future policy decisions, such as those relating to the ultimate rollout of default TOU.

PG&E is actively exploring multiple ways to answer these questions of interest. Researchers can obtain qualitative information through various means, ranging from paper surveys, to in-depth phone interviews, to focus groups. Determining which methodology is most appropriate requires careful consideration of the behavior of interest, the available sample size, the timing, and the composition of the customers of interest. Ethnographic studies—which focus on detailed observations of specific individual behavior—are often performed through direct observation or by asking subjects to maintain detailed diaries documenting their behavior. Customers can even be asked to film their interaction with their devices.

PG&E is currently exploring a range of similar options, such as asking participants in this study to maintain detailed logs documenting their interaction with their thermostat, and following up with these customers through in-depth phone interviews. PG&E is also exploring the benefits of alternatively gathering information primarily through in-depth telephone interviews or focus groups. Each approach varies in critical ways. For example, asking customers to

maintain a diary or film a video better captures behavior over time, however it is more difficult to recruit customers who will commit to such a study over a long period of time. Additionally, larger incentives are typically required to encourage customers to participate given the commitment involved. Focus groups can also provide in-depth insights, however those insights are captured at one moment in time (versus over an extended period of time) and require participants to be geographically close together. It is important to note that specific details on *how* to best implement this study to answer the questions of interest will be refined upon further consultation with firms specializing in ethnographic studies, academic experts on thermostat user behavior, and leading companies in the industry in Q1 2016.

The insights gleaned from in-depth surveys and focus groups will produce a more nuanced understanding of customer behavior, preferences, and expectations, providing stakeholders with critical real-world evidence around the potential value of smart thermostats in the context of residential TOU rate treatments. The survey information will complement, instead of duplicate, smart thermostat load impact and customer acceptance research being conducted through the SCE and SDG&E pilots. However it must be acknowledged that the insights from Smart Thermostat owners will be obtained from a self-selected, early adopter segment of customers who chose to purchase these devices. During the default TOU Pilot in 2018, it is hoped that Smart Thermostats can be installed and tested on a randomly-selected population in at least one IOU's service territory.

4. Segmentation and Sample Size

To increase the explanatory power of the results, PG&E proposes to recruit customers from multiple segments:

- Customers with a Smart Thermostat assigned to a TOU Pilot Rate;
- Customers with a non-smart thermostat assigned to a TOU Pilot Rate; and
- Customers with a Smart Thermostat assigned to the pilot control rate.

The latter two segments will provide valuable reference cases with which to compare the results from the first segment. PG&E will be able to compare and contrast how TOU customers behave based on whether they have a Smart Thermostat or not. Similarly, PG&E will be able to compare and contrast how smart thermostat owners behave based on whether they are on a TOU rate or

not. Both comparisons will offer valuable perspectives than can help inform policy in advance of the rollout of default TOU.

PG&E intends to focus the study on pilot participants in its moderate and hot climate zones. These customers are of primary interest because customers located in cool climate zones tend to rely less on central air conditioning during the summer.

PG&E does not expect it to be necessary to over-recruit customers for this study. As noted in the Nexant Report, "ethnographic studies are qualitative in nature so these small cell sizes do not limit the insights that can be gained through this approach and are more than large enough to conduct such a study." Based on a review of studies of similar scope, PG&E believes it is reasonable to recruit a pool of up to 30 customers per segment for a diary-based ethnographic study, or 50 customers per segment for in-depth phone interviews. Based on data requests of certain manufacturers of qualifying Smart Thermostats, PG&E estimates that—absent any oversampling of Smart Thermostat owners—approximately 400 of its pilot participants are likely to own qualifying Smart Thermostats. PG&E believes this is a sufficient number from which to recruit customers for the ethnographic study, regardless of the methodology chosen.

If upon the pre-test in early 2016, PG&E anticipates challenges in recruiting sufficient customers from the existing pilot pool, PG&E will work with qualifying Smart Thermostat vendors to recruit additional Smart Thermostat owners so as to achieve the desired target number of participants for the study.

5. Smart Thermostat Treatment Timing and Budget

PG&E intends to use the pre-screening process for the overall TOU pilot as an opportunity to identify customers who own a qualifying Smart Thermostat. PG&E will follow up with self-identifying customers and ask them to participate in the study, in exchange for an additional incentive ranging between approximately $150 to $500—depending on the type of study chosen and the level of commitment expected of the participant. A higher commitment, such as asking customers to maintain a detailed diary, will require a higher incentive amount but will also require smaller sample sizes to obtain meaningful results.

PG&E will administer the study during and/or immediately following the end of the first summer, depending on the methodology chosen. Additional

research will be conducted during the second summer and/or after the entire pilot ends. PG&E will prepare a report on findings, the specific timing to be determined after consultant is hired, and incorporated as appropriate into PG&E's January 1, 2018 Rate Design Window (default TOU proposal) application.

The cost to implement this component of the pilot is expected to be approximately $70,000 to $100,000 for two summers.[7] This cost includes an incentive to encourage customers to participate in this portion of the pilot, and an incentive to Smart Thermostat manufacturers if their assistance is needed to recruit a sufficient number of customers. PG&E plans to hire a consultant to design the survey and run the study, at an additional cost of $400,000.[8]

D. Informational/Educational Smartphone App

1. Smartphone App Treatment Overview

PG&E supports the proposal described in the Nexant Report to understand how the availability of, and active interaction with, a Smartphone app can increase satisfaction and understanding of a residential TOU rate. While the study will focus on the impact of the app on customer satisfaction and understanding of TOU, load impacts may also be estimated if a sufficient number of pilot participants choose to use the app.

2. Smartphone Experimental Design

As described in the Nexant Report, PG&E will implement this study using a Randomized Encouragement Design (RED). The process of implementing and evaluating an RED experiment is well-documented in the Nexant Report, but

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7 These estimates assume 60-90 customers across all three segments are recruited. A high-end estimate of the cost to recruit is $500 per customer, which creates a range of $30,000-$45,000. An additional $10,000 is allocated for potential payments to thermostat vendors.

8 PG&E has found that costs for ethnographic studies can vary widely depending on the overall scope as well as the frequency and complexity of the interviewing and data gathering process. However, due to the amount of personal interaction involved in a typical ethnographic study, costs can be high and may not necessarily benefit from economies of scale as the number of customers goes up. PG&E arrived at this estimate by allocating $200,000 for each summer, which it believes to be a reasonable estimate of the cost to perform a high-quality ethnographic study involving the proposed number of customers. If the cost to perform an in-depth study is higher than currently anticipated, it may be necessary to reduce the sample size or focus the study on one summer.

the key difference from an RCT is that an RED involves randomly assigning customers into two groups, and offering the treatment to only one of the groups. The primary advantage of an RED is that, unlike an RCT, a RED enables researchers to measure the impact of a treatment without having to deny the treatment to a subset of customers who were offered it. Customers in the pilot will already be asked to face uncertainty with regard to what rate they are assigned; avoiding a similar situation for the Smartphone app will minimize customer dissatisfaction.

PG&E will monitor customers' behavior on the app and, as a part of the two statewide surveys following the 2016 and 2017 summers, seek answers to the following questions:

- Does the treatment increase customer acceptance of TOU rates?
- Does it increase customer satisfaction with TOU rates?
- Does it impact customers' interaction with other PG&E energy management services?
- If possible: Does the treatment cause more load shift in response to TOU rates?

The study will have several advantages and limitations. It will be one of industry's first real-world studies on customers' interest in monitoring residential energy use via their smartphones when on a TOU rate. It will provide information on how this type of technology affects understanding and satisfaction of TOU rates. It may also provide information on whether such technology can enable customers to shift load in response to TOU price signals. However, the experiment will also be specific to one vendor and one single set of product features due to practical cost constraints. Additionally, in an environment where smartphone users are inundated with advertisements and incentives from a wide variety of companies to try new smartphone apps and associated services, PG&E will not be able to take advantage of a long and persistent marketing campaign to encourage customers to download and actively use the app. Although PG&E plans to actively market the app to treatment customers during the pilot, the take up rate and engagement rate observed during the pilot is unlikely to be representative of the app's long-term potential.

E. Proposed Preliminary Schedule and Estimated Costs

PG&E presents below its current preliminary projected schedule and estimated budget for these two technology assessments. The total estimated costs expected to be recorded in the Memorandum Account for 2016 technology assessment costs is $525,000 and the annual costs for 2017 and 2018, to be recovered through PG&E's 2017 General Rate Case Phase 1 proceeding, is currently estimated at $450,000 for 2017 and $100,000 for 2018, for a grand total of $1,075,000 to conduct these two technology assessments as proposed by PG&E and recommended in the Nexant Report.

TABLE 6-1
PROPOSED SCHEDULE FOR PG&E'S SMART THERMOSTAT AND SMARTPHONE APP TECHNOLOGY ASSESSMENTS

	Q1&2 2016	Q3&4 2016	Q1&2 2017	Q3&4 2017	Q1&2 2018
Smart Thermostat study					
Identify Smart Thermostat owners from pilot sample					
Recruit customers for study					
Conduct first round of surveys and focus groups					
Conduct second round of surveys and focus groups					
Publish findings					
Smartphone app					
Product development[(a)]					
Launch product for pilot participants					
Gather first round of survey results					
Gather second round of survey results					
Publish findings					

(a) Although PG&E is targeting the release of the app by June 1, 2016, PG&E cannot guarantee that all milestones necessary to prepare the product for use (such as security review clearance, product development, and user acceptance testing) will be met in time to meet this date.

TABLE 6-2
ESTIMATED COSTS FOR PG&E'S SMART THERMOSTAT AND SMARTPHONE APP TECHNOLOGY ASSESSMENTS

	2015/2016	2017	2018
Smart Thermostat Study			
Implementation	$50,000	$50,000	
Ethnographic Research	$200,000	$125,000	$75,000
Smartphone App			
Implementation	$250,000	$250,000	
Measurement and Evaluation	$25,000	$25,000	$25,000
Total	$525,000	$450,000	$100,000

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 7

TOU PILOT RECRUITMENT PRE-TEST

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TOU PILOT RECRUITMENT PRE-TEST

A. Introduction

In January 2016, Pacific Gas and Electric Company (PG&E) will conduct a pre-test of pilot recruitment (pre-test) that will provide essential information to help PG&E refine the Opt-In TOU recruitment that will begin in March 2016.

The recruitment pre-test will provide essential input that will assist PG&E with finalizing the approach for outreach and help determine the following for the pilot recruitment outreach:

1) What is the most effective and expeditious delivery method(s) for recruitment communications that results in customer participation?
2) What levels of customer incentives will work best to maximize participation in the pilot at the least cost?
3) What other information can be obtained to refine the communications methods and enrollment procedures before full roll-out of the pilot in the spring?

PG&E agrees with, and incorporates by reference Section(s) 3.7 and 4.2.3 of the Nexant Report relating to TOU Pilot Pre-Testing, and provides the following fuller PG&E-specific descriptions, scheduling and cost-estimate information to supplement the Nexant Report.

B. Why a Pre-Test Is Needed

In alignment with both standard practice and the Working Group's recommendation for pilot pre-tests, PG&E will conduct a pre-test of Opt-In TOU pilot recruitment in January 2016.

1. Timing Challenge Given Target June 1, 2016 Launch Date

Such a pre-test for this particular pilot is of critical importance because PG&E has no prior research and little market intelligence on a short-term recruitment for an opt-in TOU pilot program like this, or opt-in TOU rates with these features. Once the California Public Utilities Commission (CPUC or Commission) issues a final Resolution approving the pilot design, there will only be a very short window (probably less than two months) to actually recruit the approximate 18,500 customer participants needed to satisfy the pilot design's sample size requirements.

The actual pilot recruitment period will be limited to about two months prior to the pilot beginning on June 1, 2016. If the CPUC issues its Resolution adopting the final Opt-In TOU Pilot structure at its February 25 Commission meeting, PG&E will conduct outreach over a two-and-a-half month period (in March, April and half of May). However, if the final Resolution is not adopted until the following CPUC meeting on March 17, 2016, PG&E will only have two months (from approximately mid-March to mid-May, pending exact details of CPUC's final Resolution) to recruit customers to be ready for the targeted June 1, 2015 start date for pilot roll-out. The pre-test is essential because this compressed schedule does not allow time for a standard, iterative "test and learn" approach that makes adjustments serially based on feedback from the immediate prior outreach effort. Such a test and learn approach was successfully used by Sacramento Municipal Utility District (SMUD) during its opt-in pilot recruitment process, in which it took SMUD a *full eight months* to recruit fewer than 4,000 opt-in TOU pilot participants.

At the Residential Rates Summit,[1] SMUD presented their experience and challenges with opt-in TOU recruitment that required an eight-month period to obtain enough participants. SMUD's pilot included a single defined rate that was described to the customer up-front. SMUD advised that it would be a significant challenge to recruit customers in a two- or even a three-month timeframe, and they had to employ a second set of tactics, including outbound calling, to achieve their enrollment goals in the eight-month period. SMUD's experience with its pilot further underscores why pre-test is essential, to ensure the recruitment communications are as effective and efficient as possible recruiting customers very quickly, as there is little time for follow-up tactics if the June 1, 2016 target start date is to be met.

2. Messaging Challenge Given Agreed Pilot Design

It is a big "ask" of a customer to get them to consider moving from their standard tiered Schedule E-1 rate, to which they have long been accustomed, to instead participate in an Opt-In TOU pilot with experimental TOU rates that vary by time of day (which seems like a "paradigm shift" for most customers). Specifically, the customer is being asked to participate and be randomly

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1 First Annual CPUC Residential Rates Summit. November 17, 2015.

assigned to one of three experimental TOU rates for 18 months without knowing the exact rate or details of the TOU rate onto which they will be placed. To prevent "cross-contamination" in the Opt-In TOU Pilot, the recruitment communications will not be able to provide customers details of the particular rates they might be assigned to as a pilot participant. Communications will be limited to a more general description of a TOU rate and that it is an opportunity to save money and help the environment by shifting some energy use to lower-priced hours of the day, and shifting energy use away from higher rates during the peak period mostly on weeknight evenings. With no prior research and very little market intelligence on short-term recruitment for opt-in TOU pilot rates like these, the pre-test is essential for successful actual recruitment for this Opt-In TOU Pilot.

As discussed in the TOU Working Group meetings, offering bill protection to customer may help them to be more inclined to participate. While this is likely true, offering bill protection also may change the way customer interact with the rate. PG&E will be exploring offering bill protection to customers as a way to boost enrollment.

C. Pre-Test Recruitment Details

The pre-test will include conducting outreach to approximately 2,000 customers with a goal of recruiting approximately 10 percent (or 200) customers during the month long pilot.[2] The pre-test will seek to learn the most cost-effective method(s) of delivery for achieving the necessary sample size in a short time, combined with the appropriate level of recruitment incentive necessary to get customers to sign up despite the "blind" nature of the pilot where assigned rates cannot be provided upfront. Southern California Edison Company (SCE) will design its January 2016 pre-test to study enrollment rates with and without bill protection (and with a lower participation incentive for bill protection customers). PG&E will leverage SCE's findings and proceed with PG&E's pre-test, and with testing bill protection via its Customer Voice Panel, as well as focus group findings to be conducted in January 2016. Based on the results of both PG&E's qualitative assessment and SCE's quantitative pre-test, PG&E will determine whether to offer bill protection to all

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[2] Eligible PG&E residential customers who agree during the pre-test to participate in the pilot will get a reserved spot for when PG&E's actual pilot is rolled out in June 2016.

customers for actual pilot recruitment (see also discussion of bill protection in Chapter 9).

1. Most Cost-Effective Methods of Delivery

Several methods of delivery of recruitment communications will be tested as a part of the pre-test. PG&E will evaluate the impact that each delivery method has on customer participation rates and the overall cost per customer enrolled. Of the 2,000 customers PG&E plans to contact during its January pre-test, one-half will receive direct mail customer recruitment communication through the United States Postal Service (USPS) first class mail and one-half will receive a letter envelope delivered by FedEx. The USPS letter will feature an outer envelope message and PG&E logo while the FedEx envelope will come standard (not include PG&E logo or message). This test will determine whether using a courier, such as a FedEx delivery, calls more attention to the opt-in TOU pilot communication and thus results in higher customer enrollment as compared with a standard letter envelope from PG&E delivered by the USPS. On the other hand the pre-test may find that FedEx delivery does not result in more and possibly less response if enough customers are concerned that it might be a scam or not really from the utility, since PG&E hasn't previously used FedEx to communicate about rate programs with residential customers. FedEx is a more costly delivery method so will only be employed if we find it will help enrollment relative to return on investment. Shortly after the pre-test is completed, the results will be evaluated to determine which method recruited the largest amount of customers and what the cost per enrollment was for each method tested. Other test results from the other investor-owned utilities will also be evaluated and considered where applicable. This will yield a conclusion about the most cost-effective approach necessary, and the number of outreach communications that must be sent out to achieve a total enrollment of 18,500 within a short period of time in the spring.

2. Most Appropriate Level of Incentive Pay-Outs Over the Pilot

The pre-test will also help evaluate the most appropriate level of incentive payouts to achieve adequate numbers of participants to meet all required sample sizes. PG&E will look at different combinations of payouts over time, including whether aggressive up-front payment amounts are needed, and what

level of subsequent payments during the remainder of the pilot, paid after completion of pilot surveys, has the greatest impact on customer enrollment. PG&E will evaluate various incentives options ranging from $175 to $250 and initial payouts of $50 or $100. PG&E proposes to test the following combination of delivery types and incentive levels.

TABLE 7-1
DELIVERY METHODS AND INCENTIVE LEVELS FOR PG&E PRE-TEST

Delivery Method	Incentive and Initial Payout	No. of Customers
FedEx	$250 $100	250
FedEx	$250 $50	250
FedEx	$175 $100	250
FedEx	$175 $50	250
Direct Mail Letter	$250 $100	250
Direct Mail Letter	$250 $50	250
Direct Mail Letter	$175 $100	250
Direct Mail Letter	$175 $50	250

With a short window for enrollments PG&E has a contingency recruitment plan that includes making live calls to customers and will be activated in the third week of January if enrollments are not on track to meet 200 in January. If the contingency calling plan is activated, customers who have been sent recruitment materials will be called and asked questions about receiving the pilot communications and why they haven't taken action to help identify recruitment weaknesses. They will also be invited to sign up for the pilot at that time. This live call provides an opportunity to inform customers about the pilot and answer any questions or concerns the customer may have and to obtain information about how to adjust recruitment going forward. If the recruitment goals are met without the need to activate the calling plan, this tactic and associated budget will not be utilized. During the SMUD pilot, SMUD identified a need to conduct outbound customer calls, and used this method during the last two months of the pilot recruitment period to increase opt-in TOU

enrollment levels. SMUD was ultimately able to recruit approximately 45 percent of the customers through direct mail outreach, but a full 35 percent of SMUD's Opt-In SPO Pilot customers signed up as a result of follow-up outbound calls.[3]

D. Costs

The following is PG&E's preliminary estimate of the likely costs of conducting its proposed one-month pre-pilot test in January 2016.

TABLE 7-2
TOU PRE-PILOT TEST (JANUARY 2016)

Tactic	Assumptions	Cost per Customer	Quantity	Estimated Budget
Direct Mail	Test to send 1/2 of the customers will receive recruitment materials using FedEx Delivery.	$10.25	1,000	$10,250
Direct Mail	Test to send 1/2 of the customers will receive recruitment materials using USPS.	$0.435	1,000	$435
Creative Material Development	Includes one month of agency time to develop outreach message development, creative material development, campaign execution, production, data pulls and sorting, etc.	N/A	N/A	$45,000
Outbound Calling	This contingency budget will be utilized if needed to reach enrollment of 2,000 customers. At this time it is unknown how many customer calls will be required to reach 2,000 customers in the pre-pilot test. Customer calls average $10-$15 per call. Assumption uses $12.50 per call and estimates calling 2,000 customers to encourage enrolment in the pilot as a part of the pre-test.	$12.50	2,000	$25,000
	Total Estimated Budget (January 2016)			$80,685

E. Timing

PG&E proposes to prepare for and execute its pre-test under the following schedule, with the main efforts taking place in January 2016.

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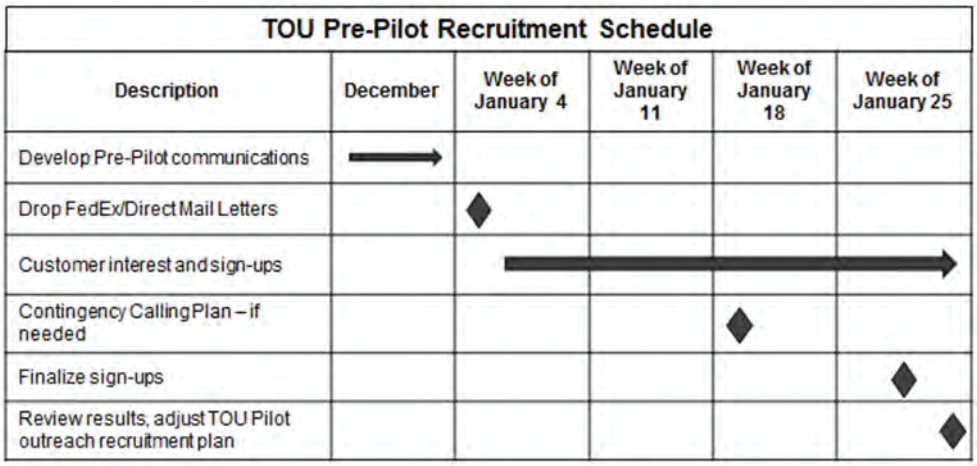
3 SMUD SmartPricing Options (SPO) Interim Evaluation, October 23, 2013, p. 89, Figure 20; Section 7.2.4 Outbound Customer Service Notifications, pp. 95-96.

FIGURE 7-1
TOU PRE-PILOT RECRUITMENT SCHEDULE



Based on the guidance from the Working Group and its consultant, Steve George of Nexant, Inc., and timing constraints in order to take learnings and adjust recruitment plans in time for launch, PG&E must proceed with this pre-test in January even before a final CPUC decision adopting the overall pilot proposal presented in Advice Letter and in the Nexant Report. Unless PG&E hears differently from the Commission before January 4, PG&E will proceed with the pre-test according to the schedule and parameters described above, and will record all actual costs into the Memorandum Account approved by the CPUC in D.15-07-001. If any changes were to be made to this pre-test plan, it would cause a delay in the pre-test and its results, which will be used to refine downward the high-end cost estimates included in this Advice Letter based on "road-tested" experience with actual customers. PG&E will share the results of its pre-test with the CPUC's Energy Division, the TOU Working Group, and Nexant, including the refinements PG&E concludes can be made to its Opt-In TOU plan and estimated costs based on pre-test results.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 8

OPT-IN TOU PILOT MARKETING RECRUITMENT PROPOSAL

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OPT-IN TOU PILOT MARKETING RECRUITMENT PROPOSAL

A. Introduction

This chapter describes the preliminary plan Pacific Gas and Electric Company (PG&E) has developed for recruiting the necessary number and types of customers into its Opt-In TOU pilot during March to mid-May 2016. This recruitment plan will be refined and finalized in early February 2016, after PG&E's January 2016 pre-pilot test is completed and evaluated.[1] That pre-test will provide additional insights necessary to select the most effective, expeditious and economical methods to refine and finalize PG&E's plan for recruiting customers during the short period between California Public Utilities Commission (CPUC or Commission) approval of the pilot plan proposal and the beginning of the Opt-In TOU Pilot targeted to start June 1, 2016. PG&E will begin recruiting customers for the TOU Opt-In pilot immediately after the CPUC issues its resolution on this Advice Letter, which is expected to be voted at by the Commission either at its February 25, 2016 or March 17, 2016 Commission meeting. PG&E's recruitment efforts need to be completed by approximately May 9, 2016 in order to allow time for preparation of customer assignment into rates and sending a welcome kit including rate information and tips before actual enrollment begins to take place on or about June 1, 2016.

B. Recruitment Goals

During the Opt-In TOU Pilot recruitment period, PG&E will conduct outreach to approximately 200,000 customers with the goal of recruiting 9 percent to 10 percent of the customers. According to the agreed sample size for PG&E's pilot, described in the Nexant Report and in Chapter 5 above, PG&E must recruit a total of approximately 18,500 customers and create stratified random rate assignments into either a control group non-TOU rate, or onto one of the three experimental TOU rates being tested in the pilot.

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1 PG&E's planned January 2016 pre-launch test of pilot recruitment ("pre-test") is described in Chapter 7.

C. Customer Enrollment Options

The recruitment communications will encourage customers to enroll in the pilot and will provide three ways for customers to enroll. The recruitment communications will include the following ways for customers to enroll, including:

1) A Business Reply Card ("BRC") – A postage-paid reply card for customers to fill out and return to opt-in to the TOU pilot.
2) Phone – A dedicated phone number for customers who want to call to learn more details about the pilot and enroll.
3) Website – PG&E will provide a website URL dedicated to the opt-in TOU pilot for customers to learn more and enroll online.

D. Opt-In Pilot Recruitment Plan

The plan PG&E describes in this chapter is preliminary and will be finalized once the pre-test described in Chapter 7 is complete. The insights from the pre-test will provide insights to recruit customers for this pilot in a compressed timeframe. PG&E's final plan will leverage best practices, lessons learned from Sacramento Municipal Utility District's (SMUD) opt-in pilot experience as detailed in the interim and final evaluation, and lessons learned from PG&E's opt-in residential rates programs, such as SmartRate™.

PG&E's preliminary plan includes the following tactics seeking to recruit 18,500 customers during March through mid-May 2016. The outreach plan presented below will be finalized after the completion of the pre-test at the end of January 2016. The lessons learned from the pre-test being conducted by PG&E, San Diego Gas & Electric Company (SDG&E), and Southern California Edison (SCE) will be applied to this plan to select the most cost-effective methods for recruiting the necessary number of customers in the limited time available.

1. Direct Mail

Customers targeted for pilot recruitment will receive a direct mail communications from PG&E in early March inviting them to participate in the opt-in pilot. The direct mail will be sent through FedEx or the United States Postal Service (USPS) depending on the results of the pre-pilot test as described in Chapter 7.

Since the amount of time to recruit customers will be limited to about a two-month period, there is not sufficient time prior to the launch of pilot

operations to send randomly selected customers multiple outreach touches that encourage them to agree to participate in this pilot. Typically, a multi-touch outreach campaign is conducted since most customers need to receive several communications before they respond to a call to action. PG&E's pre-test will determine whether or not sending pilot recruitment materials through a service like FedEx might draw more of a customer's attention and result in higher enrollment rates, as compared with a letter mailed through the USPS. PG&E will also leverage learnings from SCE's January 2016 pre-test on both direct mail channels and incentive amounts with and without bill protection, as well as from SDG&E's customer focus groups, and other relevant learnings.

If during the IOUs' collective pre-pilot tests it is determined that a FedEx delivery of recruitment materials is more effective at driving rapid customer participation, it will be selected as the direct mail recruitment method. If, however, the IOUs' pre-pilot tests shows that the USPS or some other method of direct mail is more effective, it will be selected instead as the direct mail delivery method. The preliminary cost estimates set forth below show a range of costs, from the higher cost scenario (assuming the FedEx channel might be used), as well as a lower cost (if the USPS channel is found to be more effective). The conservative, higher cost estimates below would be adjusted downward if PG&E finds that a less expensive method of direct mail outreach can achieve the required sample size in the limited time available for recruitment.

2. Live Customer Calls

PG&E is also proposing, as a contingency, the possibility of a follow-up recruitment plan that also includes live outbound calls to customers who received but did not respond to the prior direct mail or FedEx solicitation. That additional tactic would only be activated in April if the enrollments were not then on track to meet the necessary total of 18,500 customers for the pilot sample in time for the targeted June 1, 2016 launch. The outbound calling contingency plan that PG&E will be prepared to activate is based on lessons learned from the SMUD Smart Pricing Options (SPO) opt-in TOU pilot, which found that telephone outreach was necessary as a follow-up tactic to meet enrollment their enrollment goals. As mentioned in Chapter 7 on pre-pilot plans, during the SMUD SPO opt-in pilots SMUD identified a need to conduct outbound customer

calls and used this method during the last two months of its overall 8-month pilot recruitment period to recruit approximately 4,000 opt-in customers. Specifically, SMUD found that it was able to recruit approximately 45 percent of its opt-in TOU customers through direct mail outreach, and another 20 percent through the contact center and My Account based on the direct mail materials sent to them. But thereafter they were able to boost enrollment by another approximately 35 percent of solicited customers through outbound calling.[2]

If PG&E's contingency outbound calling plan were activated, customers who had already been sent recruitment materials would be called and personally encouraged to sign up for the pilot. This live call provides an opportunity to inform customers about the pilot and answer any questions or concerns they might have. If the recruitment goals can be met without activating this contingency outbound calling plan, this tactic and the associated costs for it estimated below would not be utilized. However, in order to present a conservative cost estimate, PG&E includes the cost of its outbound calling contingency plan in the cost estimates provided in Section I below.

E. Considerations for Specific Customer Groups

PG&E's proposal is based on a careful review of best practices, and lessons learned from prior PG&E residential rate program outreach, as well as on discussions with the TOU pilot Working Group, and the Marketing Education and Outreach (ME&O) Working Group. Based on all these inputs, PG&E has taken into consideration several specific customer groups in developing this proposed TOU Pilot outreach plan.

1. Economically Challenged Customers

PG&E will be drawing on its long experience working extensively on other communications to economically challenged customers who take service on the California Alternate Rates for Energy (CARE), Energy Saving Assistance (ESA) and Family Electric Rate Assistance (FERA) programs. PG&E is leveraging lessons learned on the communications styles that are more appropriate to meet the needs of these customers, in terms of the tone, manner, clarity, and

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2 *See* SMUD Smart Pricing Options Interim Evaluation, October 23, 2013. p. 89. Figure 20. *See also*, Section 7.2.4 Outbound Customer Service Notifications. p. 95-96. https://www.smartgrid.gov/files/MASTER_SMUD_CBS_Interim_Evaluation_Final_SUBMITTED_TO_TAG_20131023.pdf.

straightforwardness of messaging. Those same communications styles will be utilized for pilot recruitment outreach materials.

2. In-Language Communications

PG&E will also be drawing on its extensive experience with outreach to PG&E's diverse customer base, including customers for whom English is a second language or who are non-English speaking. As customers sign up to participate in the pilot, PG&E will be determining language preferences for all future communications. PG&E currently anticipates that in-language pilot outreach will need to be provided in English, Spanish and Chinese, but will assess the need for additional languages as the pre-test and actual pilot outreach rolls out.

3. Large Print

PG&E will include key recruitment information and calls to action in large print on outreach materials each based on TOU Working Group discussions with Melissa Kasnitz of the Center for Accessible Technology. Specifically, Ms. Kasnitz indicated during the Working Group meetings that large print should be used for certain key messages, so that disabled customers can more easily determine whether they want to keep the mail piece and seek to learn more so that they can determine whether they want to participate in the Opt-In TOU Pilot.

4. Renters

The recruitment is based on a random sample, PG&E's Opt-In TOU Pilot will include both customers who rent and own their homes. Census data[3] for PG&E's service territory identifies 57 percent of homes are owner occupied and 43 percent are renter occupied. Therefore, PG&E's recruitment and outreach materials will be geared towards both customer groups. PG&E plans the primary focus of its outreach to be on low cost and no cost solutions for managing energy use to ensure solutions can be implemented by all customers. Home upgrades to the structural building or interior will be a minor part of outreach that customers who are homeowners are more likely to implement.

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3 2009-2013 American Community Survey data release.

F. Messaging Strategy

Recruitment outreach messaging will leverage best practices, insights from SMUD's pilot, lessons learned from PG&E's SmartRate Program, lessons learned from the pilot's January pre- test, and insights from a Residential TOU Rate Development Conjoint Research Report (Hiner Res TOU Study).[4] PG&E will leverage the results of the Hiner Res TOU Study, which identified flexibility/control of usage, and saving money as the top two reasons for TOU rate plan preference.[5] Energy savings and environmental conservation will also be referenced as reasons to participate. In addition, PG&E plans to test its recruitment messaging with PG&E's existing online focus groups to further ensure that the planned messaging resonates with customers, prior to finalization of recruitment outreach. The pilot recruitment outreach materials will leverage insights of customer understanding gained during a "customer voice" panel and focus groups conducted in December 2015 and January 2016, as further described in Chapter 12, pages 12-4 and 12-5.

G. Recruitment Challenges

Enrolling approximately 18,500 customers into this residential Opt-In TOU Pilot in a very short period of time poses a significant challenge. PG&E's outreach must overcome the recruitment barriers and enroll enough customers into the pilot to meet the CPUC's targeted June 1, 2016 Pilot start date.

As discussed in Chapter 7, a significant challenge to overcome will be that customers cannot be informed, before or at the time of recruitment, of exactly which one of the three experimental TOU pilot rates onto which they will be randomly assigned. The Hiner Res TOU Study showed that the main reason for customers choosing a TOU cited "flexibility and control" (42 percent) while the second most important reason for TOU rate plan preference was the ability to save money

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4 *See* "TOU Rate Development Conjoint Research Report Among Residential Customers, Final Report," dated September 25, 2014, performed by Hiner and Associates as commissioned by PG&E. (Referred to herein as the Hiner Res TOU Study.) This Conjoint Research Report was received into evidence as part of Exhibit PG&E-1, Chapter 4, Attachment A in Application 14-11-014, PG&E's 2015 Rate Design Window decided in Decision 15-11-013.

5 TOU Rate Development Conjoint Research Report Among Residential Customers, Final Report, September 25, 2014, PG&E Presentation, p. 23.

(19 percent).[6] Since PG&E will not be able to inform customers of the specific test rate they will be placed on, it will be difficult to utilize these as selling points for participating in the TOU pilot. PG&E will not be able to tell the customer specifically how much they can control and save, or when, (i.e., a bill comparison can't be run without knowing the rate they will go to in the pilot and the three options vary significantly). PG&E will however be able to explain to them that for the majority of the hours of the day, under any of the three experimental rates, there will be lower prices, and only for between three to six hours of the day on weekdays (ranging from 4:00 p.m. to 10:00 p.m.) would prices be higher, so that if they can shift more usage to the low cost hours, they can manage their bill unlike on a monthly tiered rate where prices are the same throughout the day. PG&E will need to leverage other benefits of participation to encourage customers to participate in the pilot, including altruistic messages about contributing to future rates policy for all Californians and environmental benefits of grid demand reduction.

Customers will need to be educated generally about TOU rates and how they enable customers the opportunity to reduce their bill by moving usage away from the highest cost hours for purchasing power, among other benefits of a TOU rate. PG&E will also need to educate TOU pilot customers about how being on a TOU rate differs from the tiered rate plan they are currently on. Clearly, significant education will be needed as the Hiner Res TOU Study found that 25 percent of the Schedule E-1 customers surveyed thought they were already on a TOU rate plan, and only 55 percent of customers have heard of tiered rates.

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6 *Id.*, p. 23.

H. Timing

PG&E will begin developing the pilot recruitment materials and messaging in early 2016 to be prepared to launch the recruitment outreach materials as soon the Commission approves PG&E's TOU Pilot Advice Letter, either as possible after at its decision conference on February 25 or March 17, 2016. The schedule for PG&E's Opt-In TOU Pilot recruitment is set forth below.

TOU Pilot Recruitment Schedule				
Description	January 2016	March 2016	May 2016	June 2016
Conduct Pre-Recruitment Pilot	→			
Implement Pre-Recruitment findings to final plan	◆			
Begin pilot recruitment		◆		
Conduct contingency outreach – if needed			◆	
Pilot rates begin June 1, 2016				◆

I. Recruitment Costs

PG&E's estimate for the recruitment costs for its Opt-In TOU Pilot is preliminary and cannot be finalized until after the IOUs' pre-tests, discussed in Chapter 7, are completed. The preliminary forecast of estimated recruitment outreach costs set forth below includes certain higher cost tactics for conducting outreach to 200,000 customers. The forecast provides an estimate of the potential high-end uppermost costs of outreach because PG&E does not and cannot currently know whether the necessary enrollment levels can be achieved in such a short time without using these types of higher cost tactics. If the pre-test shows those less expensive methods can be effective enough to achieve the necessary level of expedited Opt-In TOU Pilot recruitment, PG&E will not utilize the full amounts shown in Table 8-1 below.

TABLE 8-1
PG&E'S OPT-IN TOU PILOT RECRUITMENT OUTREACH PRELIMINARY COST ESTIMATES
(FEBRUARY, MARCH, APRIL AND MAY 2016)

Tactic	Assumptions	Cost Per Customer	Customer Count	Budget Allocation
Direct Mail	FedEx recruitment communications to 200,000 customers' home addresses at $10.25 per customer.	$10.25	200,000	$2,050,000
Creative Material Development	Includes agency time to develop outreach message development, creative material development, campaign execution, production, data pulls and sorting, etc.	N/A	N/A	$60,000
Outbound Calling	This contingency tactic would only be used during the latter part of the recruitment period if needed to reach total sample size of 18,500 enrollments. It is unknown how many customers will need to be called, if any, to reach a TOU pilot enrollment of 18, 500 eligible customers. Each call to a customer averages $10-$15. PG&E's contingency calling cost estimate is based on an assumption of $12.50 per call. The contingency calling plan assumes that customers to encourage enrolment in the pilot.	$12.50	40,000	$500,000
	Budget Allocation			$2,110,000

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 9

INFORMATION TECHNOLOGY AND OPERATIONAL NEEDS

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INFORMATION TECHNOLOGY AND OPERATIONAL NEEDS

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CHAPTER 9
INFORMATION TECHNOLOGY AND OPERATIONAL NEEDS

A. Introduction

This chapter describes the Information Technology (IT) costs that Pacific Gas and Electric Company (PG&E) will incur to implement its residential Opt-In TOU Rate Pilot.

As described in earlier chapters, this Opt-In TOU Pilot will require a number of changes in how PG&E will need to interact with the customers who choose to participate in the Pilot and will require PG&E to do significant incremental work to compile and manage customer and system data. These changes lead to the development of new business requirements for various PG&E departments, which ultimately translate into new requirements for PG&E's IT infrastructure (including, e.g., some structural changes to PG&E's billing system due to a new rate design that is not currently programmed).

To prepare the initial IT cost estimate, PG&E performed assessment of the changes and enhancements required to its IT systems to implement the Opt-In TOU Pilot. This assessment was based on the high-level business requirements developed by affected PG&E departments, based on the discussions from the TOU Working Group. PG&E established its estimated costs for these changes and enhancements using its prior experience with similar system enhancements.

The remainder of this chapter is organized as follows:

- Section B – IT Planning Considerations
- Section C – IT Pilot Rates Scope
- Section D – System Modifications
- Section E – Timeline and Cost Table
- Section F – Timetable Risk Factors
- Section G – Operational Need and Education/Outreach

B. IT Planning Considerations

PG&E has numerous inter-related IT systems that support the day-to-day operations of its gas and electric service and PG&E's interaction with its customers, including billing. While PG&E has upgraded its systems over the years to enhance system flexibility to adapt to a changing market and regulatory environment,

whenever new requirements arise that affect one or more of PG&E's IT systems, PG&E must carefully manage the system changes to avoid potentially serious system errors or failures.

Project scheduling involves, among other things, meeting the milestones, deadlines and budget associated with a given project, as well as Change Management/Resource Management any modifications that are made during the Project Delivery process. Project scheduling must take place within the context of regular operations and maintenance activities. As with any business operating with commercial software, new versions and updates become available at fairly regular intervals. These updates often contain software patches or enhanced functionality. Generally, PG&E prefers not upgrading to the latest revisions of software unless absolutely necessary as there is a risk associated with being on the cutting edge of any technology. Conversely, PG&E must schedule regular maintenance and upgrades to existing programs in order to capture the benefits of software patches and new functionalities before the version in PG&E's live systems becomes out-of-date from a service and support standpoint to maintain a stable IT Infrastructure.

C. Opt-in TOU Pilot Rates

A summary of the residential Opt-In TOU Pilot program is provided in the earlier chapters of this report, with the rates presented in Chapter 2. PG&E's rate proposals for its Opt-In TOU Pilot consist of three new TOU pilot rates.

TOU Pilot Rate 1 is based on PG&E's recently-adopted E-TOU-A rate (with baseline credit) which has a 5-hour peak period and a 4-month summer season. Since the E-TOU-A rate (along with E-TOU-B rate) is already being programmed into PG&E's billing system (to be available to customers March 1, 2016), for this Pilot Rate 1, PG&E will only have to change the TOU (weekday) peak period to 4:00 p.m. to 9:00 p.m. rather than E-TOU-A's initial 3:00 p.m. to 8:00 p.m. period (per D.15-11-013).

TOU Pilot Rate 2 (also with a baseline credit—since that is required for any default TOU rate), will also have a 4-month summer season, but with a shorter 3-hour peak period (from 6:00 p.m. to 9:00 p.m.) on weekdays and weekends, in addition to part-peak periods partial peak "shoulder periods" (from 4 p.m. – 6 p.m., and 9 p.m. – 10 p.m.) during the summer.

TOU Pilot Rate 3 will be the complex experimental TOU Rate, which will not only include a 4-month summer, and a summer (weekday) peak from 4:00 p.m. to 9:00 p.m. This rate also includes a new spring season from March through May, with three TOU periods: peak is weekdays from 4:00 p.m. to 9:00 p.m., super-off-peak is all days from 10:00 a.m. to 4:00 p.m., and off-peak is the remaining hours. TOU Pilot Rate 3 involves the most significant structural programming challenge, as it requires adding a whole new spring season in addition to other structural changes.

In addition to these high-level programming requirements, PG&E will program to address the pilot rate exclusion rules described in Chapter 4.

D. System Modifications

To be ready to deliver the Opt-In TOU Pilot Rates, PG&E must make necessary structure and logic programming changes to its core billing system.

- Implement new TOU Pilot Rates for eligible customers, which includes Billing System changes. TOU Pilot Rate 3 is an especially complex rate for PG&E to implement because it adds a third new, Spring season. Historically, PG&E rates have only been based on *two* seasons—summer and winter. The addition of a third season requires major structural changes that need to be thoroughly tested to verify that the usage data is framed accurately for billing purposes, and that there are no negative downstream impacts.
- Energy Statement (bill) modifications and updates are also required to support the new Spring Season and different time periods.
- Update Interfaces to and from dependent and related systems (such as Revenue Reporting System) to recognize the new rates.
- Implement a process to synchronize PG&E's Customer Information System (CIS) with the Enrollment and Tracking Database for Pilot Participation.

Any major billing system modifications by PG&E represent a significant undertaking, with myriad interdependencies. PG&E's billing system is an integral part of PG&E's overall IT infrastructure and customer relations. PG&E must do extensive testing to ensure the new rates are computed properly, bills are printed correctly, and dependent applications can integrate with system records.

As discussed previously, the most significant impact of the changes is the timing of the modifications for the target launch on June 1, 2016. These

modifications will need to be made while PG&E is implementing other projects including other rate programs and structural rate modifications.

E. Timeline and Cost Table

PG&E's IT professionals developed the preliminary cost estimate discussed in this chapter and shown below. As explained, the estimate was based on high-level business requirements provided by individual PG&E departments. PG&E reviewed the requirements provided by these departments and developed the cost estimate to upgrade the affected IT systems and/or incorporate new system functionality.

Early cost estimates for IT projects tend to be based on reasonable assumptions and informed judgment regarding the work to be performed. PG&E is anticipating the IT costs related to building these Pilot rates is likely to range from $900,000 to $1.3 million. Based on PG&E's preliminary cost estimate, PG&E expects that it will require six to nine months to design, build, and deploy the IT-related deliverables. Although PG&E normally does not start IT project planning until a final decision has been issued, given the time constraints in being ready to bill under the Pilot Rates starting June 1, 2016, PG&E has already begun planning and performed initial analysis, based on guidance from the Opt-in TOU Pilot Design Consultant, Dr. Steve George and the TOU Working Group to do so based on the pilot rate structures agreed to by Energy Division in early December 2015, in order to maximize the chances of being able to have all of the pilot rates ready by the target date of June 1, 2016.

F. Timetable Risk Factors

As mentioned above, PG&E's IT department has already begun planning and performed initial analysis to support the programming of the pilot rates as soon as possible.

Because the pilot rates use many of the components from the E-TOU-A and E-TOU-B rates plan that is currently being programmed (for a March 1, 2016 launch), PG&E will leverage these efforts, but cannot begin actually programming the TOU Pilot Rates until its E-TOU-A and E-TOU-B rates programming has been fully tested. Otherwise, defects could be promulgated through the building of new pilot rate plans. With that caveat, PG&E expects to continue with the analysis the pilot rates even before the Commission issues a final Resolution (expected to be voted out at either the February 25 or March 17 California Public Utilities

Commission (CPUC or Commission) Decision Conference). If the approved pilot rates differ in structure[1] from the rates that to which the Energy Division has agreed as part of the TOU Working Group process, then PG&E may not be able to meet the targeted June 1 launch date for these Opt-In TOU Pilot Rates.

G. Operational Need and Education/Outreach

PG&E will leverage its existing operational systems to support the pilot:

- CIS, which is PG&E's billing system, also known as CC&B (Customer Care and Billing);
- Online display of usage and costs (MyEnergy).

PG&E's billing information will be the system of record for customer attributes that impact their participation in the pilot, such as status (e.g., whether the customer has dropped out of the rate or moved), eligibility, rate plan and receipt of customer communication.

PG&E will contract to develop and maintain an initial dedicated web microsite to initially provide prospective pilot participants with additional information about the pilot, answer any enrollment questions, and to allow prospective participants to enroll in the pilot. Once the enrollment phase of the pilot is finished, the pilot microsite content will be used to provide the pilot participants with specific educational information to supplement the direct education and outreach tactics. Participants will be directed to their portion of the microsite based on their unique identifier. In this manner, participants will only see information relevant to *their* pilot rate. The microsite will provide customers with tips and tools to manage their usage and the content will be refreshed periodically to ensure that customers requiring assistance are continually engaged and informed about the pilot.

A new enrollment and tracking database will be developed to track enrollment in the pilot, assignment to a sample cell, participation in surveys, and disbursement of incentives. PG&E will develop a process to pass data between the billing system and the tracking database in order to keep the data synchronized. This two-way communication will help customer service representatives (CSR) address customer questions about their pilot participation and allow PG&E to track program metrics.

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1 Structural changes are not simple changes in a rate value, but rather they require system modifications to include a new rate structure, such as new TOU periods or new seasons, into which those rate values are entered.

For example, the following information will be passed from the Tracking Database to the CIS:

- Acknowledgement letter that the customer has successfully enrolled in the pilot
- Customers who have not successfully enrolled in the pilot and ineligibility reason
- Assignment of the customer to control and pilot rates
- Customers enrolled in the Opt-In TOU Pilot
- Customers sent a welcome kit
- Incentive payment(s) status
- Opt-outs

The following information will be passed from the CIS to the Tracking Database:

- Opt-outs
- Customer ineligibility once they have become a pilot participant and ineligibility reason
- Moves

PG&E estimates that this two-way communication will cost approximately $101,000 to $350,000 for 18 months of IT support.

Information from the Tracking Database will provide information to determine the number of participants in each customer segment. During the enrollment phase of the pilot, PG&E will use the Tracking Database to monitor, on a weekly basis, enrollment into each treatment cell and customer segment. PG&E will use this information to adjust the sample size calculation based on actual recruitment. PG&E will also use this information to assign customers to each cell; once this assignment is done, the tracking system sends the rate information to the billing system for bill calculation and transmittal to the customer. The Tracking Database will also be used to send welcome and education kits to customers that are specific to the rate plan to which that customer has been randomly assigned.

Incentives are disbursed when customers fulfill certain requirements associated with various milestone of the pilot, such as completing a survey. Completion of the milestone is sent to the Tracking Database, which will trigger the disbursement of the incentive. At the same time, this information is sent to the CIS so that CSRs can answer any questions about the incentive payment.

Customers need to call PG&E to opt-out of the pilot. Opting-out will be captured in the billing system, as customers will need to be migrated to either the

standard tiered rate plan or E-TOUA/B.[2] This opt-out information and the opt-out reason will be transmitted to the Tracking Database for monitoring and reporting.

See Chapter 10 on Customer Support for a description of how PG&E will handle customer inquiries about the pilot program, enrollment/un-enrollment, information about the TOU rate plan onto which that customer has been randomly placed, billing, incentive payment, and technology support.

H. Incentives

Customers will be provided an incentive for participating in the pilot. As discussed in Chapter 7, PG&E will be testing different combinations of incentive levels and payouts. For estimating budgets, PG&E assumes the most conservative scenario of $300 in incentives a possible additional survey payment ($25) for the Fall of 2017. For budgeting purposes, PG&E estimates three payouts for the $300 incentive:

1. The first payout will be done once the customers is enrolled into the pilot i.e., once the customers is put on the pilot rate or assigned to the control group which will happen in Summer 2016;
2. The second payout will be done after participating in the Joint IOU Survey #1, which will be conducted after the end of the first summer on the pilot (sometime in Early Fall 2016); and
3. The third and final payout will be done after participating in the Joint IOU Survey #2, which will be conducted after the end of the first Winter/Spring on the pilot (sometime in Early Summer 2017).

An additional incentive of $25 will be paid out after participating in the Joint IOU End of Pilot Survey, which will be conducted around the end of the Pilot (Fall 2017).

I. Decommissioning

Based on TOU Working Group consensus, PG&E understands that its pilot customers will be issued their last installment of their incentive payment after they complete the final survey, after Summer 2017. At that time, they may drop off the rate, but they will not actually be required to migrate off their pilot rate until December 31, 2017. This will provide useful information about how many customers might drop out of their pilot TOU rate once they are no longer getting any

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2 PG&E will use the existing training process for informing customers about the choice in rate plans.

more incentive payments, since there will not be any such incentives in a default TOU environment. Accordingly, in the third quarter of 2017, PG&E will contact all then-current pilot participants to thank them for their participation in the opt-in TOU pilot and to educate them about other available optional rate plans. Both test and control participants will be provided information about PG&E's existing residential rate plans including the existing Opt-in TOU rates (E-TOU-A and E-TOU-B), as well as about the expected timing of the shift to default TOU. If a participating customer on the TOU Pilot rates (not control group) does not affirmatively choose another rate plan, they will be migrated to the E-TOU-A rate plan after the end of the pilot.

J. Bill Protection

Pursuant to Pub. Util. Code Section 745(c)(4), "a customer shall not be subject to a *default* TOU rate schedule unless that residential customer has been. . . provided with no less than one year of bill protection during which the total amount paid by the residential customer for electric services shall not exceed the amount that would have been payable by the residential customer under that customer's previous rate schedule." (*See also* D.15-07-001, p. 318.) Although protection is required for the actual roll-out of the final default TOU rate during the first year after default is implemented for that customer, this 2016-2017 pilot is an opt-in pilot, and no customer is being defaulted without their prior consent to being on a TOU rate. As discussed in prior chapters, this opt-in pilot will rely on a research method that enrolls customers first on a pilot with an incentive to participate and then assigns participants randomly to one of three experimental TOU rates or a control rate. This method for an opt-in pilot is useful to inform parties of the relative load impacts and acceptance of a number of options under consideration for a 2019 default TOU tariff.

Bill protection is used to mitigate the risk of a rate change for customers who may be resistant to try a new rate due to the potential for higher bills. However, research has shown the bill protection can dampen load impact. For example, the first-year load impacts for PG&E's SmartRate program have shown that customers with bill protection provide less load than customers without bill protection.[3] In addition, the fact that the CPUC has required the opt-in pilot to be completed by the

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[3] 2010 Load Impact Evaluation of Pacific Gas and Electric Company's Time-Based Pricing Tariffs, Final Report, April 1, 2011, Freeman, Sullivan & Co.

end of 2017 means that there will not be enough time to adequately study performance both before and after bill protection because of the 18-month duration of the opt-in pilot. As a result, PG&E is not proposing the use of bill protection for its opt-in pilot.

Rather, PG&E proposes that bill protection be included as one of the research objectives in the 2018 default TOU pilot. In that default TOU context, bill protection could be studied to inform parties as to the value of bill protection to increase customer acceptance of a default TOU rate and reduce the opt-out rates. In other words, the opt-in pilot should focus on a comparison of different impacts that would expected *after* the first year of a default TOU rate when bill protection has ended, to gain a better understanding of the ultimate load impacts that are likely under each of the three opt-in pilot TOU rates. Then the default pilot will quantify and identify those customers that who are put onto the default rate but may not benefit on it without additional education and outreach to help them perform better on their rate by shifting usage as much as possible to non-peak hours in order to reduce negative bill impacts.

However, due to the large sample requirements for the opt-in pilot, and the short timeframe available to recruit them prior to the targeted June 1, 2016 start date, there have been concerns that it might nonetheless prove necessary to offer bill protection to increase the acceptance rate of the pilot. PG&E proposes to gain additional information regarding bill protection during its Communications' Optimization Consumer Panel in December 2015 and Communications' Optimization Focus Groups in January 2017. Bill protection would not only affect load response as discussed above, but also, by definition, bill protection will result in revenue loss because all of these pilot TOU rates are designed to be revenue neutral.

To compensate the subset of customers that paid more on a TOU rate relative to their otherwise applicable rate, yet not collect more from customers that saved money on the TOU pilot rate, necessarily creates a revenue shortfall that would be recovered from the residential class as a whole. Given that PG&E's pilot sample is approximately 18,500 customers, this will not be a significant shortfall for the

4.7 million customer residential class as a whole.[4] However, the bill protection payments would need to be treated as an additional pilot incentive payment for accounting purposes. Hence bill protection if included in the Opt-in TOU Pilot, could cause a significant increase in the 2017 pilot costs as shown in Table 9-1 below.

If bill protection is required for the Opt-in TOU Pilot, PG&E proposes to follow the following process – Calculate the bill difference between the customer's otherwise Applicable Tariff and the pilot TOU rate, and send a credit check to customers for this difference along with a letter (not on the monthly bill). PG&E would make this calculation once the customer has been in the pilot for one year. The calculation will not be made monthly; on a monthly basis, the pilot participants would see their true cost of being on the pilot rates. PG&E proposes to record the revenue shortfall as a cost in its Distribution Revenue Adjustment Mechanism (DRAM). The costs would be incorporated into the Annual Electric True-Up (AET) process. PG&E will file a Tier 1 Advice Letter to inform the Commission of the revenue shortfall. Because this revenue shortfall will not have been tracked in PG&E's billing system and projected to be a small percentage of overall revenues, and thus will not materially affect Utility User Tax (UUT), PG&E proposes to not true-up franchise fees and UUT.

True bill protection requires tracking the individual rate components so that accounts can be properly credited. For example, Utility Users' Tax will vary depending on revenues. To properly credit the affected cities, PG&E would need to track costs by components, not just at the bill level. This level of IT complexity will be addressed for the Default TOU, but is not possible to be completed in time for the pilot's June 1, 2016 target start date. Therefore, if the CPUC were to nonetheless order PG&E to include bill protection for the first year of the Opt-In TOU pilot, PG&E would have to manually calculate the 2017 bill protection credit outside of the billing system.

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4 It is not possible at this time to determine with any precision what the cost of bill protection are likely be in 2017 if implemented, but by way of a hypothetical illustration: if 25 percent of the participating customers proved to be "losers" under the TOU rate (30 percent of 18,500 ≈ 4,000 customers receiving some sort of bill protection payment in summer 2017), and if the annual differential between their TOU pilot rate and their otherwise applicable tariff were to average $500 per customer, then the potential bill protection cost for the PG&E pilot could be roughly estimated at approximately $2 million (a very conservative, high estimate).

TABLE 9-1
ESTIMATED IT AND OPERATION OPT-IN PILOT COSTS

	2015/2016	2017
TOU Pilot Rate 1	$150K – $250K	
TOU Pilot Rate 2	$150K – $250K	
TOU Pilot Rate 3	$600K – $800K	
Pre-Test Enrollment	$36K	
Pilot Rate Enrollment	$40K	
Pilot Rate Un-Enrollment		$40K
Synchronization Between CIS and Tracking Database	$34K – $120K	$67K – 230K
Pilot Enrollment and Tracking	$195K	$390K
Incentive Payment	3,700K	$2,312,5K
Bill Protection Calculation		$200K
Bill Protection Revenue Shortfall		$2,000K
Bill Protection Disbursement		$100K
Total	$4,905 K – $5391K	$5109.5K – $5272.5K

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 10

CUSTOMER SUPPORT

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CUSTOMER SUPPORT

A. Introduction

This chapter describes PG&E's proposed plan for how its Contact Center Operations (CCO) organization anticipates providing support to Pacific Gas and Electric (PG&E) customers throughout the duration of its residential Opt-In TOU Pilot.

PG&E incorporates by reference the Nexant Report, dated December 17, 2015, and adds the discussion below as to the PG&E-specific customer support activities and estimated costs that are expected to be caused by PG&E's Opt-In TOU Pilot.

B. Customer Support

The term Customer Support here includes responding to customer calls and e-mails regarding the Opt-In TOU Pilot. PG&E's CCO organization will provide customer support throughout three stages of the Pilot, during which customers may have different questions or concerns they want to discuss with PG&E: (1) throughout recruitment efforts leading up to the start of PG&E's Pilot (approximately four months from March-June 2016); (2) throughout actual Pilot operations from June 2016 through December 2017; and (3) for two months beyond the end of the Pilot, to respond to any inquiries related to the close of the Pilot.

PG&E forecasts $0.4 million in incremental costs related to customer contacts, including calls and e-mails, related to its Opt-In TOU Pilot. Most of these costs are expected to be incurred in 2016 during the recruitment and launch phase.

To arrive at this forecast PG&E assumed that eight percent of customers who receive a Pilot solicitation letter will contact PG&E's Contact Center (either with questions or to enroll). This estimated contact rate uses actual contact rates from prior PG&E rate education efforts (such as the Minimum Delivery Charge letters that were sent to approximately 400,000 customers in September 2015) as the starting point for calculation. While the actual contact rate resulting from the Minimum Delivery Charge letters was four percent, PG&E assumed that the contact rate for its Opt-In TOU Pilot will be higher (approximately double) since the Pilot outreach requests action to be taken by PG&E customers (to opt-in to the Pilot) as well as the pay-to-play recruitment approach which may cause customers to have more

questions and require more details. While there are no direct parallels or industry benchmarks, PG&E also considered the results of the 2013 Sacramento Municipal Utility District (SMUD) SmartPricing Options Interim Evaluation in arriving at its contact rate assumptions.[1] Even though PG&E has not estimated the contact rate to be higher than SMUD's, PG&E recognizes that the contact rate for PG&E Pilot customers may be higher than SMUD due to the TOU Working Group's experimental design for this Pilot, which calls for a "blind" assignment of willing customers to one of three TOU Pilot rates (or to a control group), in an effort to somewhat mimic default TOU conditions. This is a significant difference from SMUD's residential SPO Opt-In Pilot design, which allowed customers to be told about the specific rate onto which they would be placed if they agreed to participate.

PG&E's cost estimates detailed below are based on the 2015 end of year cost-per-call forecast of $9.56, escalated by 2.9 percent each year in 2016 through 2018.[2] The contact volume forecast is broken into five sections as follows:

1. Initial Contact (March 2016-June 2016): PG&E assumed that eight percent of the approximately 200,000[3] Pilot recruitment letters to be sent to randomly selected customers would result in a contact to PG&E prior to the start of the Pilot. This assumption results in a total estimate of 16,000 contacts to PG&E during the four-month period from March-June of 2016, for an average of 4,000 contacts per month during this four-month period.
   - 200,000 letters x 8% x $9.84 = $157,440
2. First Year Pilot Customer Contacts (July 2016-December 2016): PG&E assumed that six percent of the approximately 18,500 customers expected to

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1 *See* SMUD, "SmartPricing Options Interim Evaluation," Section 9.1, which describes SMUD's high call volume expectations during the SPO pilot. The actual contact center hours required to support SMUD's call volume during the first summer was less than 8,000 calls which is less than one third of what was planned (15 minute calls for a total of 6,000 hours or 24,000 calls). SMUD solicited 35,000 SPO pilot opt-in TOU participants.

2 The calculation for cost-per-call is based on January-November 2015 actual and December 2015 forecasted total CCO labor costs including burdens, adjusted to remove one-time non-recurring expenses divided by the January-November 2015 actual Customer Service Representative (CSR) calls handled and December 2015 forecasted CSR calls handled. E-mails are assumed to be included in the cost-per-call calculation for the purpose of the cost estimates described in this chapter. The labor escalation factors described in this chapter are consistent with that of PG&E's 2017 General Rate Case, Exhibit (PG&E-6).

3 *See* Chapter 8, Marketing and Recruitment, for assumptions. The number of letters sent is subject to change pending the results of the January pre-launch test.

participate in the Pilot were likely to contact PG&E every other month (three times) for the first calendar year of the Pilot. This assumption resulted in a total estimate of 1,110 contacts from July 2016 through December 2016.

- 18,500 customers x 6% x 3 contacts x $9.84 = $32,767

3. Second Year Pilot Customer Contacts (January 2017-December 2017): PG&E assumed that the customer contact rate would decline in the second calendar year of the Pilot, down to four percent every other month (six times), for a total of 4,440 contacts in 2017. This assumption is based on the results of the SMUD SmartPricing Options Interim Evaluation, completed in October 2013.
   - 18,500 customers x 4% x 6 contacts x $10.12 = $44,933
4. Incentive-Related Calls (September 2017): PG&E assumed that there will be a slight increase in contacts to PG&E from Pilot customers specifically inquiring about the discontinuation of the incentive in September 2017. PG&E assumed that four percent of 18,500 customers that could then still be participating in the Pilot were likely to contact PG&E once around September 2017, for a total of 740 contacts.
   - 18,500 customers x 4% x $10.12 = $7,489
5. Pilot Close-Out Calls (January 2018 – February 2018): PG&E assumed that four percent of 18,500 Pilot customers will contact PG&E once to inquire about the end of the Pilot.
   - 18,500 customers x 4% x $10.42 = $7,711

C. Employee Training

PG&E forecasts $0.1 million in incremental costs for the following employee training related to the Pilot.

1. Training Facilitation: The 2016 forecasted hourly rate for instructor-led training is $67.64. PG&E assumed that approximately 800 CCO employees, including supervisors and CSRs, will receive 30 minutes of instructor-led training. The content for this training will include general awareness and understanding of the Pilot as well as process-related information such as how to identify a Pilot customer and how to handle these types of contacts. In addition to general awareness training PG&E will provide more in-depth, specialized training to the remaining approximately 100 employees, to whom calls will be directed so they can respond to customer inquiries specifically related to the Pilot. PG&E assumed that the business hours for Pilot-related inquiries are Monday through

Friday from 8 a.m. to 5 p.m and that each training session will include an average of 20 employees.[4] The cost estimates also include 15 minutes of instructor preparation time per session.

a. Awareness Training: 40 sessions x 0.75 hours x $67.64 = $2,029
b. Specialty Training: 5 sessions x 2.25 hours x $67.64 = $761

2. Employee Training: The 2016 forecasted hourly rate for CCO is $48.49. Using the assumptions described in Section C.1, the employee training costs are forecasted as follows:

a. Awareness Training: 800 employees x 0.5 hours x $48.49 = $19,396
b. Specialty Training: 100 employees x 2 hours x $48.49 = $9,698

PG&E also assumed that supplemental web-based training and communication will be delivered to CCO employees throughout 2017. Based on the 2017 forecasted hourly rate for CCO of $49.90, the 2017 training costs are forecasted as follows:

- Supplemental training: 900 employees x 0.5 hours x $49.90 = $22,455

3. Training Development: PG&E assumed 450 hours for development of training content for CCO employees. This estimate assumes approximately 150 content development hours for every hour of instructor-led training. As described in Section C.1, the total instructor-led training for both the awareness and specialty training is forecasted to be two and a half hours for a total of 375 development hours. An additional 75 hours is included to account for subject matter expert and stakeholder reviews. The 2016 forecasted hourly training development rate is $77. The estimated cost for this work is forecasted as follows:

- 450 hours x $77 = $34,650

D. Technology, Reporting and Communication

PG&E forecasts $0.3 million in incremental costs to track and report customer contacts related to the Pilot, as well as ongoing communication support. PG&E assumed costs to establish a dedicated toll-free number, e-mail queue, various reporting capabilities and ongoing employee communications (including web-based training and communications) will require approximately one full-time equivalent

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4 Additional employees will need to be trained if the hours for responding to Pilot-related inquiries are expanded beyond Monday through Friday, 8 a.m. to 5 p.m.

over the course of the Pilot, from February 2016 through January 2018 (24 months). The forecasted hourly rate for this support is $67.64 in 2016, $69.60 in 2017 and $71.62 in 2018.[5] The estimated cost of this work is calculated as follows:

- 2016: 2,080 hours per year x 11/12 year x $67.64 = $128,967
- 2017: 2,080 hours per year x 1 year x $69.60 = $144,768
- 2018: 2,080 hours per year x 1/12 year x $71.62 = $12,414

E. Timing

PG&E proposes to prepare for and execute its customer support strategy under the schedule presented below in Table 10-1.

TABLE 10-1
PG&E PROPOSED CUSTOMER SUPPORT SCHEDULE

	Jan 2016 – May 2016	Summer 2016: Jun 2016 – Sep 2016	Winter & Spring: Oct 2016 – May 2017	Summer 2017: Jun 2017 – Sep 2017	Oct 2017 – Mar 2018
Customer support via contact center (phone & e-mail)					

F. Estimated Costs

PG&E's estimated costs for its CCO organization to support customer enrollment and inquiries related to the Pilot are presented below in Table 10-2.

TABLE 10-2
PG&E ESTIMATED CUSTOMER SUPPORT COSTS

	2016	2017	2018
Customer Support	$190,207	$52,422	$7,711
Employee Training	66,534	22,455	–
Technology, Reporting & Communication	128,967	144,768	12,414
Total	$385,708	$219,645	$20,125

[5] The 2017 and 2018 forecasted hourly rate assumed a 2.9 percent year-over-year increase for labor escalation.

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CHAPTER 11

EDUCATION AND OUTREACH DURING PILOT OPERATION

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EDUCATION AND OUTREACH DURING PILOT OPERATION

A. Introduction

The purpose of this chapter is to describe Pacific Gas and Electric Company's (PG&E) proposal for outreach to customers once the Opt-In Pilot begins on June 1, 2016 and throughout the duration of the pilot (ending December 31, 2017). PG&E's Education and Outreach (E&O) will focus on: (1) creating customer awareness of rates in general, and specifically about the experimental TOU rate onto which each pilot participant was placed; (2) customer acceptance of and satisfaction with the experimental rate on which they were placed; and (3) customer understanding of how to modify their usage in response to TOU rates so as to save on their bills. The insights gained during this Opt-In TOU Pilot will help identify the most effective ways to communicate with customers for default TOU, which the CPUC has determined should be implemented starting in 2019, as a part of residential rate reform.

PG&E generally supports and incorporates here by reference Section 4.2.3 of the Nexant Report, dated December 17, 2015, which describes PG&E's Education and Outreach (E&O) Plan. PG&E will not repeat it here but provides additional descriptions to augment and explain its Opt-In TOU Pilot E&O Plan, and provide the estimated forecast costs to conduct such efforts, for both 2016 and 2017.

B. Outreach Methods

Once a customer is enrolled onto one of the experimental rates being studied through PG&E's Opt-In TOU pilot, PG&E will begin sending customers E&O materials that we would expect to send to customers who are defaulting to a TOU. Customers will receive the following outreach materials during the first year of the pilot in 2016:

1. Welcome Kit

A Welcome Kit will be sent to each pilot participant after they have agreed to participate, shortly before the beginning of the Pilot. The Welcome Kit will include the following:

a. Rate Education – Customers will be informed of the rate in which they have been placed and provided specific details for the rate including pricing and peak time periods.
b. Performance Tips – Customers will be provided with tips on how to best perform on the rate, reminders on how to shift usage away from peak hours, tips for hotter and cooler climate zones, and low- and no-cost actions customers can take to manage their energy usage.
c. Seasonal Tips – Customers will be provided with seasonally relevant tips to help them manage their energy usage and perform best on their TOU rate.
d. Physical Reminder – Customers will be provided with a physical reminder, potentially in the form of an appliance magnet or cling, to provide an in-home/near or on appliance reminders featuring rate details.

There will be four different versions of the Welcome Kit, each tailored to the specific rate onto which the customer has been randomly assigned. In addition, the Welcome Kits will be provided in-language for the most preferred languages. At a minimum, PG&E plans to produce each of the four versions in English, Spanish, and Chinese. Customer language preferences will be evaluated at the end of the recruitment period and other versions will be made available as necessary.

2. In Season Direct Mail and Email

All customers will receive separate in-season communications to provide seasonally relevant low- and no-cost tips for how they might engage on the rate to shift their electric usage to lower cost hours during Summer 2016, Winter 2017, Spring 2017, and Summer 2017. These in season communications will be sent to customers by direct mail to their residence and/or to their email address if customers have provided PG&E with an email address at the time of enrollment, or had one on file with PG&E previously.

PG&E will explore using its nine existing customer personas, as appropriate, to aid outreach development and customer relevance and acceptance of messages during in-season direct mail and email outreach. These personas consist of customer groups who think, act, and believe similarly. Every PG&E customer has a specific persona attached to their profile. While PG&E's personas include nine different psychographic profiles, there are also many commonalities amongst them and it is possible to achieve efficient messaging

based on aggregated groupings of similar types of personas. An example of this is taking personas that tend to resonate more with “saving money” and grouping those together, while using personas that lean more towards “environmental messages” and connecting those similar personas. Once pilot participants have been identified, PG&E will be able to formulate education and outreach strategies that incorporate key attributes of persona groups and formulate how to best use this information in outreach messages, along with other interest and data points for messaging and versioning. While customer personas help with some messaging and targeting of customer preferences to specific programs, tools and/or energy actions, it is only one component of many in how PG&E identifies and communicates most appropriately with customers. Each outreach exercise must be assessed to determine the most strategic approach to talking with customers about energy solutions and options. Some uses of persona information and applicable messaging can be limited, such as in the case of TOU. Since customers will already be enrolled on the program, PG&E may be able to catch attention with various headlines and copy that may (or may not) provide some broad appeal. PG&E will need to continually evaluate our TOU customer groups based on multiple outreach and data points, including but not limited to persona information.

PG&E is currently assessing whether to test climate-specific, tailored outreach in some of its communications. These variations could focus on different tips for pilot participants in hot inland climate regions with high air conditioning usage, than the tips given to pilot participants in climate zones with milder climates where air conditioning saturation is low and installed air conditioners are infrequently used, to provide tips that are the more relevant to the customer. If any or all of the in season materials test climate specific communications, both the direct mail and e-mail will require development of several versions. Materials and content will be tested with customers to determine whether climate-region variant tips are helpful to customers—this also could vary by season. Out of an abundance of caution, PG&E includes in the cost estimates below the potential cost for doing so in all of its in season communications.

3. Dedicated Web Pages

For each pilot rate and the control rate, a dedicated web page will feature content specific to each rate that customers on that rate can visit at any time to find details about their TOU rate and tips for success. Communications will direct participants to a section of the microsite based on their unique identifier and only provide information relevant to their pilot rate. The sections of the microsite will be updated periodically with seasonally relevant tips and other information as assessed in-pilot.

4. Social Media Channel(s)

PG&E is exploring the option of hosting social media groups that are available by invite only to its Opt-In TOU Pilot participants on the pilot rates. Social media channels are a low-cost way to continually engage with customers and provide a platform for customers to engage with each other. These social media channels will be developed, maintained and the level of customer engagement evaluated over time and refined based on learnings. Social media channels will provide customers with education about performance on a TOU rate, plus tips and reminders for shifting load away from peak hours, additional seasonal tips, and additional ways customers can manage their energy use to potentially save more on their bills as the pilot progresses. This platform will also provide the opportunity for customers to interact with others by sharing stories or tips that have worked in their situations.

5. Smartphone Application/Web-Enabled Tool

PG&E will provide customers with a smartphone application or web-enabled tool as an additional way for customers to obtain information and engage with PG&E. PG&E plans to encourage approximately one half of the pilot participants to download PG&E's proposed Smartphone/web-enabled tool. This outreach is planned as a part of the outbound communications (e.g., in-season tips postcard). In addition, PG&E plans to conduct outreach to encourage the use of the app/web tools via two additional dedicated direct mail and email communications. Details on the Smartphone application and web-enabled tools can be found in the Information Technology Plan in Chapter 6.

6. Outreach Exclusions

Customers who opt-in to the TOU pilot will not be sent recruitment outreach materials on E-TOU A or B and will not receive any bill comparison reports for the duration of the pilot. This is in order to not contaminate pilot participants exposure to other rate information or encourage pilot opt-out.

PG&E differs with the Nexant Report (p. 68) in regard to post-season e-mails on rate performance. PG&E is concerned that at the first summer (2016), customers having just seen the highest potential rate impacts are likely to have a higher opt-out rate if presented with rate comparison information at that early stage. These customers will be given a Bill Protection True-Up report at the end of their first year where they can compare their performance on their TOU rate versus their otherwise applicable rate.

7. Pilot Notices

PG&E will send customers a direct mail and e-mail notification at the end of the Bill Protection period with end-of-year true-up information, as well as at the end of the Pilot, which will include important details about how long they can remain on their current pilot rate.

C. Considerations for Specific Customer Groups

Specific types of customers enrolled in the pilot may require additional specialized E&O messaging to understand and perform well on their TOU pilot rate. PG&E will leverage its extensive learnings from prior communications with such groups, and the best practices on communications that have already been developed, such as about the clarity, straightforwardness and manner of messaging, such as utilizing a customer-friendly tone and simple, straightforward communications.

1. Economically Challenged Customers

PG&E has worked extensively on communications to economically challenged customers on the California Alternate Rates for Energy (CARE), Energy Savings Assistance (ESA), and Family Electric Rate Assistance (FERA) programs communications styles to meet the needs of the customer regarding tone, manner, clarity, and straightforwardness of messaging. Those same communications styles will be utilized for pilot recruitment outreach materials.

2. In-Language Communications

PG&E will draw on extensive experience with outreach to PG&E's diverse customer's base including customers for whom English is a second language or who are non-English speaking. As customers sign up to participate in the pilot, PG&E will be determining language preferences for all future communications. PG&E current anticipates providing in-language pilot outreach will need to be provided in English, Spanish, and Chinese, but will assess the need for additional languages as more is learned about the needs of those who enroll in the pilot.

3. Large Print

PG&E will include key recruitment information and calls to action in large print on outreach materials, based on TOU Working Group discussions with Melissa Kasnitz of the Center for Accessible Technology.

4. Renters

Opt-In TOU Pilot participants will include residential customers who are either renters or homeowners. Census data[1] for PG&E's service territory identifies that 57 percent of homes are owner-occupied, whereas 43 percent are renter-occupied. Therefore, PG&E's recruitment and outreach materials will include information relevant to both of these customer groups. PG&E's outreach will primarily focus on providing low- and no-cost solutions for managing energy use, which can easily be implemented by both renters and homeowners, to ensure that solutions are something every customer can implement. Given that this Opt-In Pilot lasts only 18 months, it is unlikely that participants will make more expensive investments in upgrading to their structural building, which tends to hinge on some sense that the investment is cost-justified (i.e., a payback period, which would typically require cost-saving performance under the TOU rate over a number of years). Therefore, more expensive investments in home upgrades, which may be more likely to appeal to homeowners in a long-run default TOU rate environment, will be only be, at most, a minor part of outreach on tips.

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1 2009-2013 American Community Survey data release.

D. Timing

TABLE 11-1
PG&E'S ESTIMATED OPT-IN PILOT OUTREACH SCHEDULE

TOU In-Pilot Outreach Schedule						
Description	May 2016	June 2016	July 2016	Fall 2016	Winter 2016	Spring 2017
Send Customers a welcome kit	◆					
Pilot rates begin June 1, 2016		◆				
Launch social channel(s)		→	→	→	→	→
Mid-Summer 2016 Direct Mail + Email			◆			
Winter 2016 Direct Mail + Email					◆	
Spring 2017 Direct Mail + Email						◆
End of Bill Protection Notice						Q3 2017 →
End of Pilot Notice						Q3 2017 →

E. Estimated Costs

PG&E's preliminary estimates of the likely costs associated with its Opt-In TOU Pilot customer communications plan is presented below. The costs for communications are related to the June 1, 2016 pilot launch, communications through the last half of 2016 and communications throughout 2017 until the end of the Pilot. PG&E will evaluate and adjust outreach tactics throughout the Pilot utilizing lessons learned.

TABLE 11-2
ESTIMATED COSTS FOR TOU IN-PILOT CUSTOMER OUTREACH

Tactic	Details	Cost Per Customer	Quantity	2016 Proposed Budget	2017 Proposed Budget
Direct Mail Welcome Kit	Welcome Kit developed for each of the rates offered. Includes development of in-language versions. Kit includes information about the rate, how to best perform, low cost and no cost actions, etc.	$10	18,500	$185,000	–
Seasonal Direct Mail and Email	Winter, spring, and summer outreach to seasonal relevant tips provided in language. Materials may be further segmented and versioned by climate regions with tips for that zone and persona messaging. The 2016 outreach includes summer and winter outreach after the pilot begins in March 2016. $10 per customer will provide up to three direct mail and three email communications each year and also accounts for any direct messaging to those invited to engage with the smartphone app.	$10	18,500	$185,000	$185,000
Social Media	Create social media channel for Opt-In TOU Pilot participants only. Maintain the channel to provide continual engagement with customers participating on the TOU pilot rates.	N/A	N/A	$105,000	$29,000
Web Development	Develop web pages for each of the three rates being tested in the pilot.	N/A	N/A	$30,000	$30,000
Creative Development (Agency)	Includes outreach message development, creative material development, campaign execution, data pulls and sorting, etc. Material development includes Welcome Kits for each of the rates offered, seasonal winter, spring, and summer direct mail and email, and social media content. Includes costs for in-language development.	N/A	N/A	$360,000	$180,000
Direct Mail and E-Mail	End of Bill Protection Notice	$1.08	18,500		$20,000
Direct Mail and E-Mail	End of Pilot Notice	$1.08	18,500		$20,000
	Total Estimated Budget			**$865,000**	**$464,000**

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 12

CUSTOMER INSIGHT AND RESEARCH

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CHAPTER 12
CUSTOMER INSIGHT AND RESEARCH

A. Introduction

This chapter describes Pacific Gas and Electric Company's (PG&E) proposals for customer insight and research related to its Opt-In TOU Pilot. It is important to include research, such as surveys and focus groups, during and after the Opt-In Pilot to gain insights beyond simple load and bill impact quantitative analyses. Surveys and focus groups provide insights on: understanding of, and engagement and satisfaction, with program marketing materials; and experience with the rate plan. These insights will provide input to design a default TOU rate plan that is as successful as possible in terms of customer acceptance and engagement as well as customer retention.

PG&E incorporates here by reference and supports the Nexant Report's discussions regarding customer research surveys. PG&E's plan takes to heart Dr. Stephen George's caution that pilot participants should not be over-surveyed, and that surveys should not be too long—which dampens customer responses even when customers are being paid to do the survey. PG&E's customer research plan builds upon and supplements the Joint Investor-Owned Utility (IOU) Surveys (described in Chapter 13, Section 3), which are necessary to perform Measurement and Evaluation (M&E) of the pilot at the statewide level. PG&E's customer research plan consists of the following elements, all of which are necessary to assess customer understanding of, and satisfaction with, their pilot rate plan:

1. Initial Brief Questionnaire: A single, brief quantitative Enrollment Survey will be completed by customers as they sign up for the pilot;
2. Qualitative Research: The M&E quantitative surveys discussed above will be followed and complemented by:
    a. Focus Groups:
        - PG&E's research plan calls for two sessions of focus groups (one set in November 2016 and one in November 2017). PG&E anticipates that these two sessions will, in total, be comprised of 12 individual focus group meetings involving 6-8 customers in each session.

b. Telephone Interviews:
    i. PG&E's plan allows for in-depth telephone interviews if certain customer segments are challenging to recruit into focus groups (such as California Alternate Rates for Energy (CARE) customers, disabled customers or those with major hardships, and seniors).
    ii. PG&E's plan further calls for ad-hoc telephone interviews, when possible, of customers who decide to opt-out during the course of the pilot (the Nexant Report, Section 5.4, states that understanding why customers drop out will be important).
    iii. PG&E also plans to conduct telephone interviews with a sample of pilot participants following the 2016-2017 winter season, in order to assess perceived attitudinal and behavioral differences with respect to winter versus summer seasonal changes in the rate.

3. Additionally, in order to maximize the effectiveness of the pilot communications materials prior to the launch of the recruitment campaign, PG&E will be informally testing the pilot recruitment letters and Business Reply Cards (BRC) with PG&E's existing online research panel. Following the results of the online customer panel, PG&E will incorporate the findings and take the pilot communications material into focus groups in order to gain further insights and optimize communications.

PG&E has included, below, the broad topics that will be covered in both its qualitative focus group sessions and in-depth interviews to illustrate the importance of these customer interaction points.

It is important to remember that, as part of the pilot design agreed by the TOU Working Group, all pilot participants who opt-in to the program will already have been told that they will be asked to participate in surveys throughout the program, and they will also know that their participation incentive payment is contingent on completion of surveys. Thus, PG&E anticipates pilot participants may be predisposed to participation in *any* research, even those beyond those for which they will receive an incentive.

PG&E recommends instituting a cross-functional team among the IOUs to share communications plans, insights and successes to ensure efficiency in program and communications design, to meet by teleconference regularly throughout the preparations for and execution of the pilot.

B. Background and Basic Recommendation on Customer Research Approach

There are two main approaches to customer research; *quantitative surveys* which poll large numbers of customers to give concrete observations and approximate a projectable outcome from the entire population, and *qualitative approaches* which are designed to explore emotions, feelings and context for customer motivations and behaviors (qualitative often uncovers insights that can be overlooked in a questionnaire). Using these approaches in tandem provides both the breadth (quantitative) and depth (qualitative) of understanding of customer engagement in the program.

PG&E considers these customer engagement points as an opportunity for Opt-In TOU Pilot customers to provide their feedback to program components, helping PG&E to refine everything from communications to program elements and participation criteria. The research program is designed to give insights into the needs of specific customer populations of interest such as CARE/Family Electric Rate Assistance (FERA) customers and senior households who may be especially economically vulnerable, as well as specific outreach targets such as non-English speaking customers, and renters. By leveraging qualitative research as well as quantitative surveys at various times throughout the pilot duration, PG&E will be able to explore in-depth customer populations in terms of rate understanding, engagement, and satisfaction, and be especially sensitive to economic hardships and/or difficulties on the rate. At the same time, through use of limited qualitative research methodologies such as focus groups or in-depth phone interviews, PG&E takes into consideration not wanting to bias customer behavior or responses through over-surveying, as recommended in the Nexant Report.

PG&E proposed research approach is as follows in Table 12-1:

TABLE 12-1
PG&E PROPOSED CUSTOMER INSIGHT AND RESEARCH APPROACH

	Feedback Method	Purpose	Sample Frame/N	Timing
1	Communications Optimization Customer Voice Panel	Optimize the pilot invitation to ensure materials clearly communicate rate information, and engage program participation.	Customers in PG&E's Customer Voice Panel, prequalified for the TOU Pilot. N=300	December 2015
2	Communications Optimization Focus Groups	Optimize the communications materials to ensure they drive program participation, and clearly communicate rate details and energy management strategies.	Prequalified customers in different climate zones/6 focus groups. N=48	January/February 2016
3	Pre-Test Enrollment Survey	Collect key household (HH) demographics, Air Conditioning (AC)/Smart Thermostat use, contact information, language preference.	Qualified participating customers. N=2000	January/February 2016
4	Enrollment Survey	Collect key HH demographics, AC/Smart Thermostat use, contact information, language preference.	All participating customers. N=18,500	March-May 2016
5	Interim Program Evaluation Focus Groups and Telephone Interviews	Explore rate understanding and program experiences, and inform tone and content of future communications.	Participants in different climate zones / 6 focus groups and 10 interviews. N=58	November 2016
6	Program Evaluation Winter Season Telephone Interviews	Explore winter season experiences, understand attitudinal and behavioral reactions and inform any seasonal program communications content.	Participants in different climate zones. N=30	March/April 2017
7	End-of-Pilot Evaluation Customer Focus Groups	Explore opportunities to improve rate understanding and engagement.	Participants in different climate zones/6 focus groups. N=48	November 2017
8	Opt-Out Telephone Interviews	Explore drivers and motivations for dropping out of the program.	Opt-Outs in 3 climate zones. N=20 per wave	November 2016 and May 2017

1. *Communications Optimization "Customer Voice Panel"*

   Timing: December 2015

   Method: PG&E's Customer Panel

   Objectives: To understand customer reactions to communications (specifically, the pilot enrollment letter and BRC. The research will investigate:

   - Customers' understanding of messaging
   - Which messaging most motivates them
   - Their willingness to participate in the pilot
   - Whether and by how much bill protection increases likelihood of participation

   Target: Residential customers who are eligible to enroll in the TOU pilot

Cost: PG&E internal labor only

2. *Communications Optimization Customer Focus Groups*

   Timing: January/February 2016

   Method: Focus Groups

   Objectives: To understand customer reactions to communications in order optimize marketing materials (specifically, the pilot enrollment letter and BRC; other outreach may be included). The research will investigate:

   - Understanding of the invitational offer in the letter, including clarity of specific details:
     - Do customers understand what the commitment would be
   - Which aspects/benefits of the invitational offer are the most motivating:
     - Incentive vs. possible bill savings vs. altruism (informing energy policy)
   - Which aspects are the least motivating.
   - What are the perceived barriers to enrollment/participation.
   - What, if anything else, do they need to know to enroll.
   - Overall reasons for likely participation/non-participation.

   Target: Residential customers who are eligible to enroll in the TOU pilot.

   Cost: $54,200

3. *Pre-Test Enrollment Survey*

   Timing*:* January/February 2016

   Method*:* BRC contains a short questionnaire to be completed for program consideration. Opt-In to the program, and submission of the BRC is totally optional. Potential participants will also be able to complete their survey via phone and online, as they enroll.

   Objectives*:* Through this brief demographics-focused survey, we will also identify: customer technologies; renters; presence of any senior in the household; household income; and language/communications preferences. Data collected from this survey will be used to update classification of customers into senior and income segments (as recommended in the Nexant Report, Section 5.4).

   Target*:* Residential customers who are solicited for participation into the pre-test (and will be retained for the pilot).

   Cost*:* $6,000 (for survey development and analysis)

4. *Enrollment Survey*

   Timing: March-May 2016

   Method: Same survey as Item #3 above (could be modified according to findings). Survey will be available via BRC, phone or online.

   Objectives: Same as described in Item #3 above.

   Target: Residential customers who are solicited for participation into the program.

   Cost: $20,000 (for analysis only)

5. *Interim Program Evaluation Focus Groups and Telephone Interviews*

   Timing: November 2016, after completion of surveying by statewide consultant.

   Method: Focus groups and telephone interviews.

   Objectives: The objective of this qualitative research is to explore how pilot participants are understanding and experiencing the rate. PG&E will be sensitive to exploration of specific customer segments (seniors, economically vulnerable in hot zone, etc.) to ensure greater understanding of their participation challenges.

   Target: Groups to consist of pilot participants, CARE vs. non-CARE, divided by hot vs. moderate/cool zones. PG&E is also considering Spanish in-language groups. In-depth interviews by phone among potential hardship CARE and senior customers.

   Costs: $64,200

6. *Program Evaluation Winter Season Customer Interviews*

   Timing: March/April 2017

   Method: Telephone interviews

   Objectives: To determine understanding, acceptance, engagement and behavior of customers with regard to new TOU rate plans. Details as in (b) above, except that we are focusing on winter outreach awareness and engagement, and customer experiences and behaviors over the winter rather than summer.

   Target: Pilot participants

   Costs: $30,000

7. *End-of-Pilot Evaluation Focus Groups*

   Timing: November 2017

   Method: Focus groups

   Objectives: To further understand the customer experience in depth after two summers on the rates.

   Target: Pilot participants, details to be determined.

   Costs: Approximately $54,200

8. *Opt-Out Telephone Interviews*

   Timing: November 2016 and May 2017 (approximately post-summer and post-winter; dates are flexible according to drop-out rate).

   Methodology: In-depth telephone interviews (30-minutes each) to explore the drivers of pilot drop out.

   Objectives: Understand reasons for opt-out, and explore how communications, program design and other engagement tools could have played a role in keeping the customer on the program. To suggest modifications to ongoing communication and engagement materials to help maintain customer engagement throughout the pilot run.

   Costs: $40,000 (assuming 20 depths each time)

C. Overall Research Cost Summary

The total estimated cost of all of the customer insight and research outlined above is $268,600.

This breaks down to $164,400 for 2016, which would be recorded in PG&E's Memorandum Account, and $104,200 for 2017 and $0 for 2018, for which recovery would take place through PG&E's 2017 GRC Phase 1 requested cost recovery for TOU pilot expenses for those years, as discussed in Exhibit (PG&E-6), Chapter 3, pages 20-23, of PG&E's 2017 GRC (A.15-09-001).

TABLE 12-2
PG&E ESTIMATED COST OF RESEARCH STUDIES COSTS BY YEAR

Research Studies	2015/16	2017
Communications Optimization Focus Groups	$54,200	
Pre-Test Enrollment Survey	6,000	
Enrollment Survey	20,000	
Program Evaluation Focus Groups and Phone Interviews	64,200	
Program Evaluation Winter Season Phone Interviews		$30,000
End of Pilot Evaluation Focus Groups		54,200
Opt-Out Phone Interviews	20,000	20,000
Total:	$164,400	$104,200

Note: Research costs are all-inclusive (costs include: screener preparation; recruitment; interviewing/focus group moderation; incentives; analysis; reporting and web streaming (in the case of focus groups).

D. Research Schedule

TABLE 12-3
PG&E PROPOSED SCHEDULE FOR STUDIES

Research Studies	Dec 2015-May 2016	Jun-Sept 2016	Oct 2016-May 2017	Jun-November 2017
Communications Optimization "Customer Voice" Panel	X			
Communications Optimization Focus Groups	X			
Pre-Test Enrollment Survey	X			
Enrollment Survey	X			
Interim Program Evaluation Focus Groups and Phone Interviews		X		
Program Evaluation Winter Season Phone Interviews			X	
End of Pilot Evaluation Focus Groups				X
Opt-Out Phone Interviews			X	

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 13

MEASUREMENT AND EVALUATION PLAN

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CHAPTER 13
MEASUREMENT AND EVALUATION PLAN

A. Introduction

The purpose of this chapter is to describe Pacific Gas and Electric Company's (PG&E) planned measurement and evaluation (M&E) of customer response to the experimental TOU rates in the Opt-in TOU Pilot beginning in 2016. These activities will be closely coordinated with the Customer Insight and Research discussed in Chapter 12 and, to the extent possible, with the Technology Treatment Research discussed in Chapter 6.

PG&E incorporates by reference the discussion of the Evaluation Plan in Section 5 of the Nexant Report dated December 17, 2015, and PG&E generally supports the Nexant Report's evaluation recommendations, although a more detailed plan will be developed by the M&E consultant once selected. PG&E provides here explanatory information, including schedule and estimated cost detail, to augment the Nexant Report.

B. Measurement and Evaluation

PG&E proposes to coordinate with Southern California Edison Company, San Diego Gas & Electric Company, and California Public Utilities Commission (CPUC or Commission) to jointly hire a third-party evaluator to evaluate the results of all three Opt-In TOU pilots. The research, which will be coordinated at a statewide level and published at multiple stages over the course of the pilot, will primarily focus on informing the Investor-Owned Utilities (IOU) default TOU advice filings for which testimony must be prepared starting in the third quarter of 2017, and which must be filed by January 1, 2018 pursuant to Decision (D.) 15-07-001. The Statewide Report on Opt-In Pilots' M&E will cover: (1) customer enrollment and attrition rates; (2) load shift in response to the TOU rates; (3) changes in energy usage in response to the TOU rates; (4) bill impacts; and (5) customer satisfaction, engagement, and awareness. The results will be reported by the segments of interest as defined in the TOU Working Group's evaluation plan.

PG&E will plan in advance to collect the data necessary to perform the above analyses, which includes but is not limited to: (a) customer tracking data; (b) interval data; (c) billing data; and (d) survey responses.

PG&E has significant prior experience conducting load impact evaluations of dynamic rates, including TOU rates. Evaluations adhering to the demand response protocols adopted in D.08-04-050, *Decision Adopting Protocols for Estimating Demand Response Load Impacts,* are required for all dynamic rates offered by PG&E. However, while a number of analytical best practices from these demand response protocols may be useful for estimating residential Opt-In TOU Pilot impacts, some protocols are not directly aligned with the goals established for the Opt-In TOU Pilot. These include reporting recommendations for event-based DR programs (versus non-event based DR programs such as TOU) and the need to use ex-post impacts to provide a long-term forecast based on historical weather conditions. It is important to note that the ultimate goal of the Opt-in TOU Pilot is not to provide load impact forecasts to feed into long-term resource planning. Rather the goal is to generate internally valid comparisons across the three experimental rate designs to identify which rate will provide the optimal balance of customer acceptance and load shift. Default TOU load impacts and corresponding forecasts will be more accurately measured after PG&E's official default TOU rate design has been approved and PG&E is able to observe customer impacts in a true default setting, instead of a comparable but less ideal pay-to-play opt-in setting.

The M&E approach for PG&E's Opt-in TOU Pilot will therefore be more analogous to those evaluations of similar experimental TOU pilots meant to inform policy, such as the evaluation of Sacramento Municipal Utility Districts' SmartPricing Options (SMUD SPO) Pilot. For example, the SMUD SPO Pilot included both an interim report after one year of operation, and a final report after the full pilot period was complete. Below, PG&E proposes that a similar approach, with two interim reports and a final report, also be used here.

C. Survey Design and Implementation

The statewide surveys conducted[1] after summer 2016 and June 2017[2] are critical for measuring pilot outcomes. The surveys will help determine how

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1 There may also need to be a third statewide coordinated survey in October 2017, if appropriate, to gain better understanding if there are significant opt-out rates after July 2017 when customers will have received their final incentive payment because customers may choose to leave their Opt-In Pilot Rate, even though they may still remain on it until December 31, 2017. This late opt-out behavior may need to be studied.

2 I.e., at the end of participation period for the pilot incentive.

understanding, acceptance, engagement and behavior of customers vary across the experimental Opt-In TOU Rate Plans. In addition, the surveys will help inform whether seniors and low-income customers in hot climate zones are likely to suffer hardship if defaulted onto the experimental TOU rates.

The IOUs will work with an experienced survey design consultant to design and implement the pilot surveys, which will be closely coordinated among the three IOUs to ensure consistency and comparability across the three pilots. The survey design and the primary statewide evaluation may be contracted out to the same consultant or separate consultants, depending on the quality of proposals received.

While the surveys' specific content and design will be subject to further discussion among stakeholders and the consultant hired to design the survey, areas of investigation may include:

- Customer profiles
  - Demographics: Age, gender, ethnicity, languages spoken in the home, education, household income; and
  - Household characteristics: age of home, size of home, number and ages of people living in the home, presence of energy consuming appliances (Air Conditioning (AC), electric vs. gas water heating, pool, spa), types of light bulbs.
- Awareness and understanding of rate plan
  - Likes and dislikes;
  - Perceptions of benefits of the rate (e.g., agreement with benefit statements about the rate); and
  - Understanding what they need to do to be successful on their rate plan.
- Awareness of education and outreach materials (Welcome Kit, direct mail and email rate, social media)
  - Whether smartphone app downloaded and how utilized; and
  - Understanding and clarity of outreach messaging, how to apply tips/tools, usefulness.
- Behavioral information; what are they doing with regard to reducing and time shifting behaviors
  - Specific actions taken: used energy consuming devices before or after peak times, adjusted thermostat, pre-cooling, used fans instead of AC,

purchased more energy efficient appliances or bulbs, involved others in the household, etc.;

  - Specific problems encountered;
    1) "Severity" of problems; and
    2) Hardships caused by the new rate (inability to pay PG&E bill, foregoing other necessities in order to pay PG&E bill).
  - Perceptions of the amount of effort required to manage energy use.
- Attitudes towards the rate plan
  - Attitudes towards monthly bills and how have they changed; and
  - Beliefs about the bill impact of the new rate: did they save or pay more on the new rate, how much more or less compared to their previous rate.
- Satisfaction with rate plan; likelihood of remaining on the rate and of recommending to a friend

D. Schedule and Cost Estimates of Opt-In TOU Pilot

In coordination with the relevant parties, the IOUs will issue a Request for Proposals (RFP) to select a measurement and evaluation and survey design consultant in the first half of 2016. The proposals will be evaluated according to the consultants' proposed approach, relevant experience performing similar evaluations or surveys, team qualifications, and proposed cost.

To ensure timely reporting of results, PG&E recommends requesting the consultant produce two interim evaluations during the pilot and one final evaluation following its conclusion. PG&E believes a preliminary evaluation should be provided in Q1 2017, reporting on customer behavior and sentiment following the first summer of the pilot based on fall 2016 survey results and preliminary summer 2016 load impact results. The second interim evaluation should cover the entire first full year of the pilot, from June 1, 2016 to May 31, 2017, and be published by October 1, 2017 in order to provide results in time for rate design on the default TOU rate and program proposal that each of the IOUs' must file by January 1, 2018. A final report will be produced by the end of Q1 2018, in time for the CPUC to consider it as part of its review of the January 1, 2018 default TOU proposal filings. However it is important to note that the proposed schedule, outlined in response to the milestones defined in the CPUC's Residential Rate Reform decision, is extremely aggressive and will require all tasks, from data collection and validation, analysis, review, and reporting, to be accelerated beyond standard norms of

measurement and evaluation.[3] The proposed target milestones cannot be confirmed without validation from the consultants who bid on the proposed work in 2016.

PG&E provides cost estimates for estimates the statewide evaluation is likely to cost approximately $925,000 at the lower end to $1,250,000 at the higher end, split proportionately among the three IOUs. Consistent with the cost share percentages agreed upon by the three IOUs for statewide demand response evaluations, PG&E expects it is likely to be expected to incur 40 percent of the total cost, or $370,000 - $500,000. However, these initial cost estimates are highly uncertain and cannot be precisely assessed until after an RFP and contract negotiations are complete with the selected consultant.

[3] For example, the final report for the SMUD SPO Pilot, which concluded in Fall 2013, was published in September 2014.

TABLE 13-1
PILOT MEASUREMENT AND EVALUATION
PROPOSED SCHEDULE

	Q1&2 2016	Q3&4 2016	Q1&2 2017	Q3&4 2017	Q1&2 2018
Select M&E Consultant(s)					
Design Joint IOU Survey					
Administer Joint IOU Survey 1					
Data collection, validation, analysis, and review					
1st Interim Report					
Data collection, validation, analysis, and review					
2nd Interim Report					
Administer Joint IOU Survey 2					
Administer Joint IOU Survey 3 (if necessary)					
Advice Letter filing					
Data collection, validation, analysis, and review					
Final Report					

TABLE 13-2
PILOT M&E PRELIMINARY ESTIMATED COSTS

M&E	2015/2016	2017	2018
Survey Design	$40,000	$20,000	
Survey Implementation	$80,000	$120,000	
M&E Consultant	$100,000	$100,000	$40,000
Total	$220,000	$240,000	$40,000

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CHAPTER 14

OPT-IN TOU HIGH-LEVEL SCHEDULE

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OPT-IN TOU HIGH-LEVEL SCHEDULE

A. Introduction

This chapter attempts to give a high-level view of the schedule for the Opt-in TOU Pilot that is planned to start in June 2016 and end December 31, 2017. The tasks listed here for 2018 are only for the Opt-In TOU Pilot, and do not include tasks associated with the default TOU pilot since the TOU Working Group has agreed that the 2018 default pilots will not begin being designed until after August 2016. Tasks for 2018 listed here include carry-over tasks for the 2016-2017 Opt-In TOU Pilots (e.g., final Measurement & Evaluation analysis and report production in Q1 2018).

B. High-level Schedule

TABLE 14-1
HIGH LEVEL SCHEDULE

	Aug2015-Dec2015	Jan2016-May2016	Summer 2016: Jun2016-Sept2016	Winter and Spring: Oct2016-May 2017	Summer 2017: June2017-Sept2017	Oct2017-Mar2018
Opt-In TOU Pilot Design						
TOU Pilot WG consensus on the 3 Pilot Rates and the control rate						
Build Pilot rates in PG&E IT and Billing system						
Tier 3 Advice Letter Filing on Opt-In TOU Pilot Design						
Communications Optimization Customer Voice Panel						
TOU Pilot Recruitment Pre-Test						
Communications Optimization customer Focus Groups						
CPUC Decision on the Opt-In TOU Pilot Tier 3 Advice Letter						
TOU Pilot Recruitment and Enrollment Survey						
TOU Pilot Training						

TABLE 14-1
HIGH LEVEL SCHEDULE
(CONTINUED)

	Aug2015-Dec2015	Jan2016-May2016	Summer 2016: Jun2016-Sept2016	Winter and Spring: Oct2016-May 2017	Summer 2017: June2017-Sept2017	Oct2017-Mar2018
Start Opt-In TOU Pilot						
Pilot Rate Enrollment						
Send Welcome Kits						
1st Installment of Incentive Payout						
Run Opt-In TOU Pilot						
Customer Support via Call Center and E-Mail						
Thermostat Technology Treatment						
Smartphone App Technology Treatment						
Social Media Channel(s)						
First Summer In-Season E&O (DM and EM)						
Joint IOU Survey #1						
2nd Installment of Incentive Payout						
Opt-Out Telephone Interviews						

TABLE 14-1
HIGH LEVEL SCHEDULE
(CONTINUED)

	Aug2015-Dec2015	Jan2016-May2016	Summer 2016: Jun2016-Sept2016	Winter and Spring: Oct2016-May 2017	Summer 2017: June2017-Sept2017	Oct2017-Mar2018
Interim Focus Groups and Telephone Interviews (Post Summer Qualitative)						
M&E for 1st Interim Report						
1st Interim Report						
Winter In-Season E&O (DM and EM)						
Winter Season Telephone Interviews						
Spring In-Season E&O (DM and EM)						
Opt-Out Telephone Interviews						
Joint IOU Survey #2						
3rd and Final Installment of Incentive Payout						
End of Bill Protection Notice and Payout of Credits[(a)]						
M&E for 2nd Interim Report						
2nd Interim Report						

TABLE 14-1
HIGH LEVEL SCHEDULE
(CONTINUED)

	Aug2015-Dec2015	Jan2016-May2016	Summer 2016: Jun2016-Sept2016	Winter and Spring: Oct2016-May 2017	Summer 2017: June2017-Sept2017	Oct2017-Mar2018
Second Summer In-Season E&O (DM and EM)						
Joint IOU End-of-Pilot Survey						
End-of-Pilot Focus Groups						
Preliminary Results From the End-of-Pilot Survey						
End of Opt-In TOU Pilot Notice						
End of Opt-In TOU Pilot						
Decommissioning of Pilot Rates						
Application filing						
M&E for Final Report						
Final Report						

(a) Only if bill protection is required for the Opt-In TOU Pilot. The maximum Bill protection period on the Opt-In TOU Pilot will be 12 months.

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CHAPTER 15

SUMMARY OF TOU PILOT ESTIMATED COSTS

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OPT-IN TOU PILOT COST SUMMARY

A. Introduction

This chapter summarizes the cost estimates for the Opt-In TOU Pilot that is targeted to start June 1, 2016 and end December 31, 2017. This cost estimate is generally consistent with the forecasted costs presented in PG&E's 2017 GRC Application (A.15-09-001), in Exhibit (PG&E-6), pages 3-20 to 3-22 and pages 3-24 to 3-25, lines 13 to 20. Those forecast pilot costs have been adjusted here to account for a later pilot launch date in 2016, rather than in 2015 as had been assumed in the application (which was filed in early September 2015, before the TOU Working Group had begun its pilot design efforts). It has also been adjusted here to reflect a more accurate estimates of costs based on the specific design developed by the TOU Working Group. The estimated costs listed here for 2018 are only for the Opt-In TOU Pilot, and do not include costs associated with the later Default TOU Pilot targeted to start in 2018, since the WG has agreed that design of the IOUs' Default TOU Pilots will not begin until mid-2016. Opt-In Pilot cost estimates for 2018 listed here include carry-over from tasks for the 2016-2017 pilots (e.g., Measurement & Evaluation final report to be prepared and issued in Q1 2018).

B. Cost Summary[1]

TABLE 15-1
COST SUMMARY

	2015/2016	2017[(a)]	2018[(b)]
Planning and Design			
Pilot Design (consultant work)	$180,656[(c)]	N/A	N/A
Pre-testing			
Recruitment Pre-test			
Marketing	80,685	N/A	N/A
Enrollment	36,264	N/A	N/A
Customer Insight	6,000	N/A	N/A
Marketing and Outreach			
Marketing and recruitment			
Creative Material Development	60,000	N/A	N/A
Direct Mail Recruitment	2,050,000	N/A	N/A
Outbound Calling	500,000	N/A	N/A
Incentive Payment	3,700,000	$2,312,500	N/A
Education & Outreach			
Direct Mail Welcome Kit	185,000	N/A	N/A
Seasonal Direct Mail and Email	185,000	185,000	N/A
Social Media	105,000	29,000	N/A
Web Development	30,000	30,000	N/A
Creative Development (Agency)	360,000	180,000	N/A
End of Bill Protection Notice	N/A	20,000	N/A
End of Pilot Notice	N/A	$20,000	N/A
Implementation			
Sampling and Randomization/Power Analysis			
Update Power Analysis and Sampling Plan	25,000	N/A	N/A
Generate Customer List and Assign Treatments	10,000	N/A	N/A
Purchase Customer Demographic Data	$125,000	$50,000[(d)]	N/A

1 Costs have been adjusted to account for a later Pilot launch date in 2016 rather than 2015, and for more accurate estimates of costs based on the specific design that was not fully developed by the TOU Working Group until December 2015.

TABLE 15-1
COST SUMMARY
(CONTINUED)

	2015/2016	2017	2018
Technology Treatments			
Thermostat Study Implementation	$50,000	$50,000	N/A
Survey Research & Report	200,000	$125,000	$75,000
Smartphone App Study Implementation	250,000	250,000	N/A
Survey Research & Report	25,000	25,000	25,000
IT and Operations			
Pilot Enrollment and Tracking	195,000	390,000	N/A
Building Pilot Rates in Billing System (design, build, test and implementation)	1,300,000	N/A	N/A
Synchronization Between CIS and Tracking Database	120,000	230,000	N/A
Pilot Rate Enrollment	40,000	N/A	N/A
Bill Protection Credit Calculation	N/A	200,000	N/A
Bill Protection Credit Disbursement Process	N/A	100,000	N/A
Est'd Bill Protection Revenue Shortfall	N/A	2,000,000	N/A
Pilot Rate Participant Migration and Pilot Decommissioning	N/A	40,000	N/A
Customer Support			
Initial (during recruitment) Customer Contact	157,440	N/A	N/A
Ongoing Customer Support (customer inquiries into the call center)	32,767	52,422	7,711
Training	66,534	22,455	N/A
Technology, Reporting and Communication	128,967	144,768	12,414
Evaluation and Reporting			
Customer Surveys and Research			
Customer Surveys Design	40,000	$20,000	N/A
Customer Surveys Implementation	80,000	120,000	N/A
Customer Insight Studies	158,400	104,200	N/A
Measurement & Evaluation Consultant	$100,000	$100,000	$40,000

TABLE 15-1
COST SUMMARY
(CONTINUED)

	2015/2016	2017	2018
Labor			
Project Management and Other Pricing Product. Marketing, M&E and Customer Insights Labor	$2,730,000	$2,250,000	$585,000
Subtotals	$13,312,713	$9,050,345	$745,125

(a) 2017 cost estimates have not been escalated for inflation.

(b) 2018 cost estimates have not been escalated for inflation.

(c) This estimate includes cost overage of $8,000 in 2015 for TOU Pilot Design Consultant. Also the TOU Working Group consultant contract ends December 2015. However, if the Commission determines the TOU Working Group requires additional support from the consultant beyond the evaluation consultant discussed in Chapter 13 to finish some opt-in pilot planning in 2016, PG&E has allowed for an additional three months of work in this estimate.

(d) This estimate assumes there will be cost sharing with other projects within PG&E.

The grand total costs for PG&E's Opt-In TOU Pilot, for 2015-2018, is preliminarily estimated to be: $23,108,183.

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CHAPTER 16

CONCLUSION

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CONCLUSION

Although it has been incredibly challenging to scope and plan a residential Opt-In TOU Pilot of the magnitude desired by the TOU Working Group, Pacific Gas and Electric Company (PG&E) is pleased that the various parties appear to have found their way to framing a consensus Opt-In TOU Pilot Plan that seeks to provide the necessary data as well as important insights that will support development of eventual default TOU proposals, required to be filed by January 1, 2018 pursuant to Decision (D.) 15-07-001. As described herein, and in the Nexant Report to the TOU Working Group (attached hereto as Appendix A), this Opt-In Pilot Plan aims to provide useful interim results in time for the utilities to develop their default TOU applications and testimony due January 1, 2018.[1]

PG&E has shown herein why its proposed Opt-In TOU Pilot Plan PG&E is reasonable, and should be promptly adopted.

A timely approval is absolutely essential if PG&E is to meet the targeted pilot launch date of June 1, 2016 (the start of PG&E's residential TOU summer season). Recruitment of some 18,500 customers to opt-into this pilot can only begin after a final California Public Utilities Commission (CPUC or Commission) approval of the Opt-In TOU Pilot, as proposed in this Advice Letter. Given that the target start date for the pilot is June 1, 2016 (the start of PG&E's residential TOU summer season), PG&E requests that Commission approve this Advice Letter request no later than its Decision Conference on March 17, 2016. That date will leave less than two months to complete recruitment by mid-May, for roll-out of the Welcome Kits before launching the pilot rates starting on June 1, 2016. The TOU Working Group has recognized that this is a very short time to accomplish such large opt-in enrollments, even with the proposed incentive payments and other features of the pilot. Therefore, if it is possible for the

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[1] Analysis and development of testimony supporting PG&E's residential default TOU rate proposal must begin by September 2017 in order to meet the Commission's deadline of January 1, 2018. The pilot has been designed to provide interim results by September 2017 for that reason. Any slippage of the overall pilot schedule will jeopardize PG&E's ability to meet the January 1, 2018 deadline envisioned in D.15-07-001 for filing its residential default TOU program proposal.

CPUC to accomplish approval at its February 25, 2016 decision conference, this would be far preferred as it would allow an additional three weeks for Pilot recruitment.

PG&E respectfully requests that the Commission approve PG&E's proposed Opt-In TOU Pilot Plan at the earliest possible Decision Conference, but in no event later than March 17, 2016. Otherwise, the targeted June 1, 2016 launch date will certainly have to be delayed, causing the pilot to miss part of the summer of 2016. PG&E will continue to work diligently to support a successful Opt-In TOU Pilot as an important step forward toward a successful implementation of residential default TOU, targeted for 2019 per D.15-07-001.

Advice 4764-E
December 24, 2015

Appendix A

Nexant Report

REPORT

Time-of-Use Pricing Opt-in Pilot Plan

December 17, 2015

Prepared for
TOU Pilot Design Working Group

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1 Executive Summary

In Decision 15-07-001, the California Public Utilities Commission (CPUC or the Commission) ordered California's three investor owned utilities (IOUs) to conduct certain "pilot" programs and studies of residential Time-of-Use (TOU) electric rate designs (TOU Pilots and Studies) beginning the summer of 2016, and to file applications no later than January 1, 2018 proposing default TOU rates for residential electric customers. The IOUs were also directed to form a working group (TOU Working Group) to address issues regarding the TOU pilots and to hire one or more qualified independent consultants to assist with the design and implementation of the TOU Pilots and Studies. The TOU Working Group was comprised of 37 entities and included almost 100 people. Nexant, Inc. was engaged as the independent consultant on September 18, 2015. This report summarizes the TOU Pilots and Studies that were designed over the last three months through the TOU Working Group process.

The TOU Working Group received additional guidance regarding the TOU Pilots and Studies in an Assigned Commissioner and Administrative Law Judge (AC/ALJ) ruling on September 24, which indicated that each IOU must prepare a menu of at least three opt-in TOU rate designs and that at least one rate design must have a more complex combination of seasons and time periods than traditional TOU rates that better matches system needs. Each IOU was also strongly encouraged by the CPUC Energy Division to include at least one technology treatment as part of the rate pilots.

With the CPUC direction summarized above as input, the TOU Working Group developed the following, more specific pilot objectives as input to pilot design:

- Consider treatment options and pilot designs for 2016/2017 that will provide useful insights for development of the IOU's January 1, 2018 application for default pricing that may begin as early as 2019;
- Estimate load impacts by rate period for
    - Different rate structures that vary in terms of the timing and length of rate periods
    - The number of rate periods
    - Changes in rate periods and price ratios across seasons
    - Possible other features such as low or negative prices during excess supply conditions;
- Assess customer understanding/acceptance/engagement/satisfaction with various TOU rate options;
- Calculate bill impacts for customers on each pilot TOU rate relative to the otherwise applicable tariff (OAT);
- Assess the degree of hardship that might result from default TOU rates on senior citizen households and economically vulnerable customers (and perhaps others) in hot areas as directed by Public Utilities Code Section 745;
- Assess the incremental effect of enabling technology on load impacts, bill impacts, and customer satisfaction;

- Assess adoption rates for enabling technology for customers on TOU rates; and
- Assess the effectiveness of alternative information, education, and outreach options.

1.1 Experimental Design

A key objective of any pilot or experiment is to establish a causal link between the experimental treatments (e.g., TOU rates, enabling technology, etc.) and the outcomes of interest (e.g., load impacts, changes in bills, customer satisfaction, etc.). The best way to do this is through what is referred to as a randomized control trial (RCT) research design. With this approach, participants are offered a treatment and, after they agree to accept it, are randomly assigned to either the treatment or control condition. This ensures that the treatment and control customers are identical in every way except for exposure to the treatment and any difference that might occur due to random sampling error. As such, any observed difference in load during peak period between treatment and control customers, for example, is due either to the treatment of interest (e.g., TOU pricing) or random chance.

A key challenge faced by the TOU Working Group was deciding how to gain insights from residential opt-in TOU pilots that might help inform policy decisions for residential default TOU pricing. An important difference between opt-in and default conditions is the mix of customers that are enrolled under each condition. With default enrollment, there are three types of customers who remain on the tariff: those who would enroll on the tariff if it was marketed on an opt-in basis (referred to as “always takers”); those who are unaware that their tariff changed; and those who are aware and would not have enrolled on an opt-in basis but, for a variety of reasons (e.g., inertia, transaction costs associated with switching out, etc.), do not opt out from default enrollment. This latter group—referred to as “complacents”—are likely to be less engaged than the always takers. Unaware customers are, by definition, unengaged. Because of the presence of complacent and unaware customers, average load reductions have been found to be lower under default enrollment compared with opt-in enrollment. However, aggregate load reductions could be much higher under default pricing if the lower average load reduction was offset by much higher enrollment.

In order to better represent the mix of customers that are likely to be enrolled under default conditions, the TOU Working Group decided to implement what is being called a “pay-to-play” (PTP) recruitment strategy. Under this approach, rather than recruit customers onto a specific rate by educating them about the features and potential customer benefits associated with the rate, as would be done for a typical opt-in pilot or program, participants will instead be offered an economic incentive for agreeing to be in the pilot and then will be randomly assigned to one of three rate options or to the control condition after agreeing to participate. Since the primary motivation for enrolling on the study is likely to be the PTP incentive rather than the attractiveness of any particular rate feature, this approach is likely to enroll a reasonable number of participants who would likely be complacents, and even some who might be unaware, under a default enrollment strategy.

This PTP approach is also believed appropriate in order to accommodate the need to recruit more than 50,000 participants in a very short time period (approximately 2 months) after the CPUC Resolution, in an effort to allow the pilot to be launched on June 1, 2016, as envisioned

by the CPUC. Prior pilots, including SMUD's well-known SmartPricing Options pilot, have taken much longer to recruit smaller numbers of participants.

1.2 Rate Treatments

Figures 1-1 and 1-2 show the weekday and weekend rates, respectively, that are proposed to be tested in the TOU Pilots and Studies. The prices shown there do not reflect the baseline credit that will also be incorporated into the pilot rates.

In addition to the two rates shown in Figures 1-1 and 1-2, SDG&E plans to test a much different, dynamic rate structure using an alternative research approach. This tariff is proposed to have a relatively high monthly fixed charge, generation charges that vary hourly based on wholesale energy costs, and adders that vary by time of day to reflect both commodity and distribution peak events. Enrollment on this tariff is scheduled to be completed by October 2016 and will be coupled with enabling technology that would automate response to the complex time-varying prices. The target audience and research design that will be used to evaluate this tariff will be provided in SDG&E's advice letter.

As seen in Figure 1-1, all eight TOU pilot tariffs have peak periods that primarily cover late afternoon and evening hours year round. This later peak period is driven by the increasing penetration of solar in California and is a significant departure from the vast majority of pilots and tariffs that have been implemented previously in California and elsewhere. With most of the rates having peak periods ending at 9 PM and some with peak periods that don't start until 6 PM, these pilots will be among the first in the industry to study the magnitude of load reductions during evening hours.

Another key focus of the pilot tariffs is the willingness and ability of consumers to respond to time-varying price signals that vary across more than two daily rate periods and across more than two seasons. Low prices in midday in the spring—when excess supply conditions may exist—is also something that has not been previously tested. Some of the tariffs have the same pricing structure on weekends as on weekdays, which is yet another atypical tariff feature. For most other existing TOU tariffs, off-peak prices apply on the weekend. In short, these pilots will break new ground both in California and in the industry with regard to the timing of peak periods, the frequency of price changes, and the response of customers to low daytime prices during excess supply conditions.

Collectively, the eight TOU pilot rates have significant variation in prices across rate periods. During the summer peak period, for example, prices are as low as roughly 41¢/kWh for PG&E's Rate 1 to as high as 69¢/kWh for SCE's Rate 2. Summer off-peak prices range from roughly 23¢/kwh for SCE's Rate 3 to almost 34¢/kWh for SDG&E's Rate 2. Super off-peak prices on spring afternoons are around 17¢/kWh.

Figure 1-1: Weekday Tariffs in the TOU Pilots[1]

		Weekday Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
	Summer	Off-peak (30.3¢)																Peak (40.6¢)					Off Peak (30.3¢)		
	Winter	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																Partial Peak (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)										Super Off Peak (16.9¢)						Peak (26.3¢)					Off Peak (24.8¢)		
	Summer	Off Peak (SOP) (31.4¢)																Peak (44.3¢)					Off Peak (31.4¢)		
	Winter	Off Peak (25.0¢)																Peak (27.2¢)					Off Peak (25.0¢)		
SCE Rate 1	Spring	Off Peak (23.9¢)																Peak (28.7¢)				Off Peak (23.9¢)			
	Summer	Off Peak (24.9¢)								Partial Peak (29.8¢)								Peak (37.3¢)				PP (29.8¢)		Off Peak (24.9¢)	
	Winter	Off Peak (23.9¢)																Peak (28.7¢)				Super Off Peak (23.9¢)			
SCE Rate 2	Spring	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)		Super Off Peak (17.2¢)	
	Summer	Super Off Peak (17.1¢)								Off Peak (31.7¢)									Peak (68.9¢)			OP (31.7¢)		Super Off Peak (17.1¢)	
	Winter	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)		Super Off Peak (17.2¢)	
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Peak (28.7¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)											Partial Peak (28.7¢)					Peak (59.1¢)				PP (28.7¢)		OP (23.2¢)	
	Winter	Off Peak (23.2¢)																Peak (26.7¢)					Off Peak (23.2¢)		
SDG&E Rate 1	Summer	Off Peak (30.2¢)											Partial Peak (35.5¢)					Peak (57.5¢)					Partial Peak (35.5¢)		
	Winter	Off Peak (32.4¢)											Partial Peak (33.4¢)					Peak (34.4¢)					Partial Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		

[1] The day prior to this report being completed, after examining the distribution of customer bill changes moving from the control group to the TOU pilot rates, PG&E discovered a possible problem with the rates, which it is in the process of investigating. This stems from a mismatch between the billing determinants (i.e., aggregate sales in each of the various TOU periods) used to design the rates, which were based on a sample of customers, and the billing determinants of the much larger population of customers used for the bill comparisons. If this investigation results in significant changes in the prices shown above, PG&E will update the proposed tariffs.

Figure 1-2: Weekend Tariffs in the TOU Pilots

		Weekend Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																					
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																							
	Summer	Off-peak (30.3¢)																							
	Winter	Off-peak (25.1¢)																							
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																PP (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)										Super Off Peak (16.9¢)						Off Peak (24.8¢)							
	Summer	Off Peak (31.4¢)																							
	Winter	Off Peak (25.0¢)																							
SCE Rate 1	Spring	Off Peak (23.9¢)																							
	Summer	Off Peak (24.9¢)								Partial Peak (29.8¢)														Off Peak (24.9¢)	
	Winter	Off Peak (23.9¢)																							
SCE Rate 2	Spring	Super Off Peak (17.2¢)								Off Peak (26.6¢)														Super Off Peak (17.2¢)	
	Summer	Super Off Peak (17.1¢)								Off Peak (31.7¢)														Super Off Peak (17.1¢)	
	Winter	Super Off Peak (17.2¢)								Off Peak (26.6¢)														Super Off Peak (17.2¢)	
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)																Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Winter	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		
SDG&E Rate 1	Summer	Off Peak (30.2¢)														Partial Peak (35.5¢)		Peak (57.5¢)					Off Peak (35.5¢)		
	Winter	Off Peak (32.4¢)														Partial Peak (33.4¢)		Peak (34.4¢)					Off Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		

1.3 Sample Sizes and Customer Segmentation

Public Utility Code Section 745 requires that the CPUC ensure that any default TOU rate schedule does not cause unreasonable hardship for senior citizens or economically vulnerable customers in hot climate zones. It also requires that, before defaulting residential customers onto TOU rates, the Commission explicitly consider evidence addressing the extent to which hardship will be caused for customers located in hot, inland areas, or areas with hot summer weather, assuming no change in load.

The TOU Working Group spent significant time discussing the sampling requirements and evaluation metrics that should be incorporated into the TOU pilot design to provide useful insights regarding the extent to which TOU rates might cause unreasonable hardship for seniors and economically vulnerable customers in hot areas. There were strong differences of opinion regarding the definitions of seniors and economically vulnerable customers, about the metrics that should be used to assess hardship, and about what constitutes unreasonable hardship.

An important factor affecting both the segmentation scheme and the number of participants to be recruited into each test cell is the metric of interest. Load impacts, bill impacts, and responses to survey questions each have different sample size requirements for estimating outcomes of interest with reasonable statistical precision. Based on preliminary statistical analysis that was done as part of the planning process, the pilot design assumed that roughly 1,000 treatment and 1,000 control customers would be sufficient to estimate load impacts with reasonable levels of statistical precision; roughly 500 participants would be needed to accurately characterize the distribution of bill impacts for each test cell; and at most, 250 participants would be needed for outcomes based on survey questions such as those focused on assessing hardship, satisfaction, customer acceptance, changes in usage behavior, etc.

Table 1-1 summarizes the distribution of rate treatments across customer segments that the TOU Working Group agreed would meet the multiple objectives of the TOU Pilots and Studies. The scheme oversamples seniors and CARE/FERA customers with incomes greater and less than 100% of Federal Poverty Guidelines (FPG) in hot climate regions for one rate in SCE's service territory and one rate in PG&E's service territory. Oversampling is not possible in SDG&E's hot climate region because the region only contains about 16,000 customers. For the remaining rates in PG&E and SCE's hot climate regions and for all rates in the mild and cool climate regions for all three utilities, an equal number of CARE/FERA and non-CARE/FERA customers will be recruited, which means that CARE/FERA customers will be oversampled in those zones as well since they make up less than half of the regional population.

Across the three utilities, based on the planning assumptions used for sample size determination, almost 52,000 customers will need to be recruited into the pilots to meet the sample size requirements for all of the rate, technology, and information treatments that are included in the TOU Pilots and Studies. SCE will recruit roughly 22,000 participants, PG&E roughly 18,500, and SDG&E roughly 11,250. This number of initial participants factors in a potential attrition rate of roughly 25% over the course of the pilots, which are planned to last until the end of 2017. This attrition rate is comprised of both drop outs and normal account turnover, with the latter being by far the largest share of this assumed attrition rate. Importantly,

the final sample sizes needed to meet target requirements for statistical precision for load impacts in each climate region and utility and for estimating bill impact distributions will be estimated more precisely in early January. This analysis has the potential to increase or decrease the estimated sample sizes summarized above and discussed in more detail in later sections of this report.

Table 1-1: Customer Segmentation for Rate Treatments

Climate Region	Customer Segment	SCE			PG&E			SDG&E	
		R1	R2	R3	R1	R2	R3	R1	R2
Hot	Seniors ≤> 100% FPG		X		X				
	CARE/FERA ≤> 100% FPG		X		X				
	CARE/FERA	X		X		X	X		
	Non-CARE/FERA	X		X		X	X		
	General Population		X		X			X	
Mild	CARE/FERA	X	X	X	X	X	X	X	X
	Non-CARE/FERA	X	X	X	X	X	X	X	X
Cool	CARE/FERA	X	X	X	X	X	X	X	X
	Non-CARE/FERA	X	X	X	X	X	X	X	X

1.4 Technology Treatments

Numerous prior pilots and studies have shown that enabling technology such as programmable communicating thermostats and traditional load control switches can significantly increase demand response for customers on dynamic rates such as critical peak pricing where high priced peak periods occur on some days and not others. There have been relatively few studies demonstrating the impact of enabling technology on static TOU rates. We are not aware of any studies that paired technology with TOU rates with peak periods extending well into the evening when air conditioning loads in many climate regions are much lower than during the more traditional afternoon peak periods. Furthermore, there have been few studies on the impact of newer technologies, such as internet enabled and learning thermostats (e.g., smart thermostats), in conjunction with static TOU rates.

To address this shortcoming in the empirical literature, each utility will include an investigation of smart thermostats in their pilots, but each investigation will have a different focus. SCE will recruit existing smart thermostat owners onto TOU rates and will randomly assign them

to one of two TOU rates—Rates 1 or 3—or to the control condition. This study will estimate the average load impacts for this self-selected group of early adopters of smart thermostats. SDG&E will test the acceptance rate for smart thermostats at different price points/subsidies among customers who are already enrolled on TOU rates. If enough participants purchase the technology, SDG&E will estimate load impacts using a quasi-experimental evaluation method. PG&E will conduct a qualitative investigation of thermostat-using behavior through an ethnographic study of both smart thermostat and more traditional programmable thermostat owners. Together, these studies will provide useful, quantitative, and qualitative insights regarding the potential impact of advanced thermostats in combination with TOU pricing.

PG&E is also testing a smart phone app that is both a technology and education treatment. This app will convey a variety of useful information to TOU participants, potentially including: pricing information; TOU-specific performance feedback; energy saving tips informed by user-specific end use load disaggregation; and "gamification" features to encourage energy savings or load shift. PG&E plans to divide pilot rate participants into two equally sized groups and to offer the technology to all enrolled participants across all rate options and customer segments in one group. Understanding whether the acceptance rate is 5% or 50%, learning through surveys what TOU pilot participants think of this type of service and understanding whether it increases satisfaction and acceptance of the rates will be extremely useful for planning education and outreach strategies for future residential default pricing. If the acceptance rate is high, this *randomized encouragement design* (RED) will be used to estimate load impacts associated with the smart phone app and also to compare customers' satisfaction and other metrics between those who do and don't receive the offer of the app. If the acceptance rate is low, a quasi-experimental evaluation method involving ex post statistical matching can be used to develop a control group that has load characteristics similar to those who accept the app in order to estimate load impacts for those who don't take the app.

1.5 Customer Education and Outreach

Customer education and outreach (E&O) is essential to achieving one of the primary objectives of deploying TOU rates and related treatments, which is to encourage demand reductions during high cost periods (and possibly increasing usage during excess supply conditions). This is especially true with residential default pricing where, in the absence of a strong E&O initiative, many customers might not even be aware that their electricity tariff has changed. But even if aware, electricity consumers may need significant help understanding the key features of complex tariff structures, they must be informed when seasonal rate changes occur, and they need education about actions they can take to better manage their electricity bills.

There are many E&O options that could be employed to educate consumers and there are a variety of objectives to which they can be applied. The TOU Working Group discussed the tradeoffs associated with offering E&O options to some participants and not to others for purposes of quantitative assessment of the relative effectiveness of the options. There was widespread agreement that highly effective E&O is essential to the overall success of the pilots (and to TOU pricing more broadly). TOU Working Group members also generally agreed that, with a couple of exceptions, it is more important to ensure that the vast majority of

participants receive highly effective E&O than it is to withhold E&O offerings for purposes of measuring effectiveness.

With the above considerations in mind, in January and early February 2016, each IOU will develop a portfolio of E&O materials—including welcome kits and ongoing communications. These materials will be sent to all participants with the goal of ensuring that they have a good understanding of key rate features and are educated about actions they can take to reduce their bills under TOU rates. The messaging and content of these materials will be tailored as appropriate and feasible to the interests and needs of psychographic/behavioral personas and to low income, seniors, and perhaps other segments. Spanish language materials, and possibly materials in other languages, will be available. The effectiveness of these basic E&O materials will be assessed through surveys that gather information about participant perceptions of the usefulness of the materials and other metrics, such as customer satisfaction, level of understanding of key rate features, and possibly others. These assessments will largely be informative, not comparative, unless the IOUs decide to vary at least some of the materials across customers within selected segments as discussed above.

In addition, SDG&E plans to conduct a quantitative test of the impact of weekly usage alerts on load impacts for customers on TOU rates. The alert treatment will be a TOU version of an alert service that SDG&E already provides to approximately 45,000 residential customers. The weekly alert email will include bill to date and projected bill, weekly electric use, and usage by rate period. This treatment will be deployed on a default basis using email addresses that will be gathered during enrollment into the pilot. Customers will be randomly assigned to the treatment or control condition and impacts will be estimated using an RED analysis.

1.6 Pilot Cost Uncertainty

This report does not include comprehensive budget estimates for the pilots. Those estimates will be included in the Advice Letters filed by each utility to which this report will be appended. There is a great deal of uncertainty around one of the key cost drivers, which is the cost of recruiting almost 52,000 participants that the IOUs plan to enroll in various treatments. This cost uncertainty stems in part from the PTP recruitment plan and the fact that customers will be randomly assigned to one of three rates or to the control condition. This recruitment strategy, combined with a rigorous RCT design, has never been tried before. As such, acceptance rates are highly uncertain.

To address this uncertainty, each utility will conduct pretests in early January 2016. In combination, these pretests will determine: differential acceptance rates for the PTP design for different incentive levels; differences in the timing of incentive payments (e.g., how much is paid upfront versus near the end of the pilot period); different delivery channels (e.g., courier, standard letter, email); with and without bill protection (to reduce risk for participants and, therefore, increase enrollment); and different customer segments. With results from these pretests, the IOUs will be able to estimate recruitment budgets much more precisely for a given sample size and to determine whether contingency plans, such as telephone recruitment, will be needed in order to reach the enrollment goals. There is also uncertainty in the magnitude of bill

protection payments that may need to be made if the pretests indicate that bill protection should be used to increase enrollment rates and reduce costs.

In addition, there is uncertainty associated with the required sample sizes, as discussed above. For any particular desired level or precision, required sample sizes may vary across climate regions and customer segments. The IOUs will conduct statistical analysis in January that will finalize the required sample sizes. In recognition of the above uncertainties, the IOU Advice Letters will provide a fairly wide range of costs for pilot implementation.

2 Introduction

California Public Utilities Commission (CPUC of the Commission) Decision 15-07-001 (D.15-07-001), dated July 3, 2015,[2] requires Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E)—collectively the IOUs—to (a) conduct certain "pilot" programs and studies of residential Time-of-Use (TOU) electric rate designs (TOU Pilots and Studies) beginning the summer of 2016; and (b) file applications no later than January 1, 2018 proposing default TOU rates for residential electric customers. To support the TOU Pilots and Studies, the IOUs were directed to form a working group (TOU Working Group) to address issues regarding the TOU rate design and study as detailed in D.15-07-001. The Decision also directed the TOU Working Group to select one of the IOUs to hire one or more qualified independent consultants to assist with the design and implementation of the TOU Pilots and Studies. SCE was chosen as the IOU to solicit bids from qualified consultants and to act as the contracting agent for the independent consultant.

With assistance and direction from the CPUC's Energy Division, the TOU Working Group was formed and held its first meeting on August 25, 2015. Membership in the TOU Working Group has evolved since that time. Appendix A contains the names and affiliations of TOU Working Group members. Following a competitive bidding process, the TOU Working Group chose Nexant, Inc. as the independent consultant to assist with the design of the TOU pilots. Nexant began work on the project on September 18, 2015.

The work summarized here was led by Dr. Stephen George, a Senior Vice President at Nexant with 40 years of industry experience, all of it involving the study of consumer behavior in response to utility and regulatory demand side initiatives. Dr. George is a recognized expert on time-based pricing and experimental design. He was one of the chief architects and evaluators of California's well-known Statewide Pricing Pilot and was also the chief evaluator of SMUD's well-known Smart Pricing Options pilot.

The pilot plan presented here was developed through a series of four day-long TOU Working Group meetings; weekly calls open to the entire TOU Working Group in between the meetings; weekly calls between Energy Division and the IOUs; and numerous emails and conversations among the various parties and between the parties and Nexant. The TOU Working Group meetings that were facilitated by Nexant were held on September 24, October 8, October 28, and December 1. Slide decks from each meeting and detailed summary notes of the discussion were circulated to the entire TOU Working Group. The summary notes included action items and solicited input from TOU Working Group members and many participants provided comments. This highly interactive, stakeholder process was conducted over a very compressed time period to provide input for the Advice Letters that the CPUC Required the IOUs to file by January 1, 2016. It is not unusual to take six to nine months to design a single pilot for a single utility. The TOU Working Group designed multiple pilots involving more than a dozen

[2] Decision on Residential Rate Reform for Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E) and Transition to Time-of-Use Rates, July 3, 2015, (D.15-07-001)

treatments across three utilities in less than three months, through the stakeholder process summarized above.

The Decision directed the TOU Working Group to develop plans for opt-in pilots in 2016 and 2017 and for a default pilot in 2018. Given the short time available to complete the work, the TOU Working Group sought[3] permission from the Commission to delay development of the 2018 default pilots until at least mid-year 2016, after the 2016 pilots have begun. As such, there is no discussion in this report concerning the 2018 default pilots. Reviewers should keep in mind that treatment options or customer segments of interest that are not included in the 2016/2017 pilots may be investigated in the 2018 default pilots.

The pilot designs summarized in this report represent a general consensus reached among Working Group members and include numerous compromises among diverse stakeholders. Throughout this report, phrases such as "the Working Group decided" are meant to represent this general consensus. They may not represent the specific position of some Working Group members. Appendix C contains comments and recommendations from some Working Group members that may differ from the general consensus represented by the design decisions documented in this report.

2.1 Pilot Objectives

D.15-07-001 noted that there are several important empirical questions pertaining to TOU rates and customer impacts and responses, and the TOU pilots should aim to help answer those questions prior to the introduction of default TOU rates in 2019. The Decision also stated that the IOUs must "[o]ffer a menu of different residential rates designed to appeal to a variety of residential customers, with different time periods and rate differentials."[4] A subsequent ruling by the Assigned Commissioner and Administrative Law Judge (AC/ALJ) filed on September 24 directed the IOUs to develop and evaluate a variety of TOU rate designs that may either be used as a model for a default TOU rate in 2019, and/or as viable forward-looking pricing options that accommodate the changing conditions of the grid, fulfill California's long term energy policy objectives, and appeal to a variety of residential customers at that time. Specifically, the AC/ALJ ruling indicated that each IOU must:

- Prepare a menu of at least three opt-in TOU rate designs;
- Include at least one TOU rate design with a more complex combination of seasons and time periods than traditional TOU rates that better matches system needs, which may incorporate more dynamic pricing features and enabling technologies, and this pilot must begin no later than October 1, 2016; and
- All other opt-in TOU pilots must begin no later than June 1, 2016.

Additional input regarding pilot design parameters was received during the TOU Working Group meeting held on October 8. At this meeting, Simon Baker, Energy Division's Program/Branch Manager for Demand Response, Customer Generation and Retail Rates spoke to the Working Group about the Commission's interest in including technology treatments as part of the 2016

[3] Joint Letter of SCE, PG&E and SDG&E, submitted to CPUC November30, 2015.

[4] Id at p. 176

pilots. He indicated that there is an expectation that each utility will put forth at least one technology treatment to be implemented no later than October 1, 2016.

With the CPUC direction summarized above as input, the TOU Working Group developed the following, more specific pilot objectives as input to pilot design:

- Consider treatment options and pilot designs for 2016/2017 that will provide useful insights for development of the IOU's January 1, 2018 application for default pricing that may begin as early as 2019;
- Estimate load impacts by rate period for
    - Different rate structures that vary in terms of the timing and length of rate periods
    - The number of rate periods
    - Changes in rate periods and price ratios across seasons
    - Possible other features such as low or negative prices during excess supply conditions
- Assess customer understanding/acceptance/engagement/satisfaction with various rate options;
- Calculate bill impacts for customers on each TOU rate relative to the otherwise applicable tariff (OAT);
- Assess the degree of hardship that might result from default TOU rates on senior households and economically vulnerable customers (and perhaps others) as directed by Public Utilities Code Section 745;
- Assess the incremental effect of enabling technology on load impacts, bill impacts, and customer satisfaction;
- Assess adoption rates for enabling technology for customers on TOU rates; and
- Assess the effectiveness of alternative information, education, and outreach options.

2.2 Report Organization

The remainder of this report is organized as follows. Section 3 discusses the numerous technical issues and stakeholder interests that were taken into consideration during the design process and explains how each was addressed. Section 4 presents the pilot plans for each IOU. The plans summarize the rate, technology, and education and outreach treatments[5] that will be examined in each pilot as well as the climate regions and customer segments for which each treatment will be tested. Section 5 provides a high level overview of the evaluation plan that will be used to determine the load impacts and other metrics for each treatment. The evaluation plan will include statistical analysis of load data as well as customer surveys. Section 6 provides a high level summary of pilot recruitment costs, discusses the significant uncertainty that currently exists for this critical variable, and plans for reducing the uncertainty through pretesting. Budgets for other pilot costs not related to recruitment will be provided in the IOU's advice letters and are not discussed in this report. Section 7 contains a high level

[5] The term *treatment* stems from the experimental research literature, much of which was developed in the context of medical research where subjects receive medical treatments. In this context, it refers to the various rates, technology, and E&O options that are being tested in the pilots.

implementation schedule, highlighting key dates leading up to summer 2016 and through the end of the pilots in December 2017.

Appendix A contains a list of Working Group participants, Appendix B describes the power analysis that was done as input to sample size determination, and Appendix C contains the comments of selected reviewers whose opinions may differ from the consensus opinions underlying the pilot design decisions summarized here.

3 Key Issues in Pilot Design

Designing pilots that will produce useful insights for guiding important policy decisions is challenging. In order to establish a causal link between treatments (e.g., rates, technology, and information) and effects (e.g., changes in load by rate period, bill impacts, etc.), it is necessary to eliminate other possible explanations for any observed change in the outcome variables of interest. This can be hard to do in the real world where people are subject to many other influences besides the treatment of interest and where participation in the pilot is voluntary. Pilot design typically involves making numerous, often difficult, decisions that sometimes must tradeoff technical rigor, cost, feasibility, customer satisfaction/dissatisfaction, and other factors that influence pilot design. This section summarizes a number of key issues that influenced the pilot plan presented in Section 4, and explains the decisions that were made around these issues.

3.1 TOU Rates

As indicated in Section 2, among the key objectives of the pilots is to develop and evaluate a variety of TOU rate designs that may be used as a model for default pricing rate in 2019. Another important objective is to evaluate viable, opt-in pricing options that may be useful in responding to changing grid conditions, may appeal to selected customer groups, or may help fulfill California's long term energy policy objectives. With these objectives in mind, the three IOUs worked closely with the Energy Division and in consultation with the TOU Working Group to develop nine different rate options, three for each utility, that vary with respect to the timing and length of different rate periods, the number of rate periods across seasons, and prices (and price ratios) by rate period.

Figures 3-1 and 3-2 show the proposed weekday and weekend rates, respectively, that are proposed to be tested in the TOU Pilots and Studies. The prices shown there do not reflect the baseline credit that will also be incorporated in the rates. In addition to the two rates shown in the figures, SDG&E plans to test a much different, dynamic rate structure using an alternative research approach. This tariff is proposed to have a relatively high monthly fixed charge, generation charges that vary hourly based on wholesale energy costs, and adders that vary by time of day to reflect both commodity and distribution peak events. The specific characteristics of this tariff are still under discussion with Energy Division. Enrollment on this tariff is scheduled to be completed by October 2016 and will be coupled with enabling technology that would automate response to the complex time-varying prices. The target audience and research design that will be used to evaluate this tariff will be provided in SDG&E's advice letter.

Figure 3-1: Weekday Tariffs in the TOU Pilots[6]

		Weekday Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
	Summer	Off-peak (30.3¢)																Peak (40.6¢)					Off Peak (30.3¢)		
	Winter	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																Partial Peak (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)										Super Off Peak (16.9¢)						Peak (26.3¢)					Off Peak (24.8¢)		
	Summer	Off Peak (SOP) (31.4¢)																Peak (44.3¢)					Off Peak (31.4¢)		
	Winter	Off Peak (25.0¢)																Peak (27.2¢)					Off Peak (25.0¢)		
SCE Rate 1	Spring	Off Peak (23.9¢)																Peak (28.7¢)				Off Peak (23.9¢)			
	Summer	Off Peak (24.9¢)								Partial Peak (29.8¢)								Peak (37.3¢)				PP (29.8¢)	Off Peak (24.9¢)		
	Winter	Off Peak (23.9¢)																Peak (28.7¢)				Super Off Peak (23.9¢)			
SCE Rate 2	Spring	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)	Super Off Peak (17.2¢)		
	Summer	Super Off Peak (17.1¢)								Off Peak (31.7¢)									Peak (68.9¢)			OP (31.7¢)	Super Off Peak (17.1¢)		
	Winter	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)	Super Off Peak (17.2¢)		
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Peak (28.7¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)											Partial Peak (28.7¢)					Peak (59.1¢)				PP (28.7¢)		OP (23.2¢)	
	Winter	Off Peak (23.2¢)																Peak (26.7¢)					Off Peak (23.2¢)		
SDG&E Rate 1	Summer	Off Peak (30.2¢)											Partial Peak (35.5¢)					Peak (57.5¢)					Partial Peak (35.5¢)		
	Winter	Off Peak (32.4¢)											Partial Peak (33.4¢)					Peak (34.4¢)					Partial Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		

[6]The day prior to this report being completed, after examining the distribution of customer bill changes moving from the control group to the TOU pilot rates, PG&E discovered a possible problem with the rates, which it is in the process of investigating. This stems from a mismatch between the billing determinants (i.e., aggregate sales in each of the various TOU periods) used to design the rates, which were based on a sample of customers, and the billing determinants of the much larger population of customers used for the bill comparisons. If this investigation results in significant changes in the prices shown above, PG&E will update the proposed tariffs.

Figure 3-2: Weekend Tariffs in the TOU Pilots

		Weekend Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																						
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																							
	Summer	Off-peak (30.3¢)																							
	Winter	Off-peak (25.1¢)																							
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																PP (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)											Super Off Peak (16.9¢)					Off Peak (24.8¢)							
	Summer	Off Peak (31.4¢)																							
	Winter	Off Peak (25.0¢)																							
SCE Rate 1	Spring	Off Peak (23.9¢)																							
	Summer	Off Peak (24.9¢)											Partial Peak (29.8¢)											Off Peak (24.9¢)	
	Winter	Off Peak (23.9¢)																							
SCE Rate 2	Spring	Super Off Peak (17.2¢)											Off Peak (26.6¢)											Super Off Peak (17.2¢)	
	Summer	Super Off Peak (17.1¢)											Off Peak (31.7¢)											Super Off Peak (17.1¢)	
	Winter	Super Off Peak (17.2¢)											Off Peak (26.6¢)											Super Off Peak (17.2¢)	
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)																Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Winter	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		
SDG&E Rate 1	Summer	Off Peak (30.2¢)														Partial Peak (35.5¢)		Peak (57.5¢)					Off Peak (35.5¢)		
	Winter	Off Peak (32.4¢)														Partial Peak (33.4¢)		Peak (34.4¢)					Off Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		

As seen in Figures 3-1 and Figure 3-2, all eight TOU pilot tariffs have peak periods that primarily cover late afternoon and evening hours year round. This later peak period is driven by the increasing penetration of solar in California and is a significant departure from the vast majority of pilots and tariffs that have been implemented previously in California and elsewhere. With most of the rates having peak periods ending at 9 PM and some with peak periods that don't start until 6 PM, these pilots will be among the first in the industry to study the magnitude of load reductions during evening hours.

Another key focus of the pilot tariffs is the willingness and ability of consumers to respond to time-varying price signals that vary across more than two daily rate periods and across more than two seasons. Low prices in midday in the spring when excess supply conditions may exist is also something that has not been previously tested. Some of the tariffs have the same pricing structure on weekends as on weekdays, which is yet another atypical tariff feature. For most TOU tariffs, off-peak prices apply on the weekend. In short, these pilots will break new ground both in California and in the industry with regard to the timing of peak periods, the frequency of price changes, and the response of customers to low daytime prices during excess supply conditions.

Collectively, the eight pilots have significant variation in prices across rate periods. During the summer peak period, for example, prices are as low as roughly 41¢/kWh for PG&E's Rate 1 to as high as 69¢/kWh for SCE's Rate 2. Summer off-peak prices range from roughly 23¢/kwh for SCE's Rate 3 to almost 34¢/kWh for SDG&E's Rate 2. Super off-peak prices on spring afternoons are around 17¢/kWh.

3.2 Experimental Design

A key objective of any pilot or experiment is to establish a causal link between the experimental treatments and the outcomes of interest. This is referred to as *internal validity*. In this context, the treatments of interest are TOU tariffs, enabling technology, and education and information options designed to help consumers understand and accept the tariffs and to adjust their usage in response to the time-varying price signals. The outcomes of interest are: changes in usage by rate period (e.g., load impacts); changes in bills; customer satisfaction; customer engagement in managing energy costs; customer knowledge and awareness of TOU rates; and perhaps others.

Comparing the value of outcome variables of interest before and after customers go on the TOU tariffs or take the enabling technology does not have high internal validity because there are other factors that can cause changes in the variables of interest. Unless these factors can be controlled, it is impossible to know whether the treatment of interest caused the change or whether it was caused by one of these other factors. For example, differences in weather or economic conditions could cause a change in usage for the average customer, which could bias the estimated impact of the TOU rate.

Estimating impacts by comparing the outcomes of interest between customers who do and don't receive the treatment is valid only if those two groups are identical in all respects except that one is subject to the treatment and the other is not. Comparing usage between those who

volunteer for a treatment and those who decline the treatment or who were not offered the treatment has low internal validity for voluntary pilots because customers who volunteer for the treatment may have pretreatment differences in the variables of interest. For example, if people who volunteer for a TOU rate have lower than average peak period usage compared with a control group consisting of decliners or the population as a whole, estimating the load impact as the difference in peak period usage between the treatment and control group would bias the estimated impact upward because it would include both the treatment effect as well as the pretreatment difference in usage. This is known as *selection bias* and is one of the single biggest threats to internal validity.

For voluntary pilots, the best way to avoid selection bias and to ensure a high degree of internal validity is to employ what is called a *randomized control trial* (RCT) design. With this experimental design, participants are offered a treatment and then, after they agree to accept it, are randomly assigned to either the treatment or control condition. This ensures that the treatment and control customers are identical in every way, except for exposure to the treatment and any difference that might occur due to random sampling error. If samples are large, the likelihood of significant differences occurring due to random error is small.

However, even small errors might be significant if the impact that is estimated is small. For example, if the difference between treatment and control customers is 5%, a pretreatment difference of 1% due to random chance would produce a 20% error in the estimated impact. This potential error can be reduced or completely eliminated by doing what is called a *difference-in-differences* calculation. A difference-in-differences calculation estimates the impact as the difference between treatment and control customers after the treatment is in effect minus the difference between the two groups before the treatment is in effect. An RCT design with impacts estimated as the difference-in-differences has the highest internal validity of any experimental design, which is why the TOU Working Group chose this design for the TOU pilots.[7]

Another important consideration is the impact of design decisions on external validity. External validity refers to the relevance of the findings from a pilot or experiment to estimating impacts for customers or situations not included in the experiment. The highest external validity would exist for a pilot where the exact treatment, marketed in the exact same way as in the pilot, is offered to a group of customers that are identical (from a statistical perspective) to the study population. These conditions rarely exist and they certainly are not present with the 2016/2017 pilots since

[7] An alternative to an RCT that has equal internal validity is a *randomized encouragement design* (RED). With an RED, customers are randomly assigned to two groups. One group is offered a treatment and the other is not. Among those offered the treatment, some will take it and others will not. Those who are not offered the treatment need not even know they are part of an experiment. As such, an RED avoids any potential backlash associated with a recruit and deny or recruit and delay RCT design. The estimation of impacts for those who receive the treatment in an RED is obtained in a two-step process. In step one, referred to as the intention-to-treat analysis, the variable of interest for those offered the treatment, whether they take it or not, is compared with the values for those who are not offered the treatment. In the second step, the impact estimated in the first step is divided by the percent of customers in the encouraged group who take the offer. This produces an estimate of the impact of the treatment for those who accept it. An RED works well if the acceptance rate of an offer is high, the impact is large, or both. If the acceptance rate and the expected impact are low, the initial intention-to-treat effect may be too small to estimate with any reasonable sized sample. Given the relatively small expected impact for the relatively mild TOU rates being tested in the pilots, and the unknown level of acceptance, the TOU Working Group concluded that an RED was not likely to be successful for these pilots.

the objective of these pilots is to extrapolate from an opt-in pilot to future default conditions because a default pilot cannot be implemented until 2018. A key challenge faced by the TOU Working Group was deciding how to gain insights from opt-in TOU pilots that might help inform policy decisions for default TOU pricing.

An important difference between opt-in and default conditions is the mix of customers that are enrolled under each condition. With default enrollment, three customer segments remain on the tariff:

- **Always Adopters:** These are customers who would enroll on the tariff if it was marketed on an opt-in basis.
- **Complacents:** These customers are aware that their rate has changed as a result of default enrollment, but they would not have enrolled on an opt-in basis. However, for a variety of reasons (e.g., inertia, transaction costs associated with switching out, etc.), they do not opt out from default enrollment.
- **Unaware Customers:** This group of customers is not aware that their tariff changed.

There is a fourth customer segment consisting of decliners who opt-out prior to being placed on the rate. With opt-in enrollment, only the always takers as defined above will enroll on the rate.

Empirical evidence from the well-known Smart Pricing Options (SPO)[8] pilot conducted by the Sacramento Municipal Utility District (SMUD) showed that average reductions for opt-in tariffs were significantly larger on a per-customer basis than average reductions for default tariffs. However, given the significant difference in the enrollment rate between opt-in and default tariffs in the SPO (roughly a factor of 5), aggregate load impacts were much higher under default enrollment. This result can only occur if complacents also responded to the TOU price signals. Unaware customers, by definition, do not respond. Combining data on opt-in and default enrollment rates with results from a survey done by SMUD suggests that, in this particular instance, always adopters accounted for roughly 20% of those who remained enrolled on the default rate, complacents accounted for 50%, and the remaining 30% of customers were most likely unaware that they had been placed on a new tariff.

The above evidence indicates clearly that average impacts for an opt-in pilot, populated only with always adopters, will not represent well what the impacts are likely to be for a default tariff, which will also include complacents and unaware customers. This conclusion most likely applies not just to load impacts but also to other metrics of interest, including bill impacts, customer acceptance, and satisfaction and potential economic hardship associated with being defaulted onto a TOU rate. In order to better represent the mix of customers that are likely to be enrolled under default conditions, the TOU Working Group decided to implement what is being called a “pay-to-play” (PTP) recruitment strategy. Under this approach, rather than recruit customers onto a rate by educating prospective participants about the features and potential customer benefits associated with a specific rate, as would be done for a typical opt-in pilot or program, participants will instead be offered an economic incentive for agreeing to be in the pilot and then will be randomly assigned to one of three rate options or to the control condition after

[8] Stephen S. George, Jennifer Potter and Lupe Jimenez. *SmartPricing Options Final Evaluation*. September 5, 2014. See also SmartPricing Options Interim Evaluation. October 23, 2013.

agreeing to participate. This approach has several benefits in this context over a traditional opt-in marketing effort:

- It eliminates any rate-specific selection effects, since participants will be given little information about the characteristics of specific rates (except that they will be TOU rates) and won't know until after they enroll which of the three rate options (or the control condition) to which they will be assigned;
- It reduces potential dissatisfaction that may occur in a more traditional RCT application where customers are asked to enroll and then half are assigned to the treatment condition and half to the control condition. With the PTP plan, it will be made clear up front that participants will be assigned to one of four conditions and they won't know enough about the differences in the rates to be disappointed about getting one assignment over another. Most importantly, the incentive payment, which is likely to be the strongest driver of participation and which will be paid to both treatment and control customers, should be sufficient to overcome any potential dissatisfaction that might arise from a more traditional recruit and deny RCT design;
- Given that the main driver of participation is the incentive (and perhaps interest in being involved in an important research project), and not a specific rate, the PTP approach should attract a reasonable number of complacents along with the always adopters that would be the only participants in a typical opt-in pilot;
- The incentive should significantly increase the acceptance rate for the pilot compared with a traditional marketing strategy and, as a result, it should shorten the recruitment period. This is critical given the very short time available to complete recruitment after Commission approval of the pilot plans and budgets (likely in March 17, 2016) and the target enrollment date of June 1, 2016[9] (leaving only about two months or less for actual recruitment); and
- Finally, this approach reduces the number of customers that must be recruited because within each IOU the same control group can be used for each rate option. Given that each rate being offered in the pilot would have a unique set of selection effects if marketed through a traditional opt-in approach (since tariffs have different characteristics, with different peak period timing and length and differences in rate periods across seasons, etc.), if the rates were marketed on an opt-in basis, each rate would require its own control group. With the PTP approach, customers will be recruited into the study and assigned randomly to one of two or three rates (depending on the IOU) or to the control condition. As such, there are no rate-specific selection effects so a single control group is valid. This results in substantial cost savings.

One downside to the PTP approach is that it does not allow for a determination of the relative preferences of customers for each rate based on a comparison of differential opt-in rates for each tariff. Furthermore, in order to avoid gaming by customers who might enroll to receive the incentive and then immediately drop out of the pilot, only a portion of the incentive will be paid up front with the remainder being paid either at the end of one year on the pilot or perhaps at the end of the second summer period. As such, the relative preferences of customers for the different rates can't be measured by differential dropout rates in the first year, since the delayed

[9] Recruitment for SMUD's SPO pilots required an 8-month period (October-May) and included numerous iterations of opt-in TOU outreach to completely fulfil targeted recruitment levels (SMUD ultimately recruited 3,428 customers for the Opt-In TOU portion of its SPO Pilots). Although SMUD did not offer a pay-to-play incentive, it was also able to tell prospective participants the exact rate onto which they would be placed if they volunteered to participate.

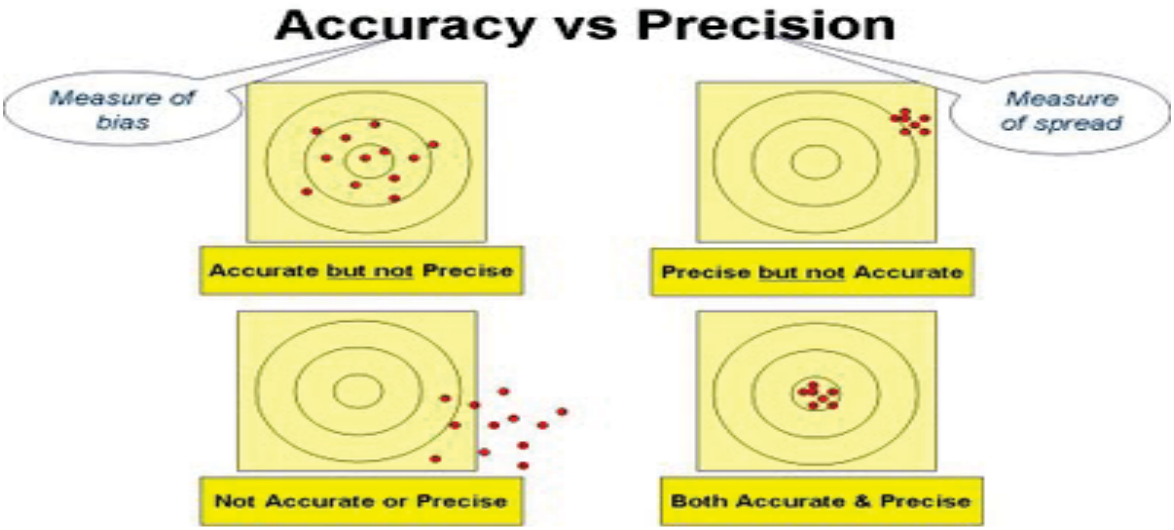
payment of the incentive is designed to keep customers on the rate. However, customer acceptance of each rate option can be assessed by asking about customer satisfaction with the rate in a survey and comparing relative satisfaction ratings for each tariff. In addition, once the final incentive payment is made, customers may opt out and it may be possible to observe differential opt-out rates as an indicator of relative preferences for the rate options offered. Another approach to assessing customer preferences would be to ask each participant near the end of the pilot whether they would have preferred either of the other two rate options over the one they were assigned. This survey question would be asked after participants have been on the rate for at least a year.

3.3 Sample Size Determination

The cost for any pilot or experiment is typically highly correlated with the number of customers that must be recruited in order to answer the key questions of interest with the desired level of statistical precision. Estimates for a variable of interest (e.g., load impact, bill impact, customer satisfaction, etc.) are not exact—they are estimates that are subject to error. Figure 3-3 illustrates two types of error that are relevant to pilot design, bias, and precision. Bias refers to the accuracy of the estimate—an unbiased estimate is one that would accurately reflect the true value for the average treatment customer across repeated samples. Precision refers to the spread of estimates across repeated samples of participants. As illustrated in Figure 3-3, it's possible to have a very precise estimate of a biased answer. Bias was discussed above and primarily stems from poor experimental design (and often from not controlling for selection effects). With the RCT design that will be deployed for these pilots, the estimates should not be biased.

Precision is tied to sample size. If samples are small, there will be greater variation in the estimated values across repeated samples than if samples are large relative to the population of interest. With small samples, there is less confidence that the estimated value from any single sample is close to the true value.

Figure 3-3: Accuracy Versus Precision



An important determinant of sample size is the desired level of confidence. Confidence level refers to the percentage of all possible samples that can be expected to include the true population parameter. For example, suppose all possible samples were selected from the same population, and a confidence interval was computed for each sample. A 90% confidence level means that 90% of the confidence intervals would include the true population parameter. If the confidence interval for an estimated value spans 0, it means that the estimate is not statistically different from 0. For example, if an estimated impact is 2 and the 90% confidence interval is ±3, it means that we can't say, with 90% confidence, that the estimated value of 2 is statistically different from 0. If the objective is to determine whether two estimated values differ from each other, if the confidence bands around the two estimates overlap, it is not possible to say that the two values are statistically different from each other. For example, if the average load impact for one customer segment is estimated to equal 5% with a 90% confidence band of ±3%, and the estimate for a different segment is 8%, with a confidence band of ±2%, it would not be possible to conclude that the two estimates are statistically different because the confidence band for one is from 2 to 8 and the other is from 6 to 10. On the other hand, if the 90% confidence bands for each estimate equaled ±1%, one could say with 90% confidence that the values of 5% and 8% were statistically different because the confidence bands from 4 to 6 and 7 to 9 don't overlap.

The remainder of this section discusses sample size targets for treatment cells and customer segments for which load impacts will be estimated, for which bill impact distributions will be produced, and for which surveys will be the primary mode of assessment. The estimates provided here for load impacts are based on a convenience sample of data from PG&E and, as discussed below, may vary across utilities and segments. Each utility will need to produce its own estimates as input to sampling for implementation, which could lead to increases or decreases in the target sample sizes relative to those shown in Section 4 for each rate treatment. Target sample sizes for bill impact distributions discussed in Section 3.3.2 are

currently an educated guess as none of the bill impacts have yet been calculated. The sample sizes for survey data analysis presented in Section 3.3.3 are based on standard power calculations and do not require further analysis prior to implementation since they will be the same across all utilities.

3.3.1 Sampling for Load Impact Estimation

The sample size required to obtain a certain level of confidence depends on a variety of variables, including the type of variable being estimated, the amount of variation in that variable, and the expected magnitude of the impact. When estimating peak period load reductions, the underlying variable of interest—electrical load during the peak period—fluctuates significantly from day to day and the estimated impact from a modest TOU rate signal is likely to be small. With these conditions, the challenge is picking out a small signal (the impact) from a lot of background noise (fluctuation in load). Doing so requires much larger samples of both treatment and control customers than if the signal was quite large and the background noise was small.

Table 3-1 shows the 90% and 95% confidence intervals for estimating peak period load impacts based on different sample sizes for combined treatment and control customers in an experiment. The estimates assume that a difference-in-differences analysis is used to estimate load impacts during the peak period. These values are based on a sample of customers from PG&E's service territory. The methodology used to produce the values in Table 3-1 is documented in Appendix B.

Table 3-1: Expected Precision for Peak Period Load Impacts Using Different Sample Sizes (Based on a sample of customers from PG&E's service territory)

Number of Treatment + Customers Combined	95% Confidence Band	90% Confidence Band
400	5.2%	4.4%
1,000	3.2%	2.7%
1,500	2.7%	2.2%
2,000	2.2%	1.9%
4,000	1.7%	1.4%

The values in Table 3-2 indicate that, with a sample of 1,000 treatment customers and an equal sized sample of 1,000 control customers (the fourth row in the table), an estimated impact of, say, 5%, would have a 90% confidence band from 3.1% to 6.9%. If the sample of treatment and control customers was doubled, to 2,000 each (4,000 total), the 90% confidence band would narrow to ±1.4% (e.g., it would range from 3.6% to 6.4% if the estimate was 5%). Importantly, in the above example using 1,000 treatment and 1,000 control customers, if the estimated value was 1% rather than 5%, the 90% confidence band would span 0. Put another way, it would not be possible to conclude with 90% confidence that the 1% load impact was statistically different from 0.

As indicated above, the values in Table 3-1 were based on a sample of customers from PG&E's service territory and are driven by the normal fluctuation in peak period electricity use for that specific sample. A sample of customers from a different service territory, or from a different customer segment within PG&E's service territory, could have confidence bands that are wider or narrower than those shown in Table 3-1 depending on the underlying fluctuation in electricity use for those customers. Table 3-2 shows how the confidence bands differ between CARE and non-CARE customers and between customers in hot and cool climate regions in PG&E's service territory.[10] The greater fluctuation in loads across days in the cooler region leads to a wider confidence band than in the hotter region where the consistently hot temperatures produce high demand levels on most summer days. This highlights the importance of each IOU conducting analysis similar to that underlying these tables based on a representative sample of the target population in each climate region. As discussed below, SCE has already completed this analysis and found that there are large differences across climate regions in the confidence bands that can be obtained from a given sample size.

Table 3-2: Expected Precision for Peak Period Load Impacts Using Different Sample Sizes (90% Confidence Band)

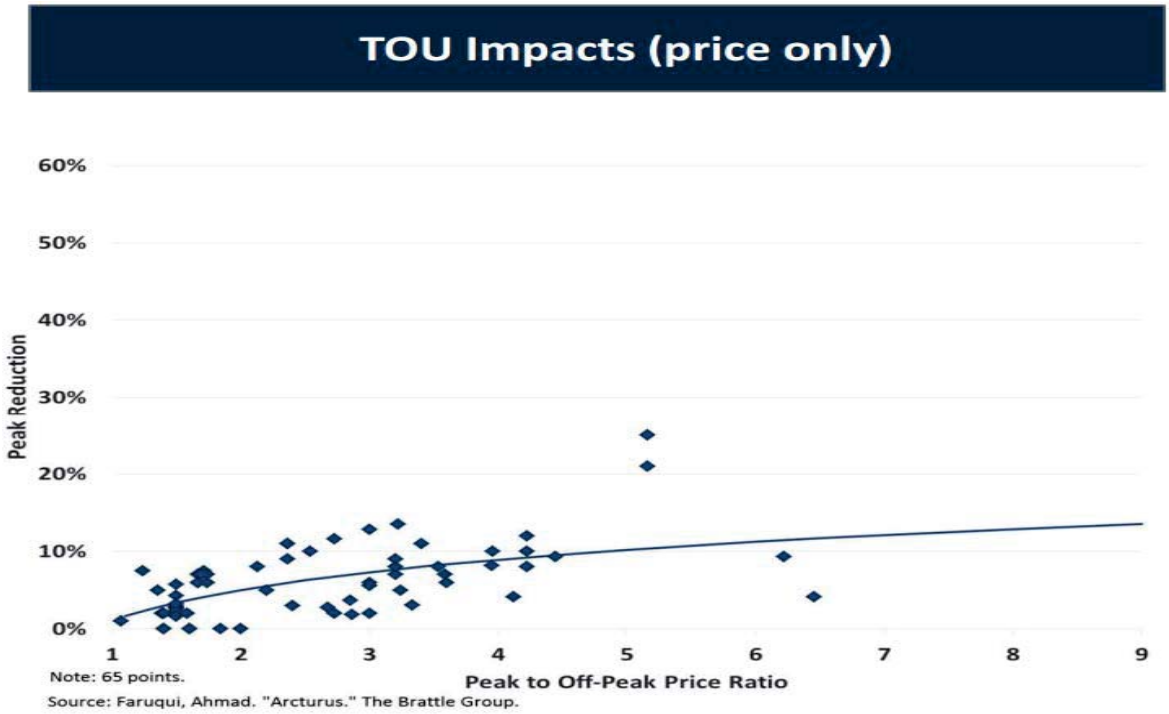
Number of Treatment Customers (Assumes Equal # of Control Customers)	Non-CARE	CARE	Cool	Hot
400	5.4%	4.2%	4.2%	3.6%
1,000	3.1%	2.6%	3.1%	2.4%
1,500	2.5%	1.9%	2.7%	2.0%
2,000	2.2%	1.8%	2.0%	1.7%
4,000	1.4%	1.1%	1.5%	1.2%

In addition to the size of the confidence bands associated with various sample sizes, another key driver of the sample size is the expected load impact. If expected load impacts are small, say 2%, and it is important to know whether the estimated values are statistically different from 0, it will be important to draw samples of at least 1,000 treatment and control customers (each) so that the confidence band is less than ±2%. On the other hand, if the expected load impact is, say 10%, and it is sufficient to know with 90% confidence that it is likely to be somewhere between 7% and 13%, then a sample size of only 500 customers would be required. Figure 3-4 shows estimates of load impacts at various peak-to-off-peak price ratios as estimated from a variety of TOU pilots and programs. As seen previously in Figures 3-1 and 3-2, the peak-to-off-peak price ratios being proposed for the various pilots range from around 1.1 to 1 to greater than 4 to 1. Based on prior studies, this suggests that the expected impacts are almost certainly less than 10% and may be less than 5%. Importantly, most prior studies have peak periods that are in the afternoon hours when air conditioning loads are relatively high and many households may be unoccupied. With some of the proposed rates having peak periods

[10] It should be noted that the difference in the size of the 90% confidence band between hot and cool climate regions may be impacted by the difference in the share of customers in each region that are CARE customers. The share of customers in PG&E's hot climate region that are CARE customers is much larger than the share in the cool climate region.

extending well into the evening when temperatures are cooler and people are home, expected load impacts may be lower than those found in most prior studies.

Figure 3-4: Load Impacts as a Function of Peak-to-off-peak Price Ratios



Based on the above sample size calculations and a review of prior studies, the TOU Working Group decided to use a sample size of 1,000 treatment and 1,000 control customers for planning purposes for each customer segment for which estimates of the average load impact is desired.[11] As discussed in Section 3.3.4, customer attrition over the course of the pilots is planned to equal roughly 25 percent; so the pilot plan is to recruit roughly 1,250 customers to be recruited for each segment for which load impacts will be estimated so that roughly 1,000 will still remain on the rate in summer 2017. This analysis is based on sample sizes for estimating summer, peak-period load impacts. The confidence level for load impacts in other rate periods and for electricity use overall may differ.[12]

As indicated above, prior to implementation, each utility will estimate the sample sizes required to achieve a similar level of confidence for their customer population by segment and climate

[11] The segments of interest are discussed later in this section and also in Section 4.

[12] It should be noted that the Environmental Defense Fund argued for much larger sample sizes and greater precision based on the importance of accurate load impact estimates for resource adequacy planning. Their comments on this issue are contained in Appendix C. They also raised this issue during the final Working Group meeting. In response, Nexant indicated that the purpose of these pilots is to provide guidance for the default rates that may be implemented in 2019. The impacts resulting from the chosen rate, which is likely to be somewhat different from the exact rates implemented in these pilots, is what matters for resource adequacy planning. Those impacts should be estimated when the rate is implemented in 2019 or in conjunction with the 2018 default pilots when much larger sample sizes can be obtained at much lower cost than the cost of recruiting participants into opt-in pilots.

region. This analysis was already completed by Nexant for SCE several days prior to completion of this report. The analysis largely confirmed the sample size estimates calculated by Nexant for pilot planning purposes, based on a convenience sample of PG&E data, with the exception of cool climate zones. The analysis showed that the width of the confidence bands in SCE's cool climate region was roughly twice as large as the confidence bands in the moderate and hot climate regions. This is due, in large part, to the greater variability in peak period load during summer months in the cooler region combined with lower mean usage, meaning that the coefficient of variation (the ratio of the standard deviation to the mean) in the cool region is much larger than in the moderate or hot regions.

In order to have confidence bands in the ±2% range in SCE's cool climate region, sample sizes would need to double compared to the other two regions. Across three rate options and the control group, the additional recruitment requirement in the cool region would total roughly 5,000 participants at a likely cost of several million dollars. If similar results are found in PG&E and SDG&E's service territories, the total incremental cost of meeting the same level of precision in all three regions could easily exceed $5 million. There is no policy reason of which we are aware for determining load impacts at the climate region level. The decision about what default rate to offer in 2019 presumably will be based on average load impacts for the service territory as a whole, not for any particular climate region. The level of precision at the service territory level exceeds ±2% since sample sizes at this level are roughly 3,000 for each rate (for a total of 6,000 for the treatment and control groups combined). As such, Nexant recommended not incurring this additional cost to maintain the same level of confidence in the cool climate region as in the other climate regions. The reasonableness of this decision is underscored by the fact that Pub. Utility Code Section 745(c) and (d) only require findings relating to hot climate regions. This issue arose too late to take it up with the entire Working Group, but it was vetted with Energy Division and with all three IOUs, and representatives from those four groups agreed with Nexant's recommendation.

3.3.2 Sampling for Bill Impact Analysis

In addition to load impacts, another variable of interest is bill impacts. There is significant interest by the Commission and selected stakeholders regarding the bill impact of default TOU rates on selected customer groups, as discussed at greater length in Section 3.5. Of particular interest is the percent of customers in selected segments that might see their bills increase by large amounts (with *large* yet to be defined) to assess whether unreasonable hardship is caused for some customers by being on the TOU rate (with *unreasonable hardship* to be determined by the CPUC after reviewing the data from this pilot). Under default TOU pricing, even with no change in usage, nearly every consumer's bill will change relative to what it would have been on the otherwise applicable tariff (OAT) except for the mythical "average customer" who would see no bill impact going from the OAT to a revenue neutral TOU rate. The distribution of bill impacts after changes in usage will differ from the distribution based on no change in usage, depending on how much customers on the rate respond by reducing their load or by shifting it from peak to non-peak hours.

Figure 3-5 shows the distribution of bill impacts associated with a hypothetical TOU tariff. In the figure, negative values represent a bill decrease relative to the OAT and positive values

represent a bill increase. In this example, there is a small percentage of customers with bill increases exceeding 20%. It is these customers on the tail of the distribution, above some specified level (e.g., 15%, 20%, or some absolute amount such as $100 or $200), that may be of greatest interest from a policy perspective because they are the customers who will see their bills go up significantly under TOU rates and may be unlikely to obtain lower bills relative to the OAT regardless of how much they reduce or shift load during the peak period. Obviously, these are customers for whom it makes economic sense to opt-out of default TOU. As such, it is important that the sampling plan for the pilots be designed to characterize with reasonable accuracy the distribution of bill impacts for the population as a whole and that samples are large enough to determine the percent of customers that will see bill increases above some predetermined level.

Figure 3-5: Hypothetical Distribution of Bill Impacts

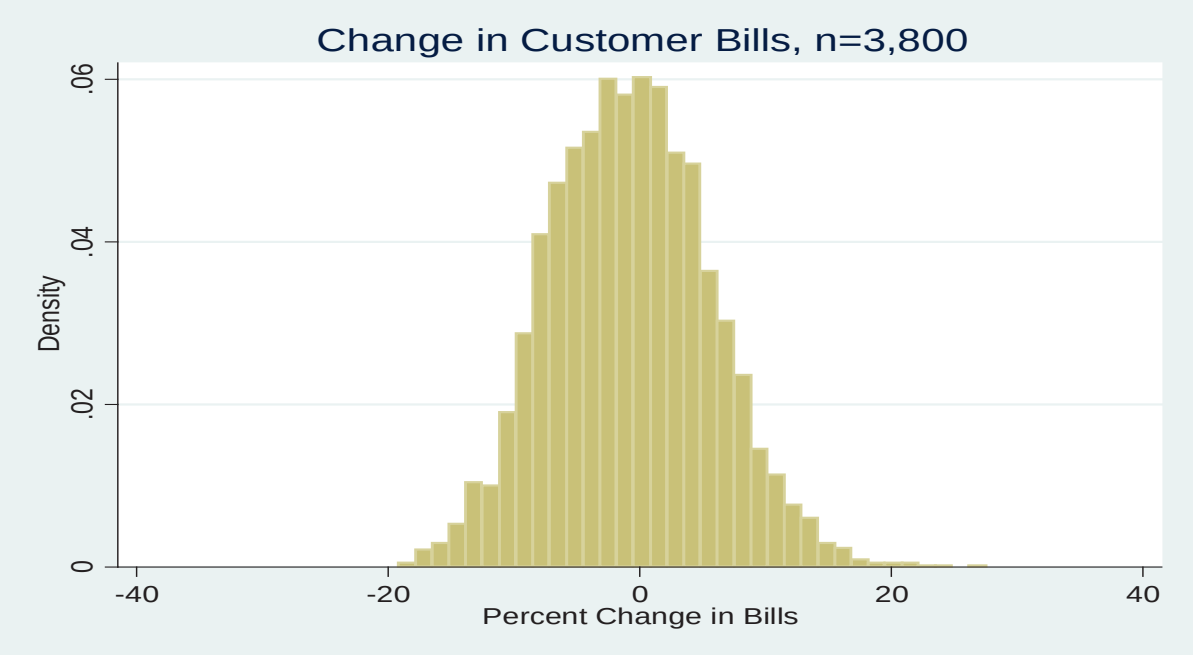


Figure 3-6 shows how the distribution of bill impacts varies with sample size for the same hypothetical tariff depicted in Figure 3-5. As seen, with very small samples, it is easy to miss the outliers that are of interest—those with high bill increases. In order to determine how large the sample size must be to adequately characterize the distribution of bill impacts for a specific customer segment of interest, it is necessary to have data on the bill impacts using pretreatment usage patterns. Because TOU rates were not finalized until quite late in the planning process, bill impacts could not be estimated in time to conduct this analysis prior to completing the report. The current operating assumption is that 500 observations will be adequate to accurately characterize the distribution of bill impacts for segments of interest and to produce reasonable confidence bands around the percent of accounts in each segment that experience bill impacts above a certain threshold. Prior to finalizing the sampling and recruitment plan, each utility will need to do the analysis necessary to either confirm this assumption or propose adjustments to the sample sizes (up or down) required to accurately characterize bill impact distributions.

Figure 3-6: Variation in Bill Impact Distributions with Sample Size

3.3.3 Sampling for Survey Questions

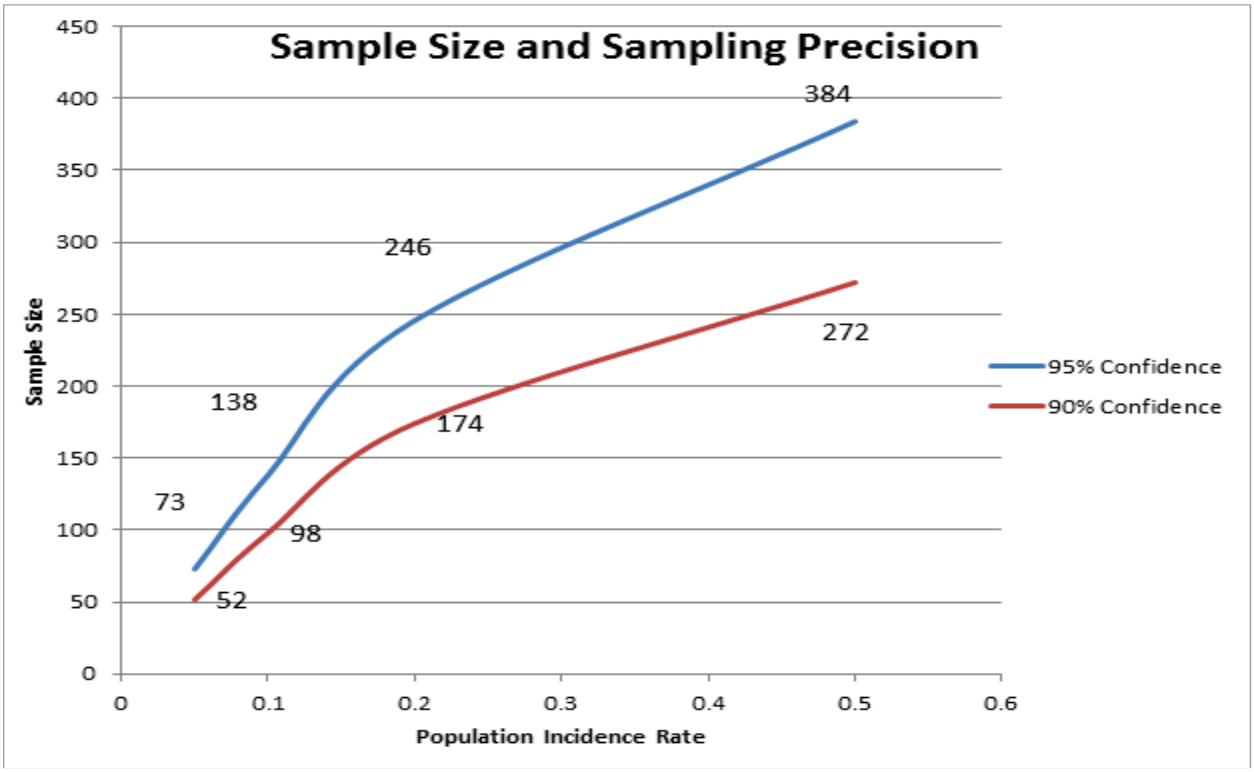
In addition to load impacts and bill impacts, decision makers will also rely on other metrics for evaluating potential pricing, technology, and education/outreach strategies. These metrics will typically involve survey questions pertaining to customer awareness, understanding of rate features, satisfaction, engagement through changes in behavior, actions driven by potential economic hardship, etc. Thus, it is important to consider sample size requirements needed to determine statistical differences in survey responses across treatments and customer segments.

There are two types of survey questions that will be used to investigate issues of interest: *categorical* and *continuous*. Categorical questions are used to quantify things such as customer characteristics (e.g., a respondent's senior status, housing type, etc.) and information about behavior that might have been driven by the treatments (e.g., Did you adjust your thermostat to reduce use in the afternoon). Continuous variables include scaler questions such as satisfaction ratings (e.g., On a scale from 1 to 10, how satisfied are you with the rate you are on), agree/disagree questions (e.g., On a scale from 1 to 10, where 1 means strongly disagree and 10 means strongly agree, please indicate your level of agreement with the following statement), and some customer characteristics information such as income, age, house size in square footage, etc. Sample size calculations differ depending on the type of variable.

For categorical variables, the required sample size is a function of the assumed incidence rate (e.g., the percent of people answering a question in a certain way) and the desired level of statistical precision and confidence. Figure 3-7 shows the relationship between sample size and incidence rate for a given level of precision and confidence. As seen in the figure, if the expected incidence rate is 5%, the required sample size to estimate the value with ±5% precision and 95% confidence is only 73. The required sample size is only 52 for 90% confidence. On the other hand, if the expected incidence rate is 20%, the required sample

size is roughly 250 for 95% confidence and about 175 for 90%. The required sample size jumps to around 385 and 275 respectively at an incidence rate of 50%.

Figure 3-7: Sample Size as a Function of Incidence Rate for Categorical Variables (±5% precision)



Sample size calculations for continuous variables vary depending on the mean and standard deviation of the answers. Table 3-3 shows how sample sizes differ with variation in the mean and standard deviation associated with actual responses from two questions that were included in a survey conducted by SMUD as part of the SPO pilot. The two questions involved a five-point, agree/disagree scale for questions pertaining to ease of understanding and perceived fairness of the pricing plans that were included in the pilot. The rows in the table pertain to the different treatment groups included in the SPO (e.g., default and opt-in TOU and CPP tariffs, etc.). The sample sizes in the far right column are based on ±5% precision and 95% confidence and differ based on the means and the variance of the survey responses. The sample sizes vary from a low of 180 to a high of 371, with the mean being 285. If the level of confidence were lowered from 95% to 90%, the required sample sizes would drop significantly, and would be below 100 participants for most groups and questions.

Table 3-3: Sample Size Requirements for Continuous Variables for Specific Questions and Treatments in SMUD's Smart Pricing Options Pilot

My current pricing plan is easy to understand

Category	N	1	2	3	4	5	Mean	Standard Deviation	Variance	Sample Size
control	300	0.25	0.313	0.263	0.137	0.037	2.40	1.11	1.24	330
default_CPP_(no_drop_outs)	163	0.247	0.381	0.212	0.11	0.049	2.33	1.11	1.23	348
default_CPP_TOU_(no_drop_outs)	141	0.256	0.423	0.186	0.123	0.013	2.22	1.00	1.00	314
default_TOU_(no_drop_outs)	417	0.275	0.386	0.177	0.134	0.028	2.25	1.08	1.18	356
deferred	736	0.258	0.419	0.204	0.089	0.031	2.22	1.02	1.05	328
opt_in_CPP_(no_drop_outs)	576	0.309	0.471	0.106	0.099	0.016	2.05	0.98	0.95	350
opt_in_TOU_(no_drop_outs)	1,017	0.35	0.438	0.118	0.075	0.02	1.98	0.97	0.95	371

My current pricing plan is fair

Category	N	1	2	3	4	5	Mean	Standard Deviation	Variance	Sample Size
control	300	0.167	0.277	0.367	0.143	0.047	2.63	1.07	1.14	253
default_CPP_(no_drop_outs)	163	0.225	0.393	0.276	0.087	0.019	2.28	0.97	0.94	278
default_CPP_TOU_(no_drop_outs)	141	0.167	0.41	0.305	0.087	0.032	2.41	0.97	0.94	249
default_TOU_(no_drop_outs)	417	0.182	0.38	0.272	0.137	0.029	2.45	1.03	1.06	271
deferred	736	0.196	0.333	0.313	0.121	0.038	2.48	1.05	1.11	279
opt_in_CPP_(no_drop_outs)	576	0.255	0.407	0.241	0.079	0.017	2.19	0.96	0.93	296
opt_in_TOU_(no_drop_outs)	1,017	0.265	0.396	0.221	0.094	0.023	2.21	1.01	1.02	322

Of course, there are many survey questions of potential interest for the pilots and it's impossible to guess what the expected incidence rate would be for categorical questions or what the means and standard deviations might be for continuous variables for all questions of interest. The pilot plan involves tying a portion of the PTP incentive to completion of surveys so survey response rates are expected to be high.[13] Based on the above analysis, treatment cells that are sized to a target enrollment of 1,000 customers in order to produce estimates of load impacts will certainly be large enough to produce a high degree of statistical precision and confidence for all survey questions of interest. As indicated in Figures 3-7 and 3-8, treatments and segments that will be assessed largely on the basis of survey data can be sized well below 1,000. Assuming a design standard of 90% confidence, a sample size of 250 should be adequate for nearly any survey question and incidence rate of interest.

[13] In California's Statewide Pricing Pilot conducted in 2003/2004, which also used a PTP approach and tied part of the incentive to survey response, the average response rate across numerous treatment cells was 90%. See Stephen S. George and Ahmad Faruqui. *Impact Evaluation of California's Statewide Pricing Pilot*. Final Report, March 16, 2005.

3.3.4 Oversampling for Attrition

An important factor affecting sample sizes and recruitment costs is the expected amount of attrition. It is necessary to factor attrition into the initial recruitment plan so that statistically valid impact estimates can still be obtained at least through the second summer of the pilot. Attrition in the pilots will be driven by two factors, account turnover from moving (or customer churn) and dropouts (participants who leave because they want to drop off the rate). Nearly all prior pilots with which we are familiar have had very low dropout rates, but customer churn can be 15% to 20% per year. For example, in SMUD's SPO pilot, the dropout rate was between 4% and 8% over two summers depending on the tariff; whereas customer churn ranged from 18% to 21%.

Given the fact that participants in the proposed pilots will be paid the largest part of the participation incentive either at the end of the first year or midway through the second,[14] dropout rates could be even lower than in the SMUD SPO pilot, at least until after the last incentive is paid. Participants will be allowed to stay on the pilot rates through the end of 2017, but from an evaluation perspective, the most valuable learnings after the end of the summer of 2017 will be what the dropout rate is once the final incentive payment has been made rather than what load impacts are in the fall of 2017. As such, the TOU Working Group concluded that over recruiting by 25% would be sufficient in each treatment cell relative to the target level of participation needed to estimate load impacts, bill impacts, or survey responses to the desired level of statistical significance. For example, for the moderate climate regions where the target enrollment rate for estimating load impacts is 1,000, 1,250 participants would be recruited to ensure that there are roughly 1,000 still on the rate during summer 2017.

3.4 Control Group Rate

Ordering paragraph 5 of D.15-07-001 required that, within 60 days of the decision, the three IOUs will file a Tier-2 Advice Letter setting forth the glide path for future rate changes to consolidate the tiers and implement the Super User Electric Surcharge. SCE, PG&E, and SDG&E filed such advice letters on September 1, 2015. The filings for all three utilities show a reduction in the number of tiers from the four-tier structure in place in 2015 and a significant reduction in the price differential between the baseline quantity (BQ) and the prices in effect up to 400% of the baseline quantity in 2019. Above 400% of baseline, a Super User Electric Surcharge comes into effect in 2017 with prices equal to roughly $0.40/kwh at PG&E and SCE and more than $0.50 at SDG&E. Table 3-4 shows the proposed glide path prices for the tiered rate for each utility in 2015, 2016, 2017 and 2019. The rate changes are to go into effect sometime between March and May each year from 2016 to 2019.

[14] The impact of payment schedule on acceptance rates will be investigated during the recruitment pretests in January.

Table 3-4: Glide Path Rates for Non-CARE Customers

	SCE ($/kWh)				PG&E ($/kWh)				SDG&E ($/kWh)			
Usage	**2015**	**2016**	**2017**	**2019**	**2015**	**2016**	**2017**	**2019**	**2015**	**2016**	**2017**	**2019**
0–100% of BQ	15.0	16.5	16.9	18.2	16.7	17.5	17.7	18.3	18.1	22.1	23.7	24.1
100–130% of BQ	20.9	25.2	25.9	23.3	19.8	21.7	24.4	23.0	20.5	22.1	23.7	24.1
130–200% of BQ	24.3	25.2	25.9	23.3	25.2	21.7	24.4	23.0	39.6	36.9	33.4	30.2
200–400% of BQ	30.2	29.8	25.9	23.3	32.1	31.9	24.4	23.0	39.6	36.9	33.4	30.2
>400%	30.2	29.8	31.8	40.8	32.1	31.9	33.8	40.3	39.6	36.9	38.9	52.9

For each utility, prices below 130% of baseline increase between 2015 and 2019 and prices between 130% and 400% of baseline decrease. For usage above 400% of baseline, prices fall modestly initially and then increase significantly when the Super User Electric Surcharge comes into effect, which occurs in 2017. Thus, customers on both the low end and the very high end of the usage distribution are likely to see bill increases between 2015 and 2019 while those in the middle are likely to see bill decreases (assuming no change in usage).

Among other things, the TOU pilots are intended to estimate the change in usage (and bills) for customers who are defaulted onto TOU rates in 2019. These TOU rates will be revenue neutral relative to the 2019 OAT shown in Table 3-4.[15] Given this, conceptually, it would seem logical to use the 2019 OAT as the rate for control group customers in the pilots and TOU rates that are revenue neutral relative to the 2019 OAT. However, this approach assumes that control group customers would adjust quickly to the change in the OAT relative to the 2016 OAT rate that will be in effect when the pilots are initiated so that their usage pattern reflects what customers would be using on the OAT after a four year period over which the tier structure gradually changes. There are reasons to believe that the change in usage in response to changes in a tiered rate structure is likely to happen much more slowly than would a change from an OAT to a TOU rate structure. If true, using the 2019 OAT and 2019 TOU rates in the pilots would not accurately reflect the TOU load or bill impact from a change in usage under the tiered rates in place in 2019.

There is substantial evidence from prior TOU pilots in other jurisdictions that residential customers can understand TOU prices quickly and make adjustments in peak period usage rapidly. For example, in the SMUD pilot, people were placed on the new rates on June 1. There were substantial load reductions in the first summer, and those impacts didn't change much in the second summer.[16] The timing of the CA Statewide Pricing Pilot many years ago was similar—people were placed on the rate very close to the summer rate period and load reductions were substantial in the first summer.

[15] In reality, it is likely that the actual rates in 2019 will differ from those shown in the table, as the final rates are yet to be approved.

[16] Stephen S. George, Jennifer Potter and Lupe Jimenez. *SmartPricing Options Final Evaluation*. September 5, 2014.

There is also evidence indicating that people have a lot of trouble understanding tiered rates and typically have no idea what tier they are in at any particular time or how prices change across tiers. In a survey conducted at the end of the SMUD SPO pilot, control group customers who were on a tiered rate (and had been for a long time) had the lowest score among all groups on the following question: "My current pricing plan is easy to understand." 56% of control group customers somewhat or strongly agreed with this statement whereas 63% to 68% of TOU default customers agreed and 78% of opt-in TOU customers agreed. On another battery of questions, control group customers had roughly the same level of accuracy (25%) in responding to questions about the characteristics of the rate they were on as default TOU[17] customers (20% to 30%) and much lower than opt-in TOU customers (42% to 48%). Most striking was that 56% of control group customers checked "don't know" to the question about rate characteristics, whereas only about one third of default customers checked "don't know" and only 20% of opt-in customers did. In short, the evidence suggests that tiered rates are harder for customers to understand compared with TOU rates. TOU pricing is common across many products in everyday life—movie prices, bridge tolls, parking, etc.—whereas tiered pricing is quite rare, especially increasing block pricing.[18]

With this in mind, if control customers were placed on the 2019 OAT at the same time that treatment customers were placed on the TOU rates, it's highly unlikely that the control group customers would modify their usage immediately to reflect the pattern of usage that customers would actually have in 2019 after going through four years of gradual changes in the tier structure. Given this, while one might think that basing the pilots on the 2019 OAT and TOU rates would produce a valid comparison of usage under the 2019 OAT with usage under the 2019 TOU rate, in fact it would more likely involve a comparison in usage under the 2019 TOU rate with usage under the 2016 OAT that control group customers will have been on for a couple of months before the start of the pilot. For these reasons, Nexant recommended that the pilot be based on the 2016 OAT and revenue neutral TOU rates relative to the 2016 OAT as a more valid basis for estimating TOU rate impacts than would using the 2019 OAT and TOU rates, which would more likely compare usage under the 2016 OAT with usage under the 2019 TOU rate.

A related decision concerned whether or not pilot rates, including the OAT, should be held constant over the course of the pilot or should be adjusted in 2017 according to the glide path rate adjustments that all non-pilot participants will experience (as shown in Table 304). Holding the rates constant through the end of 2017 and placing pilot participants back onto the 2017 OAT at a time not long before the 2018 glide path rate adjustment will occur could cause problems with large rate jumps for some consumers and multiple rate changes in a short time

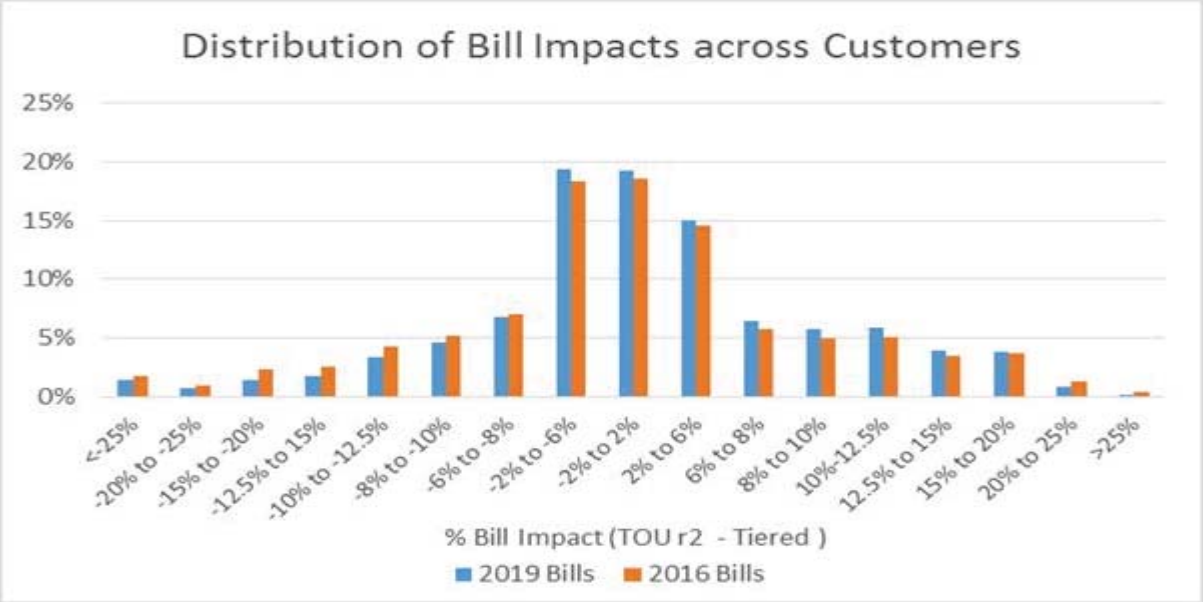
[17] Used here, TOU represents the combination of TOU, Critical Peak Pricing (CPP) and TOU-CPP rates included in the SMUD SPO.

[18] Volume discounts are, of course, quite common but these price changes are tied to quantities that consumers understand and that are easily communicated whereas for electricity pricing, in the absence of in-home displays or tier-alert services, consumers don't know what tier they are in nor can they easily relate how changes in usage would impact bills. With TOU rates, on the other hand, while these same challenges are relevant for the underlying rate structure, consumers can easily understand that electricity at certain times of the day costs, for example, twice as much as at other times of the day, and can make what many surveys suggest are relatively easy changes in certain usage patterns to reduce usage during high priced periods.

period for control group customers if the rates are held constant. For this reason, the OAT rates for control group customers will be allowed to adjust according to the proposed glide path and TOU rates will be adjusted in accordance with the OAT so as not to create anomalies between the treatment and control group tariffs.

Prior to accepting this recommendation, the Energy Division voiced concern about whether using these rates would materially distort what the bill distribution would look like under the 2019 rates, as insights regarding bill impacts will be important inputs to policy decisions. To address this concern, SCE produced distributions of bill impacts based on current usage (e.g., prior to shifting) using both the 2016 and 2019 rates. Figure 3-8 shows those two distributions. As seen, bill impacts based on pretreatment usage patterns are very similar under both the 2016 and 2019 OAT and TOU tariffs. As such, bill impacts based on post-treatment usage and the 2016 tariffs should produce a very close approximation to what the bill impact distribution would be under the 2019 tariffs after consumers on the OAT have had a chance to adjust their usage in response to the rate flattening that will occur gradually between 2016 and 2019.

Figure 3-8: Distribution of Bill Impacts Moving From OAT to TOU Rates Using 2016 and 2019 Proposed Tariffs



3.5 745 Segments and Customer Exclusions

A number of requirements embedded in Section 745 of the Public Utilities Code Section impose constraints on who will be recruited into the TOU pilots and also influence the sampling plan that will be used to recruit customers into the pilots. Practical implementation issues and other factors also influence who will be recruited.

3.5.1 Exclusions

P.U. Code Section 745(c)(1) excludes certain customers from being defaulted onto TOU rates without their affirmative consent. These customers include those who receive a medical

baseline allowance, customers requesting third-party notification pursuant to subdivision (c) of Section 779.1, and customers who the Commission has ordered cannot be disconnected from service without an in-person visit from a utility representative (Decision 12-03-054, March 22, 2012).

The cited decision, D.12-03-054, describes the vulnerable customer group that cannot be disconnected without an in-person visit to include Medical Baseline customers, Life Support Customers, and a broader group defined as follows (p. 30): "customers who certify that they have a serious illness or condition that could become life threatening if service is disconnected. We do not require the customer to produce a physician's statement in support of the certification; i.e., customers may self-certify as to the illness or condition." The decision goes on to analyze this group further and to specifically note that it is broader than the group of customers eligible for medical baseline, stating "the medical baseline designation alone may not be adequate to protect at-risk customers." This latter point recognizes that there are many households containing individuals who are not enrolled in programs such as medical baseline even though they might qualify or because they do not use above-average amounts of electricity.

IOU databases identify customers with medical baseline allowances, those that require third party notification, and those that have previously been determined to require an in-person visit prior to disconnection and these accounts will be excluded from the pilots because they are not subject to default TOU. In order to address concerns about households that may have disabled individuals living there that are not enrolled in medical baseline programs or that may include individuals who have not previously been identified but who would be subject to an in-person visit prior to disconnection, the TOU Working Group agreed that language would be included in the recruitment materials asking participants to self-certify at the time of enrollment into the pilot that losing power due to nonpayment would not put their health or safety at risk.[19]

In addition to the statutory exclusions summarized above, a number of other groups will be excluded from participating in the pilots for practical or other reasons, including:

- Direct access and community choice aggregation customers;
- Net metered customers;
- Customers that do not have a smart meter;
- Utility employees;
- Customers that are on an existing time-varying rates except for participants in SCE's Save Power Days peak time rebate, who will be included in the pilot recruitment sample.

For clarity, customers participating in each utility's load control programs (SmartAC at PG&E, Summer Discount Plan at SCE, and Summer Saver at SDG&E) will be included in the recruitment sample. Collectively, there are more than 500,000 residential accounts in these programs and prior research has shown that participants in load control programs have a higher

[19] It should be noted that this will need to be carefully crafted language so as not to suggest to potential participants that there is increased danger to the majority of customers that participating in the pilots will increase the likelihood of having their power cut off.

likelihood of also enrolling on time-varying tariffs and are more engaged in managing their energy use than nonparticipating households. Excluding these households from the pilots could bias downward the average load impacts that would be observed relative to what might occur under future default conditions when such customers will be included.[20]

Excluding customers with less than a year's worth of usage data from the pilots was considered by the Working Group but was rejected. As discussed below, this is an important issue because the pilots will oversample low income and CARE/FERA segments, which are likely to have higher average churn rates than the general population. Requiring that participants have at least a year's worth of data may significantly bias the population of participants in these segments relative to the full segment population. Not having a full year's worth of usage data means that a difference-in-differences analysis will not be able to be used to estimate impacts for all participants[21] and this could reduce the precision of the load impact estimates compared with planning assumptions. However, it was felt that trading off less bias for less precision given the importance of having these oversampled groups in the pilot was the right decision.

3.5.2 Customer Segmentation

Section 745(c)(2) of the Public Utilities Code, which was adopted in 2013 through Assembly Bill (AB) 327, states:

> "The commission shall ensure that any time-of-use rate schedule does not cause unreasonable hardship for senior citizens or economically vulnerable customers in hot climate zones."

A related section was added the following year through Senate Bill (SB) 1090, namely P.U. Code Section 745 (d), which states:[22]

> "The commission shall not require or authorize an electrical corporation to employ default time-of-use rates for residential customers unless it has first explicitly considered evidence addressing the extent to which hardship will be caused on either of the following:
>
> > (1) Customers located in hot, inland areas, assuming no changes in overall usage by those customers during peak periods.

[20] During pilot evaluation, impact estimates could be developed after excluding these customers from the sample to determine whether including or excluding them changes the average load impact.

[21] See Section 5.2 for an explanation of difference-in-differences.

[22] It should be noted that in 745(c)(2), passed in 2013 under AB 327, the phrase "unreasonable hardship" is used. And Section 745(d), added by SB 1090, which focuses solely on assuming no change in usage, refers to the considering "the extent to which hardship will be caused" in various different hot areas. The legislative history of SB 1090 shows that the legislature's concern was that the CPUC also specifically review summer bills in specific hot, inland areas, rather than on just on annual averages or through analyses that were not geographically focused. The reference to "seasonal bill volatility" in SB1090 also appears to indicate that the legislature was concerned with the difference between summer and non-summer bills.

(2) Residential customers living in areas with hot summer weather, as a result of seasonal bill volatility, assuming no change in summertime usage or in usage during peak periods."

The TOU Working Group spent a significant amount of time discussing the sampling requirements and evaluation metrics that should be incorporated into the TOU pilot design to provide useful insights regarding the extent to which TOU rates might cause unreasonable hardship for seniors and economically vulnerable customers. There were strong differences of opinion regarding the definitions of seniors and economically vulnerable customers, about the metrics that should be used to assess hardship and about what constitutes unreasonable hardship.

With regard to the definition of seniors, no member of the TOU Working Group sought an age cut-off other than 65 years. However, some Working Group members argued to define senior households as those for which the "head of the household" or the service account holder is 65 or older. TURN argued that a senior household should be any household that had someone residing there who is 65 or older.[23]

With respect to economically vulnerable households, some stakeholders argued that this group should be defined as customers served on CARE/FERA tariffs. TURN argued that there are many economically vulnerable households who are not currently served on CARE/FERA tariffs and that the hot climate region sample should be stratified based on a broader definition that includes non-CARE/FERA households with low incomes. TURN also argued that there should be some stratification based on household income within the CARE/FERA segment.

Table 3-5 shows the number of seniors (defined by age of head of household),[24] non-seniors, CARE/FERA and non-CARE/FERA customers in SCE's hot climate region segmented further by income brackets tied to Federal Poverty Guidelines (FPG). Table 3-6 shows the FPG household income by family size. As seen in Table 3-5, there is not a clear correlation between income data reported by Experian/Acxiom that would qualify customer for CARE/FERA, on the one hand, and customer enrollment in these programs on the other. Of the 115,277 households with incomes less than 100% of FPG in SCE's hot climate region based on the Experian/Acxiom data, more than 40% (47,776) are not signed up for CARE/FERA tariffs. It is also clear that there is a wide distribution of income relative to the FPG within CARE/FERA and senior customer segments. Of the 223,450 CARE/FERA customers in SCE's hot climate region, roughly 30% have incomes below 100% of the FPG and another 30% have incomes greater than 250% of the FPG.

[23] The three IOUs each have data purchased from either Experian or Acxiom that contains information on household income and persons per household by age. This information will be used to draw samples for segments of interest. However, actual segmentation within the pilots may be based on data gathered during enrollment.

[24] Basing the sampling on this definition does not take a position concerning whether this is the correct definition versus TURN's position that the segment should be defined by households that have anyone over 65 living there. By definition, there are more households in the population based on the latter definition than there are based on the former definition. Each definition can be used after the data is collected to determine whether there are differences in outcomes based on the two definitions.

Table 3-5: Number of Customers by Segment in SCE's Hot Climate Region

Household Income Relative to Federal Poverty Guidelines (FPG)	Non-Seniors			Seniors			All
	Non-CARE/FERA	CARE/FERA	All	Non-CARE/FERA	CARE/FERA	All	
<100% FPG	34,414	53,361	87,775	13,362	14,140	27,502	115,277
100%–200% FPG	52,697	47,266	99,963	15,500	10,954	26,454	126,417
200%–250% FPG	29,030	22,644	51,674	12,113	6,573	18,686	70,360
>250% FPG	130,643	53,180	183,823	66,570	15,332	81,902	265,725
Grand Total	**246,784**	**176,451**	**423,235**	**107,545**	**46,999**	**154,544**	**577,779**

Table 3-6: Federal Poverty Guideline Household Income by Household Size[25]

Household Size	100%	133%	150%	200%	250%	300%	400%
1	$11,770	$15,654	$17,655	$23,540	$29,425	$35,310	$47,080
2	15,930	21,187	23,895	31,860	39,825	47,790	63,720
3	20,090	26,720	30,135	40,180	50,225	60,270	80,360
4	24,250	32,253	36,375	48,500	60,625	72,750	97,000
5	28,410	37,785	42,615	56,820	71,025	85,230	113,640
6	32,570	43,318	48,855	65,140	81,425	97,710	130,280
7	36,730	48,851	55,095	73,460	91,825	110,190	146,920
8	40,890	54,384	61,335	81,780	102,225	122,670	163,560

Given that agreement could not be reached regarding the above definitions of customer segments, in a Scoping Memo and Ruling issued on October 15, 2015, the ALJ and Assigned Commissioner for Rulemaking 12-06-013[26] requested briefing on the definitions and requirements of Public Utility Code 745 in Phase 3 of the Proceeding. These issues were given priority because of their importance for TOU pilot design. In spite of this priority, a ruling will not be made until January 2016 at the earliest. As such, input from this decision cannot be used to guide TOU pilot or sample design at this time.

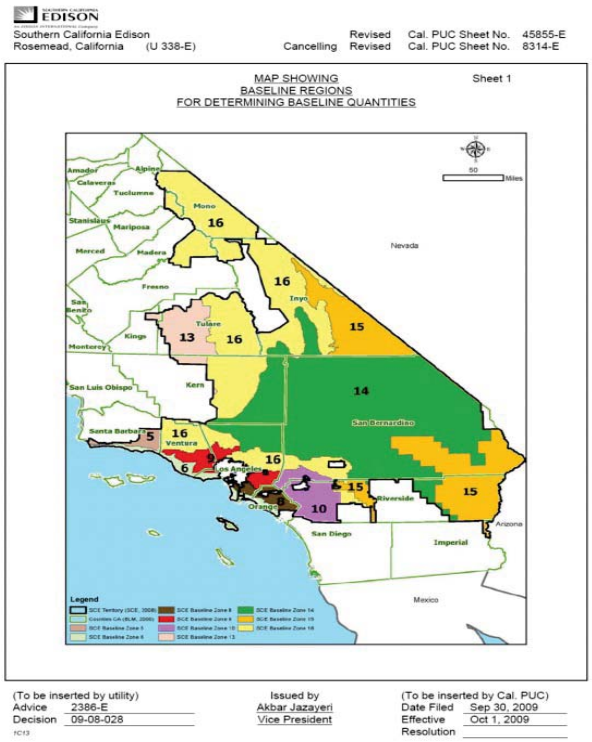
Working definitions of hot climate regions and "areas with hot summer weather" were discussed in early TOU Working Group meetings and were quickly agreed upon. The TOU Working Group decided that hot climate regions and areas with hot summer weather would be considered synonymous for purposes of pilot design and sampling. Figure 3-9 shows the climate zones used by each utility for rate purposes. For purposes of sampling for the TOU pilots, each utility will be stratified into three climate regions: hot, moderate, and cool. For PG&E, the hot region will be comprised of zones P, R, S, and W; in Figure 3-9, the moderate region will be comprised

[25] http://familiesusa.org/product/federal-poverty-guidelines

[26] http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M155/K034/155034822.PDF

of zones Q, X, and Y; and the cool climate region will be zones T, V, and Z. In SCE's service territory, the hot region is comprised of zones 13, 14, and 15; the moderate region is 5, 9, and 10; and the cool region is 6, 8, and 16. SDG&E's hot climate region is comprised of the Mountain and Desert zones in Figure 3-9 and has only about 16,000 accounts in total.

Figure 3-9: Climate Zones



In early discussions around segmentation for purposes of assessing hardship for seniors and economically vulnerable customers in hot climate regions, certain stakeholders argued for drawing samples large enough in each segment to determine average load impacts for the segment with a high degree of statistical confidence and to be able to make statements about whether the average load impact for each segment is statistically different from the average for other segments. The initial proposals along these lines would have required samples of roughly 50,000 participants in each service territory. This would have been much more costly and difficult to achieve in the short time available for recruitment than the samples that were eventually agreed to.

Nexant argued that average load impacts are largely irrelevant to an assessment of hardship both because averages mask the underlying distribution of load and bill impacts and because load reductions are, at best, a very indirect indicator of potential hardship. Someone who is a large structural loser under TOU rates could have a very large load reduction and still incur an unreasonable hardship whereas someone who is a large structural winner will see a large bill reduction even if they do not change their usage at all. Nexant also argued that assessments of hardship should be based in large part on information gathered through surveys that more directly measure potential hardship through questions about behavioral changes that were made in response to high peak period prices (e.g., Did you turn off your air conditioning on hot summer days?), about discomfort on hot summer days, about tradeoffs that might be made in purchases of food and other necessities because of high electricity bills, etc. Nexant also recommended that the specific survey questions to be used for assessing potential hardship be based on a literature review of other studies with similar objectives and that the survey research firm used to obtain the information be skilled in this type of research. Some TOU Working Group members suggested aligning the survey questions with the Low Income Needs Assessment surveys that have been conducted in the past in California and that are currently being updated. Nexant also noted that an important advantage of using survey data to assess hardship is that sample sizes can be smaller than those required to estimate and compare average load impacts across segments.

There was broad agreement among TOU Working Group members that surveys will be used to provide valuable information for developing assessments of potential hardship for seniors and economically vulnerable customers in hot climate regions. Having accurate distributions of bill impacts is also important. TURN continued to express interest in being able to estimate average load impacts for segments such as CARE/FERA and perhaps others, particularly for customers who are structural losers in hot climate regions.

Another important factor influencing the sampling strategy is that sampling efficiencies can be obtained by recognizing that many customers represent multiple segments of interest. For example, if you want to have 500 CARE/FERA participants and 500 senior households in a sample, if 50% of seniors are CARE/FERA customers, only 750 sample points would be required, not 1,000.

With the above objectives and issues in mind, Nexant proposed to TURN and Energy Division the sampling strategy outlined in Table 3-7. The specific numbers in the cells were based on the data in Table 3-5.

The proposed approach has four oversampled segments in the hot climate region for Rate 2, which is the only SCE rate that will be subject to oversampling.[27] The four oversampled segments are seniors above and below 100% of FPG and CARE/FERA customers above and below 100% of FPG. As discussed in Section 3.3.3, the minimum requirement for the desired level of accuracy for survey-related questions such as those that will be used as input to assessing hardship is around 250. After adjusting for expected attrition, this minimum size is 313 at the outset of the pilots. Meeting this requirement only requires enrolling a total of 1,013 customers rather than the 1,250 would be needed if all segments were mutually exclusive. The proposed plan also calls for a target enrollment of 1,875 (1,500 plus 25% to cover planned attrition) drawn from the general population in the hot climate region. This sample will include many customers from the oversampled groups, which helps meet some of the other design criteria as discussed below.

[27] In order to better manage costs and enrollment requirements, the TOU Working Group decided that, given similarities in the structure of Rates 1 and 2 at SCE and PG&E, PG&E would oversample for Rate 1 and SCE would oversample for Rate 2.

Table 3-7: Target Enrollment for SCE Rate 2 in the Hot Climate Zone (includes over sampling based on 25% attrition)

Climate Zone	Customer Segment	Sample Size	Non-CARE/FERA	CARE / FERA	Senior	SR < 100% of FPG	CARE / FERA < 100% FPG	<100% FPG	101 to 200% FPG	200 to 250% FPG	> 250% of FPG	Control Group
Hot	SR < 100% FPG	313	152	161	313	313	161	313	0	0	0	313
	Non-SR CARE < 100% FPG	156	0	156	0	0	156	156	0	0	0	156
	SR > 100% FPG	313	232	81	313	0	0	0	65	46	201	313
	Non-SR CARE > 100% FOG	231	0	231	0	0	0	0	89	43	100	231
	General	1,875	1,150	725	502	89	219	374	410	228	862	1,875
	All	2,888	1,533	1,354	1,127	402	536	843	564	317	1,164	2,888
	% In Sample	100%	53%	47%	39%	14%	19%	29%	20%	11%	40%	
	% In Population	100%	61%	39%	27%	5%	12%	20%	22%	12%	46%	

The top half of Table 3-7 shows the breakdown of the enrolled population according to various segments, including additional income stratum defined in terms of household income as a percent of FPG. The two rows at the bottom of the table show the % of each cohort in the overall sample and the percent in the population. As seen, this plan significantly oversamples CARE/FERA, seniors and households with incomes less than 100% of FPG relative to their share in the hot climate region population overall. The following points are worth noting:

- The total number of enrolled customers on Rate 2 in the hot region is targeted at 2,888. A comparable control group is needed, which doubles the recruitment requirement for the rate.
- Of this total, given the over sampling of selected segments, the number of customers is fairly evenly split between CARE/FERA and non-CARE/FERA, with 1,354 and 1,533 respectively. Even after the expected attrition over the course of the pilot, this is more than enough to estimate average load impacts at desired levels of precision for CARE/FERA and non-CARE/FERA customers.
- The sample would start out with more than 1,100 senior households, which is enough to estimate load impacts for this group with good statistical precision.
- The proposed plan has very strong representation among various income groups defined in terms of the percent of FPG, starting out with a total population of roughly 843 households with incomes less than 100% of FPG, 564 with incomes between 100 and 200% of FPG, 3137 with incomes between 200 and 250% of FPG (a group just above the CARE/FERA household income threshold that is of interest to TURN), and more than 1,100 households with incomes exceeding 250% of FPG. These sample sizes are all quite robust in terms of drawing insights from surveys (assuming high response rates) and would even support precise load impact estimates for customers with incomes above and below 200% of FPG.
- These samples also exceed the assumed threshold of 500 (625 initially) required for estimating good bill impact distributions for almost all of the customer segments shown as columns in Table 3-7.

The basic segmentation scheme for the other rates in the hot region and for the two other climate regions is shown in Table 3-8. It has 1,250 enrolled customers on each rate in each region, divided equally between CARE/FERA and non-CARE/FERA. This meets the objective of initially having 625 in each sub-segment for the purpose of accurately characterizing the bill impact distribution and initially having 1,250 each for estimating load impacts by rate and climate region. The latter will require reweighting the sample using the population weights for CARE/non-CARE to get an estimate that represents the overall population within each region for each rate. This approach does not allow for a robust comparison of load impacts for CARE/FERA and non-CARE/FERA for each rate within each climate region but it does allow for such a comparison for the service territory as a whole, as seen at the bottom of Table 3-8, which shows that there are 1,875 CARE/FERA and 1,875 non-CARE/FERA for Rates 1 and 3 and more than 2,500 each for Rate 2.

Table 3-8: Target Enrollment by Rate Type, Climate Region and Customer Segment For SCE

Climate Zone	Segment	Rate 1	Rate 2	Rate 3	Control	Total
Hot	CARE / FERA	625	1,354	625	1,354	3,958
	Non-CARE / FERA	625	1,533	625	1,533	4,317
	Total	1,250	2,888	1,250	2,888	8,275
Moderate	CARE / FERA	625	625	625	625	2,500
	Non-CARE / FERA	625	625	625	625	2,500
	Total	1,250	1,250	1,250	1,250	5,000
Cool	CARE / FERA	625	625	625	625	2,500
	Non-CARE / FERA	625	625	625	625	2,500
	Total	1,250	1,250	1,250	1,250	5,000
All	CARE / FERA	1,875	2,604	1,875	2,604	8,958
	Non-CARE / FERA	1,875	2,783	1,875	2,783	9,317
	Total	3,750	5,388	3,750	5,388	18,275

The Nexant sampling plan summarized above was acceptable to all TOU Working Group members for SCE and PG&E. PG&E's plan will be conceptually identical to the above plan except the oversample segments will be placed on Rate 1 rather than Rate 2 and the precise number of customers in each cell shown in Table 3-7 will vary due to differences in the share of each segment in PG&E's hot climate region.

As mentioned previously, SDG&E''s hot climate region is much smaller than either SCE or PG&E's, with only roughly 16,000 total accounts. As such, oversampling selected segments to a specific level of enrollment is not possible. The details of the SDG&E sampling plan are described in Section 4.3.

3.6 Technology Treatments

There are a large number of specific technologies available through utility programs or, increasingly, through retail outlets that may help consumers respond to TOU price signals. The technologies fall into two broad categories:

- Devices that can automate changes in energy use across rate periods, such as load control devices, programmable communicating thermostats (PCTs), smart thermostats and home area networks;
- Devices that provide information to consumers through in-home displays (IHDs) that stream usage and cost data in near real time or through utility services that deliver periodic usage alerts, notifications, tips and other information through computers and smart phones.

As indicated earlier, the Energy Division strongly encouraged each utility to offer at least one technology oriented treatment in 2016 with the primary focus being on technology that can automate load reductions during peak periods. According to the September 24th AC/ALJ ruling, enabling technologies include, but are not limited to, programmable communicating thermostats, software packages and apps to help participating customers control energy use.

Numerous prior pilots and programs have combined various forms of load control with time-varying pricing. Most have involved load control switches or PCTs in conjunction with dynamic rates such as critical peak pricing. Nearly all of these prior pilots have shown that load impacts are larger for participants with air conditioning load control than for those without it. Relatively few prior studies have combined enabling technology with static TOU rates such as those that will be examined in these pilots. Also, it is very important to keep in mind that when comparing load impacts for the average household with and without air conditioning load control, for example, observed differences are influenced by more than just the load control technology. All households with air conditioning load control have air conditioning whereas many households on TOU rates without load control do not have central air conditioning, especially in California. As a result, the difference in load impacts for households with and without air conditioning load control reflects not just the difference due to the load control device but also the difference due to variation in the saturation of air conditioning between the two groups. Very few public studies on this subject adequately control for this significant selection effect.[28]

In addition to primarily focusing on enabling technology to support demand response for dynamic rates rather than static rates, prior studies have also primarily involved peak periods driven by high demand on hot summer afternoons. Very few have examined the impact of technology for peak periods that extend well into the evening hours, as is the case for some of the rates that will be tested in these pilots.

Finally, prior studies have primarily involved utility sponsored control devices, often provided and installed free of charge, and active control by utilities on dynamic pricing event days. We are not aware of any studies that have examined the incremental effect of customer purchased devices such as smart thermostats or simpler programmable thermostats, with or without outside control, on load reductions under static TOU rates or the impact of TOU rates on the purchase of smart thermostats. Increasingly, consumers are purchasing smart thermostats on their own. These devices may make TOU prices more attractive to these self-selected consumers and these consumers may use the devices to better manage their energy costs and produce larger peak-period load reductions. It may also be true that TOU rates, especially widespread default rates, will hasten the penetration of these devices. Furthermore, these devices offer opportunities for vendors and utilities to partner with consumers to automate adjustments in usage during peak periods. This is already happening in conjunction with dynamic rate programs at selected utilities. For example, Nest, a provider of smart thermostats,

[28] See for example Faruqui and Sergici. *Arcturus*. The Brattle Group. Figure 11 in the article shows load impacts from pilots and programs with and without load control but the points on the graph do not control for differences in air conditioning saturation between participants with and without technology. Also, many of the rates included in this graph are combination TOU-CPP rates rather than static TOU rates and the average impacts reflect both typical weekdays as well as CPP event days. As such, they may overstate the average impacts for a static TOU rate that has the same prices on all days.

offers its Rush Hour Rewards service to consumers in utility service territories where Peak Time Rebate (PTR) programs exist, such as SCE's Save Power Days (SPD) program. Nest automatically adjusts the consumer's thermostat according to directions provided by the consumer on PTR event days. It may be possible for utilities and vendors to develop similar services that enable demand reductions for consumers in conjunction with static TOU tariffs.

There was not sufficient time to do a systematic literature review concerning the use of in-home displays (IHDs), web portals, usage alerts and others options in conjunction with TOU rates. Nexant has designed, implemented and evaluated numerous information feedback pilots and programs for utilities in California and elsewhere and is generally familiar with the extensive literature in this area. From this work, Nexant offers the following general observations regarding the state of knowledge on information feedback options. These opinions were not shared in detail with the TOU Working Group and some Working Group members may disagree with some of these observations.

- There have been numerous studies of the impact of IHDs on overall energy use but very few studies that estimate impacts of IHDs on peak period usage in conjunction with TOU rates. Many IHD studies suffer from poor design and small sample sizes. Customers cannot be defaulted onto technologies such as IHDs. As such, is impossible to do a true RCT design with this technology. If acceptance rates and connection rates are high, an RED can be used for impact estimation. However, acceptance rates are often quite low and connection failures are often higher than expected or planned for even when the devices are installed by professionals. If consumers must to connect the device with the meter, evidence from the SMUD SPO pilot and from ComEd's default pricing pilot indicate that connection rates can be very low, which makes the cost of IHDs per connected household very high. Neither the SMUD or ComEd pilots found any measurable impact from IHDs in conjunction with TOU prices.
- Studying load impacts associated with accessing information through utility web portals is even more challenging than estimating impacts for IHDs. It is almost impossible to control access to web portal information, which makes RCTs very difficult to employ in this regard. Randomized encouragement designs could conceptually be used to test the impact of various offers for encouraging TOU rate participants to access web portals but, to our knowledge, few if any such studies have been done. Furthermore, most studies of web portal usage find that fewer than 25% of customers ever access the portals even once let alone the multiple times that behavioral scientists believe would be necessary to change usage in a measurable way. As such, very large samples would be necessary to estimate impacts, which are expected to be small (if they exist at all).
- There have been several recent studies of usage alerts, including two done by Nexant. One that was done for an anonymous utility in the Northeast found an average reduction in monthly energy use of roughly 2 percent from weekly usage updates and goal setting. This evaluation relied on ex post statistical matching to create a pseudo control group. Another series of tests done for Southern California Gas Company that are still ongoing found 1 to 2 percent reductions in average gas usage from weekly usage alerts offered on a default basis using an RCT design. Neither of these studies was done in conjunction with TOU rates.

With the above background in mind, the TOU Working Group decided on a set of technology treatments that will provide very useful input to setting policies and strategies for the future default TOU environment. The treatments, summarized briefly below and explained in more

detail in Section 4, involve both control technologies for air conditioning and information feedback in the form of usage alerts delivered via email in one case and using a smart phone app in another.

SCE's technology treatment will focus on smart thermostats and, more specifically, on the population of customers that already have these devices installed. Using an RCT design, SCE will seek to enroll 3,000 customers from the existing population of roughly 65,000 smart thermostat owners (in SCE's territory) using the same pay-to-play recruitment strategy that will be employed for the non-technology treatments. These customers will be randomly assigned to either Rate 1, Rate 3, or the control group. This will allow for estimation of load impacts associated with TOU rates among a population of smart thermostat owners. As discussed above, this is a growing population and could become an important segment of customers by the time default TOU rates are deployed in 2019.

SDG&E's technology treatment is designed to focus on customer acceptance rather than load response. SDG&E's treatment will be launched in the fall of 2016 after customers have experienced TOU rates for the first summer period. In this study, TOU rate customers will be offered one of two subsidy amounts if they purchase and self-install a smart thermostat. If enough participants purchase the technology, SDG&E will also estimate load impacts using a quasi-experimental evaluation method that will develop a pseudo-control group using ex post statistical matching. SDG&E also plans to test a usage alert treatment. This treatment is discussed in the next subsection, which discusses Education and Outreach options.

To complement SCE and SDG&E's technology treatments, and to expand on what can be learned through all three pilots, PG&E will explore two very different technologies in very different ways. PG&E will seek in-depth understanding of how consumers with smart thermostats who are on TOU rates operate and interact with these devices using an ethnographic study[29] of existing thermostat owners. PG&E estimates that it has at least 100,000 smart thermostat owners in its service territory, a group that is growing rapidly and will be even larger by the time pilot recruitment is completed. Given this penetration, if these consumers enroll onto the pilot tariffs at the same rate as non-owners, there will be between 300 and 400 smart thermostat owners enrolled on TOU rates among the 15,000 or so participants who will be recruited into the pilot. This is more than enough to recruit a small study group for ethnographic exploration. While, by its very nature, it is hard to predict what will be

[29] Ethnography is a collection of qualitative methods that focus on the close observation of social practices and interactions. As a result of focusing on details of individual's experiences, ethnography allows the researcher to see beyond received understandings of how a certain process or situation is supposed to work or what it is supposed to mean, and learn about the meanings that its participants ascribe to it. For example, an ethnographer interested in how a student does research would ask her to describe a particular research experience she has had, or spend time with her as she is trying to do research in the library. When the researcher spends time with the student as she works on her computer, watching her click from her assignment to Google to her evolving paper, the researcher gains rich detail about the student's lived experience of the research process. This kind of Observation helps the researcher see how the student understands and does research, and what she values as she goes about it. Ethnography's unique contributions to qualitative research are that it allows the researcher to tell a group's story from the point of view of participants by deeply examining the context in which activities occur, usually involving work by the researcher with participants as they go about their daily lives. Taken from Andrew Aker and Susan Miller. *A Practical Guide to Ethnographic Research in Academic Libraries.* http://www.erialproject.org/wp-content/uploads/2011/03/Toolkit-3.22.11.pdf

learned from an ethnographic study, this exploration could provide very useful insights regarding how to educate TOU customers about the use of smart thermostats for better managing their energy costs under default pricing.

PG&E's second technology treatment will assess customer acceptance of a multi-functional smart phone app that will convey a variety of useful information to TOU participants, potentially including pricing information, TOU-specific performance feedback, energy saving tips informed by user-specific end use load disaggregation and "gamification" features to encourage energy savings or load shift. This information-oriented technology treatment has the potential to increase load impacts for customers on TOU rates. However, even if it doesn't increase load impacts, it could improve overall satisfaction with, acceptance of, and understanding of TOU rates and, if widely accepted, might logically become a basic component of education and outreach for default TOU customers. On the other hand, if it is only adopted by a small group of tech savvy consumers, it might not be worthy of investment as part of the mainstream offer down the line. Thus, one of the primary learnings from this treatment will be to determine what the acceptance rates are across various customer segments, climate regions, usage levels and rate options.

PG&E plans to divide rate participants into two equally sized groups and to offer the technology to all enrolled participants across all rate options and customer segments in one group. Understanding whether the acceptance rate is 5% or 50% and learning through surveys what TOU customers think of this type of service and whether it increases satisfaction and acceptance of the rates will be extremely useful for planning education and outreach strategies. If the acceptance rate is high, this randomized encouragement design (RED) can be used to estimate load impacts associated with the smart phone app and also to compare customers' satisfaction and other metrics between those who do and don't receive the offer of the app. If the acceptance rate is low, a quasi-experimental evaluation method involving ex post statistical matching can be used to develop a control group that has load characteristics similar to those who accept the app and to estimate load impacts for those who take the app.

3.7 Customer Education and Outreach

Customer education and outreach (E&O) is essential to achieving one of the primary objectives of deploying TOU rates and related treatments, which is to encourage demand reductions during high cost periods (and increasing usage during excess supply conditions). This is especially true with default pricing where, in the absence of a strong E&O initiative, many customers might not even be aware that their electricity tariff has changed. But even if aware, electricity consumers may need significant help understanding the key features of complex tariff structures, must be informed when seasonal rate changes occur, and need education about actions they can take to better manage their electricity bills. Education and outreach is also useful for meeting the objective of customer acceptance and comfort with a given TOU rate.

There are many E&O options that could be employed to educate consumers and there are a variety of objectives to which they can be applied. Depending on the objectives and options employed, different metrics may be required to assess E&O effectiveness. The E&O plans of

each utility are described in Section 4 and the evaluation metrics that will be used to assess E&O options are discussed in both Sections 4 and 5.

The TOU Working Group recognized that a key objective of E&O efforts leading up to default TOU pricing will be to create awareness that consumers will soon be placed on a time-varying rate, the Working Group also recognized early on that this type of E&O is not something that can be tested through the opt-in pilots that will be implemented in 2016. Every opt-in participant is necessarily aware of being on a new rate whereas not every default customer will be aware regardless of how good the awareness program is. Furthermore, many of the E&O options that will be employed leading up to default pricing are likely to involve mass media communications which is very hard to test in a pilot setting because it is very difficult to control mass media exposure. For these reasons, E&O for purposes of generating awareness about being defaulted on a TOU rate will not be tested in 2016. It will be an important consideration for testing during the default pilots in 2018.

The TOU Working Group discussed the tradeoffs associated with offering E&O options to some participants and not to others for purposes of quantitative assessment of the relative effectiveness of the options. There was widespread agreement that highly effective E&O is essential to the overall success of the pilots (and to TOU pricing more broadly). Working Group members also generally agreed that, with a couple of exceptions, it is more important to ensure that the vast majority of participants receive highly effective E&O than it is to withhold E&O offerings for purposes of measuring effectiveness. Some stakeholders argued that “everyone should get everything” while some (including Nexant) thought that rigorous effectiveness tests should be conducted at least on a limited basis.

Another important issue considered by the Working Group was the extent to which the content and formatting of E&O materials should be tailored to specific customer segments. The Center for Accessible Technology argued that all materials should have key information in large font (14 point, Sans Serif style font) so that seniors and perhaps others can easily read the main points of the message. Most stakeholders agreed that materials should be available in Spanish as well as English. There was general acknowledgement of the value of tailoring tips to selected groups so that they are more relevant, such as low or no cost tips for low income households and renters.

Late in the planning process, Energy Division indicated that E&O materials must be tailored to appeal to the psychographic/behavioral personas that the IOUs often use for profiling households for purposes of channel communication and messaging. For example, messaging for households identified as “green” might extol the environmental benefits of TOU pricing and/or smart thermostats in marketing and educational materials, messaging to “economizers” would focus on bill savings and messaging to “technology focused” households might emphasize the cutting edge nature of the smart phone app and the learning features of smart thermostats. How best to implement this requirement to tailor messages to segments defined by personas and how many different personas should be tailored to will be determined as the IOUs develop the E&O materials in early 2016.

Nexant argued that some rigorous tests should be conducted in order to determine whether tailoring for psychographic/behavioral personas improves customer acceptance and/or understanding of rates and/or changes behavior more for those who receive the tailored messages than if more generic messaging and content was used for everyone. Whether any such tests will be conducted remains an open question at this time. At a minimum, as part of the evaluation process, metrics will be reported for selected personas to determine whether levels of satisfaction, understanding of rates and changes in behavior differ across these segments. Of course, in the absence of rigorous testing along the lines described above, it will not be possible to determine whether any observed differences are the result of the tailored messaging and content or simply the result of differences in the attitudes, preferences and behavior of the persona segments.

With the above considerations in mind, in January and early February, each IOU will develop a portfolio of E&O materials, including welcome kits and ongoing communications. The IOUs will share their materials with the TOU Working Group and seek their feedback. These materials will be sent to all participants with the goal of ensuring that they have a good understanding of key rate features and are educated about actions they can take to reduce their bills under TOU rates. The messaging and content of these materials will be tailored as appropriate and feasible to the interests and needs of psychographic/behavioral personas and to low income, seniors and perhaps other segments. Spanish language materials, and possibly materials in other languages, will be available. The effectiveness of these basic E&O materials will be assessed through surveys that gather information about participant perceptions of the usefulness of the materials and other metrics such as customer satisfaction, level of understanding of key rate features and possibly other metrics. These assessments will largely be informative, not comparative, unless the IOUs decide to vary at least some of the materials across customers within selected segments as discussed above.

During the Working Group process, SCE indicated that it plans to do a comparative test between a basic and advanced educational curriculum. As of this writing, Energy Division and SCE were still discussing what constitutes basic and advanced in this context. Once decided, the relative effectiveness of the two levels of education will be assessed using surveys and metrics associated with customer satisfaction, understanding of rate features, reported behavioral changes and perhaps others. SDG&E is also exploring the possibility of testing different types of welcome kits as discussed in Section 4.3.3.

As discussed above in Section 3.6, PG&E plans to test a smart phone app, which can be categorized as both a technology and an information treatment. This app will be evaluated using similar survey-based metrics as those described above but in this case, half the population will get the app and the other half won't. This will allow PG&E to assess whether the information delivered through the app produces greater load reductions relative to consumers on TOU rates who do not receive information through the app.

Finally, SDG&E plans to conduct a quantitative test of the impact of usage alerts on load impacts for customers on TOU rates. The alert treatment will be a TOU version of an alert service that SDG&E already provides to approximately 45,000 residential customers. The weekly alert email will include bill to date and projected bill, weekly electric use, and usage by

rate period. This treatment will be deployed on a default basis using email addresses that will be gathered during enrollment into the pilot. Customers will be randomly assigned to the treatment or control condition and impacts will be estimated using an RED analysis.

4 Pilot Plan

Section 3 summarized a wide variety of issues that were considered by the TOU Working Group in developing the rate, technology and education and outreach treatments that will be examined in the various TOU pilots starting in 2016. High level summaries of the treatments were also presented in some instances. This section contains some additional details about the specific treatments and research strategies that will be implemented by each utility.

4.1 SCE Pilot Plan

SCE will estimate load impacts for three rate plans in each of three climate regions. Average load impacts will be estimated for CARE/FERA and non-CARE/FERA customers for the service territory as a whole. In addition, SCE will estimate load impacts for customers with smart thermostats on TOU rates relative to customers with smart thermostats on the OAT. In SCE's hot climate region, the participant population for SCE's Rate 2 will be segmented according to household income relative to the Federal Poverty Guidelines (FPG), with over sampling done for CARE/FERA customers and senior households above and below 100% of the FPG. Within the hot climate region, samples will be large enough to estimate average load impacts for CARE/FERA and non-CARE/FERA households and for senior and non-senior households with confidence bands in the range of ±2%. Bill impact distributions will be produced for CARE/FERA and non-CARE/FERA customers for each rate in all three climate regions, for senior and non-senior households in the hot climate region, and for households with incomes above and below 100% of FPG in the hot climate region. SCE's E&O plans will test the relative effectiveness of a basic and advanced educational curriculum based on survey data concerning awareness and understanding of rate features, differences in usage behavior and other metrics. The assessment will not be gauged based on differential load impacts.

4.1.1 SCE Rate Treatments

SCE's three rate options are summarized in Figure 4-1. The prices shown in the figure do not reflect the credit of 10.6¢/kWh for usage below the baseline quantity in each climate zone. This credit significantly reduces average prices, especially for lower usage customers.

Rate 1 has three rate periods on summer weekdays and two on spring/winter weekdays. The peak period on Rate 1 is the same all year long and runs from 2 to 8 PM. In summer there is also a partial peak period that runs from 9 AM to 2 PM and from 8 to 10 PM. The peak to off-peak price ratio (ignoring the baseline credit) is roughly 1.5 to 1 in summer and is about 1.2 to 1 in spring/winter. Customers on SCE's Rate 1 will pay off-peak prices on weekends in spring and winter. In summer, partial peak prices are in effect on weekends from 8 AM to 10 PM, which is the time period covered by the combination of peak and partial peak prices on weekdays.

SCE's Rate 2 has three rate periods on weekdays all year long, has a much shorter peak period on weekdays and has significantly higher peak period prices in summer compared with Rate 1. The peak period runs from 5 to 8 PM. Rate 2 also features a super off-peak price of roughly 17¢/kWh between 10 PM and 8 AM on weekdays all year long. The ratio of peak to super-off-peak prices in the summer is roughly 4 to 1. In spring and winter, the peak-to-super off-peak

price ratio is roughly 1.7 to 1. On weekends, customers will pay the off-peak price between 8 AM and 10 PM and the super off-peak price during the same overnight hours as on weekdays, from 10 PM to 8 AM.

Rate 3 has a peak-period length of five hours, which is in between the peak-period length for Rates 1 and 2. In addition, the peak period starts later in the day compared with Rate 1, and extends further into the evening (until 9 PM) than either of the other pilot rates. The weekday peak-to-off-peak price ratio in the summer on Rate 3 is roughly 2.5 to 1. Another difference between Rate 3 and the other rates is the presence of super off-peak pricing between 11 AM and 4 PM in spring, when excess supply conditions may exist in California. On weekends, Rate 3 has two rate periods in summer and three in spring and winter. The peak period on weekends shown in Figure 4-1 has a different color compared with weekday peak periods because the prices on weekends don't match any of the prices during peak, partial, off-peak or super-off-peak periods.

Figure 4-1: SCE Pilot Tariffs

		Weekday Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SCE Rate 1	Spring	Off Peak (23.9¢)														Peak (28.7¢)						Off Peak (23.9¢)			
	Summer	Off Peak (24.9¢)								Partial Peak (29.8¢)						Peak (37.3¢)						PP (29.8¢)		Off Peak (24.9¢)	
	Winter	Off Peak (23.9¢)														Peak (28.7¢)						Super Off Peak (23.9¢)			
SCE Rate 2	Spring	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)		Super Off Peak (17.2¢)	
	Summer	Super Off Peak (17.1¢)								Off Peak (31.7¢)									Peak (68.9¢)			OP (31.7¢)		Super Off Peak (17.1¢)	
	Winter	Super Off Peak (17.2¢)								Off Peak (26.6¢)									Peak (29.1¢)			OP (26.6¢)		Super Off Peak (17.2¢)	
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Peak (28.7¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)											Partial Peak (28.7¢)					Peak (59.1¢)				PP (28.7¢)		OP (23.2¢)	
	Winter	Off Peak (23.2¢)																Peak (26.7¢)					Off Peak (23.2¢)		

		Weekend Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SCE Rate 1	Spring	Off Peak (23.9¢)																							
	Summer	Off Peak (24.9¢)								Partial Peak (29.8¢)														Off Peak (24.9¢)	
	Winter	Off Peak (23.9¢)																							
SCE Rate 2	Spring	Super Off Peak (17.2¢)								Off Peak (26.6¢)														Super Off Peak (17.2¢)	
	Summer	Super Off Peak (17.1¢)								Off Peak (31.7¢)														Super Off Peak (17.1¢)	
	Winter	Super Off Peak (17.2¢)								Off Peak (26.6¢)														Super Off Peak (17.2¢)	
SCE Rate 3	Spring	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Summer	Off Peak (23.2¢)																Mid Peak (26.8¢)					Off Peak (23.2¢)		
	Winter	Off Peak (23.2¢)											Super Off Peak (16.7¢)					Mid Peak (26.8¢)					Off Peak (23.2¢)		

Table 4-1 shows the enrollment targets for Rate 2 and for the control group by customer segment in SCE's hot climate region where over sampling of seniors and economically vulnerable customers is required in order to assess potential hardship for these segments. Recall from the discussion in Section 3.5 that, in order to keep pilot costs down, a decision was made to include P.U. Code Section 745-driven segmentation for Rate 1 in PG&E's service territory and for Rate 2 in SCE's service territory. The third column in Table 4-1, labeled "sample size," shows the target recruitment level for each segment and for the general population. All of the other columns represent the number of customers that would be enrolled if customers represented by the column headings enroll at the same rate as their share in the segment population. For example, enrollment will be managed so that approximately 313 seniors with incomes below 100% of FPG will be enrolled. Since roughly half of seniors with incomes below 100% of the FPG are also CARE/FERA customers, and assuming that CARE/FERA and non-CARE/FERA customers in this segment enroll at roughly the same rate, this will result in enrollment of roughly 152 non-CARE/FERA and 161 CARE/FERA seniors with incomes below 100% of the FPG.

Table 4-1: Target Enrollment for SCE Rate 2 in the Hot Climate Region (includes over sampling based on 25% attrition)

Climate Zone	Customer Segment	Sample Size	Non-CARE/FERA	CARE / FERA	Senior	SR < 100% of FPG	CARE / FERA < 100% FPG	<100% FPG	101 to 200% FPG	200 to 250% FPG	> 250% of FPG	Control Group
Hot	SR < 100% FPG	313	152	161	313	313	161	313	0	0	0	313
	Non-SR CARE < 100% FPG	156	0	156	0	0	156	156	0	0	0	156
	SR > 100% FPG	313	232	81	313	0	0	0	65	46	201	313
	Non-SR CARE > 100% FPG	231	0	231	0	0	0	0	89	43	100	231
	General	1,875	1,150	725	502	89	219	374	410	228	862	1,875
	All	2,888	1,533	1,354	1,127	402	536	843	564	317	1,164	2,888
	% In Sample	100%	53%	47%	39%	14%	19%	29%	20%	11%	40%	n/a
	% In Population	100%	61%	39%	27%	5%	12%	20%	22%	12%	46%	n/a

Table 4-2 shows the target enrollment rate for all tariffs, customer segments and climate regions in SCE's service territory. These enrollment rates are designed to meet the minimum required sample sizes for each segment and tariff through the summer of 2017 based on an assumed maximum attrition rate (including customer churn and dropouts) of 25% and an assumption that the attrition rate will be the same in all test cells. As seen, the pilot plan calls for recruiting more than 18,000 customers into the study, with almost 13,000 being placed on one of the three pilot rates and with the remainder being placed on the OAT. These values do not include over sampling for the smart thermostat treatment that is discussed in Section 4.1.2 below. Roughly 45% of all participants will be in the hot climate region. With this target enrollment level, there should still be roughly 15,000 customers on the rates during the summer of 2017.

Table 4-2: Target Enrollment by Rate Type, Climate Region and Customer Segment

Climate Zone	Segment	Rate 1	Rate 2	Rate 3	Control	Total
Hot	CARE / FERA	625	1,354	625	1,354	3,958
	Non-CARE / FERA	625	1,533	625	1,533	4,317
	Total	1,250	2,888	1,250	2,888	8,275
Moderate	CARE / FERA	625	625	625	625	2,500
	Non-CARE / FERA	625	625	625	625	2,500
	Total	1,250	1,250	1,250	1,250	5,000
Cool	CARE / FERA	625	625	625	625	2,500
	Non-CARE / FERA	625	625	625	625	2,500
	Total	1,250	1,250	1,250	1,250	5,000
All	CARE / FERA	1,875	2,604	1,875	2,604	8,958
	Non-CARE / FERA	1,875	2,783	1,875	2,783	9,317
	Total	3,750	5,388	3,750	5,388	18,275

4.1.2 SCE Technology Treatments

As discussed in Section 3.6, SCE's technology treatment will focus on smart thermostats and, more specifically, on the population of customers that already have them installed. SCE will seek to enroll approximately 3,750 customers (including an extra 25% to account for attrition) from the existing population of roughly 65,000 smart thermostat owners using the same pay-to-play recruitment strategy that will be employed for the non-technology treatments. A power-analysis will be conducted to determine final sample sizes. These customers will be randomly assigned to Rate 1, Rate 3 or the OAT. The OAT assigned group will be the control group used for load impact estimation since smart thermostat owners may have different load patterns than the general participant population and the control group for the general participant population would not be valid. This RCT design will allow for estimation of unbiased load impacts for the TOU rates for a population of smart thermostat owners.

There will not be any segmentation by climate region or customer segment for this treatment since the identities of most smart thermostat owners is not currently known to SCE. As such, pre-enrollment segmentation is not possible. SCE will rely on smart thermostat vendors to distribute the recruitment letters to equipment owners.

4.1.3 SCE Education and Outreach Plans

As discussed previously, customers who agree to participate in the pilot will be randomly assigned to one of three TOU rates or to the OAT. Prior to being transferred onto the new rate, all participants will receive a welcome kit that will thank them for their participation and inform them about their rate assignment. The specific content of the welcome kit will be determined at a later date, most likely based on market research to guide creative design. For the three groups that are assigned to one of the TOU rate options, the welcome kit it is likely to include:

- A reminder of the importance of the study in terms of guiding pricing policy in CA and that all consumers will be placed on TOU rates on a default basis starting in 2019;
- A thank you for their participation;
- The date on which they will be placed on the new tariff;
- Detailed descriptions of the time periods when various prices are in effect for each season;
- A general discussion of how they might be able to reduce their energy bills by shifting usage from higher priced to lower priced time periods;
- Tips on how to reduce peak period usage through load reductions and load shifting;
- Information about the planned surveys, their importance to the study and the fact that the incentive payments are tied to completing each survey; and
- A dedicated phone number that they can call if they have any questions about the pilot or if they want to drop out of the study.

SCE is also considering including a magnet or "static cling" insert that can be affixed to a dishwasher, clothes washer or dryer or some other location to remind household members when peak and off-peak prices are in effect.

Control group customers will also receive a "welcome kit" but this will be much shorter and will focus primarily on thanking them for their participation, reminding them that their participation in the planned surveys is quite important and that their participation incentive payments are tied to completing those surveys.

In addition to this basic welcome kit, a subset of participants[30] will receive an advanced educational curriculum. Details about what constitutes basic and advanced are yet to be determined but basic will be more than just a welcome kit and will include some type of ongoing communication over the course of the pilots.

[30] The number of participants who will receive the advanced curriculum is still under discussion. ED would like it to be the majority of participants, with only a small group of participants (say 1,000) receiving the basic material.

The effectiveness of both the basic and advanced curriculum will be assessed through a survey. Effectiveness will not be gauged by load impacts. The details of the survey will be determined at a later date[31] but will likely focus on participants' awareness of being on the rate, their understanding of rate features (e.g., TOU periods, periods when prices are lowest, differences in prices on weekdays and weekends and across seasons, the block rate structure for control group participants, etc.), their specific end uses at various times of the day (to see if the advanced materials results in different behaviors), their satisfaction being on the rate and interest in staying on it, and more.

When developing the welcome kits and other educational materials to be sent to pilot participants, SCE will take into consideration the needs of special interest groups including, but not necessarily limited to, renters, low income, seniors and non-English speaking customers. These groups will be identified through questions included in the enrollment survey.

For low income participants, education (including messaging) will be very similar to that of the general pilot population except that the recruitment letter/FAQs will include language to let them know that they will not lose their CARE/FERA discount if they agree to participate in the pilot. For seniors, SCE is considering including imagery that resonates with this segment in the welcome kit and other follow up educational materials. Messaging will be similar to that of the general participant population. SCE is considering enlarging the font size to provide an enhanced customer experience for this segment.

SCE's strategy for non-English speaking participants is contingent on how many participants request educational materials in their preferred language during enrollment. SCE plans to limit language preference options to Spanish, Chinese, Korean and Vietnamese. Should very few customers state a language preference other than English at the time of enrollment, the educational materials will be sent in English and participants will be given the opportunity to go online to review the materials in their preferred language. Participants will also be able to contact SCE's call center and address any questions or concerns in their preferred language. SCE is also looking into providing follow up surveys in customers' preferred language.

4.2 PG&E Pilot Plan

PG&E will estimate load impacts for three rate plans in each of three climate regions. Average load impacts will be estimated for CARE and non-CARE customers for the service territory as a whole. In PG&E's hot climate region, the participant population for Rate 1 will be segmented according to household income relative to the Federal Poverty Guidelines, with over sampling done for CARE/FERA customers and senior households above and below 100% of the FPG. Within the hot climate region, samples will be large enough to estimate average load impacts for CARE/FERA and non-CARE/FERA households and for senior and non-senior households with confidence bands in the range of ±2%. Bill impact distributions will be produced for CARE/FERA and non-CARE/FERA customers for each rate in all three climate regions, for senior and non-senior households in the hot region, and for households with incomes above and below 100% of FPG in the hot region.

[31] A more detailed discussion of the use of surveys for evaluating the pilots is contained in Section 5.

PG&E also plans to conduct an ethnographic study of smart thermostat[32] owners who are enrolled in the pilot on both TOU and OAT tariffs to gain a better understanding of how smart thermostat owners interact with their thermostats and the device features that are most useful. This study will not involve additional recruitment of smart thermostat owners into the pilot – owners will be identified through a brief survey at the time of enrollment.

In addition, PG&E will offer a smart phone app to half of the rate treatment participants. The app will provide participants with a variety of useful information. A key focus of this test is to assess the uptake of the app by different types of participants on different rates. The app will initially be offered to half of the TOU rate participants using a randomized encouragement design (RED). If acceptance rates are high, load impacts will be estimated based on the RED. If acceptance rates are high enough to be of interest but not high enough for load impacts to be detected using a RED analysis, statistical matching will be used to develop a pseudo-control group for estimation purposes.

PG&E will also test the effects of the smart phone app on customer awareness, satisfaction and understanding. In addition, PG&E will offer a number of additional E&O materials to participants. Participant interest in and perceptions about these materials will be assessed through surveys.

4.2.1 PG&E Rate Treatments

PG&E's three rate options are summarized in Figure 4-2.[33] As with SCE's pilot rates, the prices in Figure 4-2 do not reflect the baseline credit of 8.9¢/kWh. Rate 1 has two rate periods on weekdays all year long, with the peak period running for five hours from 4 to 9 PM. Off-peak pricing is in effect on weekends throughout the year. PG&E's proposed Rate 2 has a shorter, three-hour peak period from 6 to 9 PM on weekdays all year long. During the summer, there is also a short partial peak period from 4 to 6 PM and from 9 to 10 PM. The weekend prices on Rate 2 are the same as weekday prices. This is designed to assess whether customers prefer consistency across all days of the week so they don't have to worry about changes between weekdays and weekends.

Rate 3 has the same peak period hours as Rate 1 in the summer and winter but has a third rate period in the spring, with the lowest (super off-peak) prices occurring between 10 AM and 4 PM on weekdays. On weekends, off-peak prices are in effect on Rate 3 all day long in both summer and winter. In spring, super-off-peak prices are in effect from 10 AM to 4 PM.

The same logic and drivers of the sampling plan that were discussed for SCE in Section 4.1.1 apply to PG&E as well, although the specific values in the P.U. Code Section 745-driven cells are different because of differences in the PG&E population. As of the time this report was written, PG&E had not yet received updated data from its chosen contractor, Experian, that would allow for the same precise determination of sample allocations by customer segment in hot climate regions as was shown for SCE and summarized Table 4-1. There is no reason to

[32] The definition of smart thermostat and whether or not to include a broader array of thermostats in the study is still under discussion. PG&E's current intent is to be fairly inclusive with regard to the range of specific thermostats that will be included in the study, with both lower and higher end devices included.

[33] As indicated in the footnote on Figure 4-2, these rates may change.

think that the overall sample sizes for each climate region for PG&E will be significantly different from SCE's sample sizes although the number of customers in each of the specific segments in the hot region may differ somewhat. For planning purposes, we have assumed that PG&E will seek to enroll roughly 18,500 customers into their rate treatments. As discussed in the next two subsections, neither the ethnographic thermostat study nor the smart phone app treatment will require recruiting additional participants into the pilots, so the 18,500 required for the rate treatments equals the entire sample needed by PG&E for all of the planned pilot treatments.

Figure 4-2: PG&E Pilot Tariffs[34]

		Weekday Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
	Summer	Off-peak (30.3¢)																Peak (40.6¢)					Off Peak (30.3¢)		
	Winter	Off-peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																Partial Peak (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)										Super Off Peak (16.9¢)						Peak (26.3¢)					Off Peak (24.8¢)		
	Summer	Off Peak (SOP) (31.4¢)																Peak (44.3¢)					Off Peak (31.4¢)		
	Winter	Off Peak (25.0¢)																Peak (27.2¢)					Off Peak (25.0¢)		

		Weekend Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (25.1¢)																							
	Summer	Off-peak (30.3¢)																							
	Winter	Off-peak (25.1¢)																							
PG&E Rate 2	Spring	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
	Summer	Off Peak (29.5¢)																PP (40.2¢)		Peak (45.9¢)			PP (40.2¢)	Off Peak (29.5¢)	
	Winter	Off Peak (24.1¢)																		Peak (26.3¢)			Off Peak (24.1¢)		
PG&E Rate 3	Spring	Off Peak (24.8¢)										Super Off Peak (16.9¢)						Off Peak (24.8¢)							
	Summer	Off Peak (31.4¢)																							
	Winter	Off Peak (25.0¢)																							

[34]The day prior to this report being completed, after examining the distribution of customer bill changes moving from the control group to the TOU pilot rates, PG&E discovered a possible problem with the rates, which it is in the process of investigating. This stems from a mismatch between the billing determinants (i.e., aggregate sales in each of the various TOU periods) used to design the rates, which were based on a sample of customers, and the billing determinants of the much larger population of customers used for the bill comparisons. If this investigation results in significant changes in the prices shown above, PG&E will update the proposed tariffs.

4.2.2 PG&E Technology Treatments

PG&E will explore two very different technologies in very different ways. PG&E will seek in-depth understanding of how consumers with smart thermostats operate and interact with these devices using an ethnographic study of existing owners. PG&E estimates that it currently has at least 100,000 smart thermostat owners in its service territory, a group that is growing rapidly and will be even larger by the time pilot recruitment begins in spring 2016. Given this penetration, if smart thermostat owners enroll onto the pilot tariffs at the same rate as non-owners,[35] there will be between 300 and 400 owners enrolled among the 18,500 or so customers who will be recruited into the pilot. With random assignment, there would be roughly 100 customers on each of the three TOU rates and the control group. Ethnographic studies are qualitative in nature so these small cell sizes do not limit the insights that can be gained through this approach and are more than large enough to conduct such a study. By including control group customers in the study, it may be possible to develop useful insights regarding differences in how smart thermostat owners use their devices when on a TOU rate compared with those who are on the OAT.

PG&E's second technology treatment will assess customer acceptance of a multi-functional smart phone app that will convey a variety of useful information to TOU participants. This information may include pricing information, TOU-specific performance feedback, energy saving tips informed by user-specific end use load disaggregation and "gamification" features to encourage energy savings or load shifting.

According to a recent Pew Center Research survey,[36] in early 2015, 64% of Americans owned some kind of smart phone, which is up 29 percentage points since a similar survey in 2011. However, ownership varies significantly across demographic groups, equaling 85% among individuals aged 18 to 29 and only 27% for individuals 65 years of age or older. Ownership among individuals living in households with annual incomes greater than $75,000 is 84% whereas ownership for individuals living in households with annual incomes below $30,000 is 50%.

To our knowledge, there is no good empirical data on the likely acceptance rate for an energy oriented smart phone app among electricity customers on TOU rates. Thus, one of the most useful learnings that will come out of this treatment is the acceptance rate for the app. If the pilot shows that a large number of TOU participants download the app, find it useful and that it increases satisfaction with and acceptance of the TOU rates, it could become an integral part of PG&E's default education and outreach plan whether or not it produces an increase in load response. On the other hand, if acceptance rates are low, it will not have a significant impact on load response or average customer satisfaction and acceptance in a default setting regardless of whether or not customers who accept it have larger load impacts or have much higher satisfaction levels than those who do not get the app.

[35] It's not unreasonable to think that enrollment rates might be higher for the smart thermostat population than for the general population.

[36] http://www.pewinternet.org/2015/04/01/chapter-one-a-portrait-of-smartphone-ownership/

Given the high degree of uncertainty in what the acceptance rate will be for the smart phone app, PG&E plans to proceed with implementation of the treatment as follows. PG&E will initially offer the app to half of the roughly 18,500 participants chosen at random who will enroll into the pilot. If acceptance rates are high (e.g., in the 50% range) and the incremental effect of the app on load reductions is large enough, say 5 percentage points, the impacts could be detected using a RED analysis methodology. As discussed in Section 3.2 (footnote 9), an RED has internal validity equal to that of an RCT.

An RED relies on a two-step evaluation methodology. In the first step, the difference in peak period load for the encouraged group, including both those who accepted the app and those who do not, and the non-encouraged group (e.g., the randomly selected group that did not receive the offer of the app) is calculated. This is referred to as the "intention-to-treat effect." If a statistically significant intention-to-treat effect is found, it can be divided by the percent of customers who accepted the app among the encouraged group to produce what is called the "treatment effect on the treated", which is a valid estimate of the incremental load impact for the group who accepted the app. The challenge with an RED is that the magnitude of the intention-to-treat effect equals the product of the acceptance rate and the treatment effect on the treated. In other words, if the acceptance rate is 50% and the load impact is 5%, the impact would equal 2.5%, so the sample would need to be large enough to produce a confidence band of less than ±2.5% to conclude that the impact was not statistically different from 0. The sample sizes for each rate will be large enough to estimate impacts of this magnitude for the service territory as a whole, but not for each climate region, using an RED design where the smart phone app is offered to half the participant sample.

Statistical power could be increased by pooling data across the three rates and estimating peak period impacts for the three hours from 6 to 9 that are common to all three rates. However, if the acceptance rate is much lower or the incremental impact is much smaller, it will not be possible to detect the impact, even using a pooled data set. For example, if the acceptance rate was 10% and the load impact was 10%, the intention-to-treat effect would only be 1% and the sample would not be large enough to distinguish an impact of this magnitude from 0.

Assuming the acceptance rate is too low to use an RED to estimate load impacts but high enough in the initial stage to be of interest, PG&E will attempt to estimate the load impact using a quasi-experimental evaluation method that creates a pseudo-control group for those who accept the app by using statistical matching methods to pair each participant with the app with a non-participant that has observable characteristics (e.g., load shape and level, demographic characteristics if available) similar to the participant.[37] This method reduces selection bias based on observable variables. Once the matching is complete, the impact evaluation proceeds in the same manner as if an RCT research design had been used. While not as valid an approach as an RCT or RED, this method is commonly used and is the best option available under the circumstances described above when the combination of acceptance and impacts is not large enough to detect an effect using an RED analysis.

[37] In this instance, demographic data will be collected on all customers during enrollment so this data could be used for matching along with pretreatment load data if matching is done from the non-encouraged half of the TOU participant population.

PG&E's marketing plan for the smart phone app will require market research and thus has not yet been developed. However, a straw plan might proceed as follows: An initial offer would be sent to half of the TOU rate participants, included in the welcome kit that customers receive after agreeing to participate in the pilot. The welcome kit will also identify the rate to which each participant is assigned. Shortly after going on the rate, each participant in the encouraged group who hasn't already signed up for the app would receive an email reminder[38] about the benefits of the smart phone app and would be encouraged again to download the app. These efforts would largely define the acceptance rates for the first summer. As described above, if the acceptance rate is high, an RED would be used to estimate load impacts based on usage in the first summer. If not, but assuming it is high enough to be of interest, statistical sampling will be used to create a control group from among the non-encouraged group to determine whether the app results in load impacts for the group accepting it.

The assessment of the smart phone app will also rely on survey questions regarding interest in and satisfaction with the app that will be included in the fall survey that will be conducted among all TOU rate participants.[39] Based on the combination of results from the survey, the initial acceptance rate and whether or not any incremental load impacts are detected during the initial summer, PG&E will decide whether any additional marketing should be done among the initial group that was offered the app and also whether it should be marketed to the other half of TOU participants who didn't receive the initial offer. For example, if feedback through surveys is very positive and the acceptance rate is encouraging (say 10%) from the initial marketing efforts, but no statistically significant load impacts were obtained, the latter result might be because the sample sizes were too small. In this case, additional marketing among the initial group of encouraged customers and also offering the app to those that did not originally receive an offer could boost acceptance to a level at which load impacts could be estimated during the second summer. It should also be noted that if the results of this analysis are encouraging, the smart phone app might be offered in conjunction with the default pilots in 2018 using an RED design where large samples may be cost-effectively employed.

4.2.3 PG&E Education and Outreach Plan

The smart phone app technology treatment described above is an important test of a potentially promising education and outreach (E&O) channel. PG&E also plans to offer a variety of additional E&O materials to participants and to assess participant interest in and perceptions about the materials through surveys. The following materials will be sent to all pilot participants:

- Pilot rate launch "Welcome kit"
    - Some form of pictorial depiction of their TOU rate (perhaps also through an appliance cling)
    - Details about their TOU rate
    - Tips for success etc.
- In-Season direct mail & email on their TOU rate and reminder about tips for bill savings

[38] Email addresses will be gathered from all participants who have them upon enrollment.

[39] See the discussion in Section 5 regarding the survey strategy for the pilots.

    - Summer versions
    - Winter and spring versions
- Post-season email on rate, performance and tips reminder
    - Summer versions
    - Winter and spring versions

PG&E is also exploring the possibility of using social media to provide participants with additional tips and reminders about energy savings.

PG&E is planning to tailor some of its E&O materials to address the needs of special interest groups. PG&E has conducted extensive research among CARE/FERA /economically vulnerable customers and has insights regarding how they want to be addressed in communications (regarding tone, manner, clarity and straightforwardness of messaging) which PG&E will incorporate in its pilot messaging.

Once customers are enrolled in the pilot, PG&E plans to assess participant needs and tailor outreach as follows:

- Different ethnicities and non-English speaking customers:
    - In-language or bilingual for Spanish and Chinese options (the list of languages that will be versioned is under discussion);
    - Acculturated materials;
- Seniors:
    - Materials in large print;
- Economically vulnerable customers:
    - Focus on low cost and no cost tips;
- Other options being explored:
    - Climate specific tailored E&O materials (e.g. areas without much A/C vs areas with high A/C saturation can affect what “tips” are most relevant);
    - Live customer call.

The various E&O materials will be assessed by asking participants in surveys what they thought of the materials (e.g., whether or not it was useful, whether or not they could understand it, what changes would make it more useful, etc.). The assessment may also include tracking open rates and click-thru rates for educational material sent via emails and tracking the number of customer engagements in channels and individual posts for social media channels. Through surveys, PG&E plans to cover the following topics:

- Awareness of outreach
- Awareness of information regarding their rate
- Engagement with content
- Understanding and clarity of messaging around rate

- Understanding of how to apply tips and tools
- Understanding how tips and tools can help them manage their bill
- Perceived value of information (usefulness)
- Attitudes to outreach
- Satisfaction with outreach

Customer awareness and engagement with outreach will be measured periodically during the pilot, in 2016 as well as 2017. PG&E envisions that questions pertaining to E&O will be included in the post-summer survey of 2016, post-winter/spring survey of 2017 and/or the end of pilot survey.

PG&E may also leverage other, more limited quantitative surveys or qualitative research at specific times when questions can be more tailored to the specific E&O piece, such as for the "Welcome Kit" and for specific target groups such as senior citizens, CARE/FERA customers, or in-language messaging recipients. Considerations such as not wanting to bias customer behavior/main survey responses through over-surveying and inundating them with survey requests will be taken into account before planning any supplemental research.

4.3 SDG&E Pilot Plan

SDG&E will estimate load impacts for two rate plans in the moderate and cool climate regions. In the hot climate region, Rate 2 will be offered but load impacts will not be estimated because of the small population size in this region and the difficulty of recruiting enough participants to populate both treatment and control groups. Enrollment onto these rates will use the same pay-to-play recruitment plan as the other utilities will use. Overall enrollment for the rate treatments will total roughly 8,750 participants. An additional 1,250 participants will be recruited onto Rate 2 in each of the moderate and cool climate regions (for a total of 2,500 additional participants) for use in testing a usage alert treatment on a default basis, bringing the total number of participants to 11,250.

SDG&E will also market a third rate option using a more traditional opt-in recruitment strategy. This rate is quite different from the other rates in that the supply component of the tariff will have (1) a monthly service fee, (2) prices that vary hourly, (3) dynamic rate components, and (4) net surplus energy credits. The rate will provide customers with the maximum number of low cost hours and will include high premiums, through price "adders", applied to the top 150 system peak hours and the top 200 circuit peak hours. Customers will be notified about these peak system and circuit hours on a day-ahead basis. In addition, participants on this option will receive credits for surplus energy events. Customers will be notified of surplus energy hours on a day-of basis. This tariff will be bundled with enabling technology that will provide greater automation for this dynamic rate than is provided simply through a smart thermostat. This treatment will be targeted at a small group of electricity consumers with the specific characteristics that are yet to be determined but may include electric vehicle owners.

Starting in fall 2016, after participants have been on the two TOU rates through the initial summer, SDG&E will market smart thermostats to a subset of customers enrolled on Rates 1

and 2. This treatment is designed primarily to determine the difference in take rates between customers offered a smart thermostat at two different price points. Assuming a sufficient number of customers install the thermostat, it may be possible to estimate load impacts by developing a control group using statistical matching.[40]

As part of its E&O plan, SDG&E will offer a weekly usage alert to roughly 1,000 participants in the inland (moderate) climate region. Email addresses will be collected during enrollment and this treatment will be tested on a default basis using an RED to estimate incremental load impacts for participants who receive the alerts. SDG&E will also assess customer interest in, satisfaction with and use of the usage alert through surveys. SDG&E will also assess other E&O options using surveys as discussed below in Section 4.4.3.

4.3.1 SDG&E Rate Treatments

Figure 4-3 shows the two rate options that SDG&E will test using the PTP RCT design that will also be deployed by PG&E and SCE. As mentioned above, in addition to these rates, SDG&E will also test a much more complex, dynamic hourly rate option using an alternative research design that is yet to be determined. As seen in the figure, SDG&E's two main rate options vary little from each other. Rate 1 is a cost-based TOU option with three rate periods and Rate 2 is a simpler TOU option with two rate periods. Both rates have two seasons rather than three like some of the rates that will be bested by PG&E and SCE. For Rate 1, the summer peak to off-peak price ratio is a little less than 2 to 1 while the winter price ratio is less than 1.1 to 1. In addition, for Rate 1, the TOU period definition for weekend and holidays differs from weekdays due to an extended off-peak period on the weekends. SDG&E's rates have the same price structure on weekends as on weekdays, and the same peak-period prices.

[40] If acceptance rates are much higher than anticipated, it may also be possible to estimate impacts using an RED analysis, but this is unlikely.

Figure 4-3: SDG&E Illustrative Rates[41]

		Weekday Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SDG&E Rate 1	Summer	Off Peak (30.2¢)						Partial Peak (35.5¢)										Peak (57.5¢)					Partial Peak (35.5¢)		
	Winter	Off Peak (32.4¢)						Partial Peak (33.4¢)										Peak (34.4¢)					Partial Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		
		Weekend Rate Periods (hour ending -- for example, 16 = hour ending at 4 PM)																							
Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SDG&E Rate 1	Summer	Off Peak (30.2¢)														Partial Peak (35.5¢)		Peak (57.5¢)					Off Peak (35.5¢)		
	Winter	Off Peak (32.4¢)														Partial Peak (33.4¢)		Peak (34.4¢)					Off Peak (33.4¢)		
SDG&E Rate 2	Summer	Off Peak (33.5¢)																Peak (57.5¢)					Off Peak (33.5¢)		
	Winter	Off Peak (33.0¢)																Peak (34.4¢)					Off Peak (33.0¢)		

[41] Rates presented are based on rates effective November 2015 and SDG&E's 2016 GRC Phase 2 filing and are subject to change. SDG&E's summer season is May through October and winter season is November through April. This differs from the four month summer season at PG&E and SCE, which runs from June 1 through September 30. Prices in the figure do not reflect the baseline credit that applies to usage below 100% of baseline, which equals 16.1¢/kWh in summer and 13.4¢/kWh in winter.

Segmentation in SDG&E's hot climate region differs from the approach taken for PG&E and SCE in light of the very small population of customers in the region. Table 4-3 shows the number of households by income stratum, CARE/FERA status and senior status in SDG&E's hot climate region. It should be noted that the household income stratum is not reported in terms of percent of FPG income as it was for SCE and PG&E because this information for SDG&E is not yet available. 100% of FPG income goes as high as $40,000 for a household with 8 members. The population of households with incomes less than 100% of FPG is almost certainly less than the number of households with incomes less than $40,000 but this higher threshold was used because of the very small number of customers in the climate region. If a cutoff of $30,000 was used instead, the number of households below this threshold in the entire climate region would be roughly half of the 2,351 shown in the table.

Table 4-3: Number of SDG&E Accounts in the Hot Climate region by Household Income, CARE/FERA status and Senior Status

Household Income	Non-seniors		Seniors		All
	CARE/FERA	Non-CARE/FERA	CARE/FERA	Non-CARE/FERA	
<$40,000	484	1,056	252	559	2,351
>$40,000	1,643	10,347	200	1,559	14,950
All	2,127	11,403	452	2,118	16,100

As seen in the table, there are only about 2,500 CARE//FERA customers in SDG&E's hot climate region and roughly the same number of senior households. Only about 18% of senior households are CARE/FERA customers and less than a third of senior households with incomes below $40,000 are CARE/FERA households.

In light of the small population, SDG&E will offer only Rate 2 in the hot climate region and will not have a control group in this region because of the small population size. Given that this population is too small to materially affect overall load impacts for SDG&E's service territory, estimated load impacts for this group will not affect any policy decisions so a control group is less important. However, estimating bill impacts and assessing hardship for key segments in the hot climate region is still important. Given these considerations, SDG&E will reach out to all CARE/FERA households in the region and all households with incomes below $40,000 and will then recruit from the remaining population to bring the total number of enrolled customers in the hot climate region to 1,250.

Table 4-4 summarizes the overall sampling plan for all climate regions and customer segments to support evaluation of the two rate treatments that SDG&E will test. The segmentation scheme in the moderate and cool climate regions is the same as for SCE and PG&E, with 1,250 enrolled on each rate, split evenly by CARE/FERA and non-CARE/FERA customers.

Table 4-4: SDG&E Target Enrollment by Rate Type, Climate Region and Customer Segment

Climate Zone	Segment	Rate 1	Rate 2	Control	Total
Hot	Total	0	1,250	0	1,250
Moderate	Non-CARE/FERA	625	625	625	1,875
	CARE/FERA	625	625	625	1,875
	Total	1,250	1,250	1,250	5,000
Cool	CARE/FERA	625	625	625	1,875
	Non-CARE/FERA	625	625	625	1,875
	Total	1,250	1,250	1,250	3,750
All	Total	2,500	3,750	2,500	8,750

4.3.2 SDG&E Technology Treatments

Whereas SCE's technology treatment will focus on load impacts under TOU rates for a group of customers that have already purchased smart thermostats, and PG&E study will conduct a qualitative study of thermostat behavior, SDG&E's technology treatment will examine the smart thermostat purchase rate of customers who are already on TOU tariffs at different price/subsidy points. This investigation is consistent with recent industry trends in which utilities seek to encourage the penetration of enabling devices such as smart thermostats through market interventions rather than by purchasing and installing devices themselves.

The challenge in studying this issue within the context of the pilot is that relatively few people are actively in the market for a thermostat at any given time. Moving technology into the housing stock is a long run process if left to its normal pace. Figure 4-4 shows national statistics on total thermostat sales and the percent that are smart thermostats. Figure 4-5 shows that utilities have not influenced much of the market to date and most of the penetration is coming through other channels. With about 134 million households in the US, the roughly 10 million thermostats projected to be sold in 2016 represents about 7.5% of households, of which about half are smart thermostats. Assuming that the sales of thermostats and smart thermostats is about the same in SDG&E's service territory as it is nationally, with roughly 7,500 households targeted to enroll on Rates 1 and 2 combined, these statistics suggest that somewhere between 500 and 600 treatment households would normally be in the market for a thermostat over the course of the first year of the pilot and roughly half of those households might purchase a smart thermostat without any subsidy from SDG&E.

Figure 4-4[42]

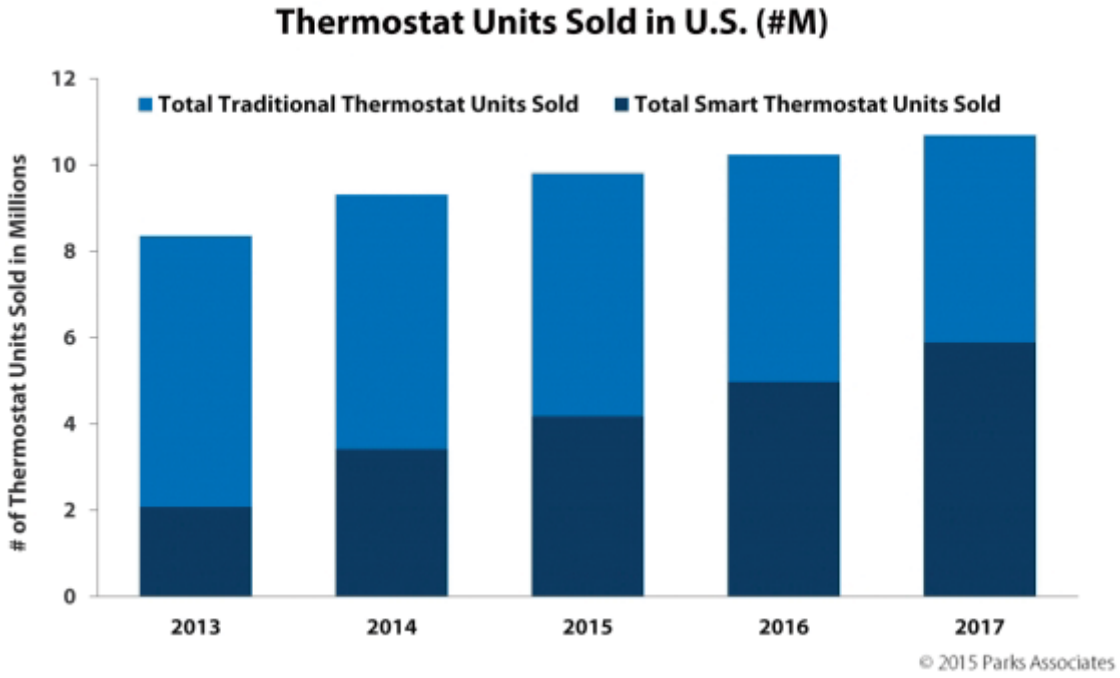
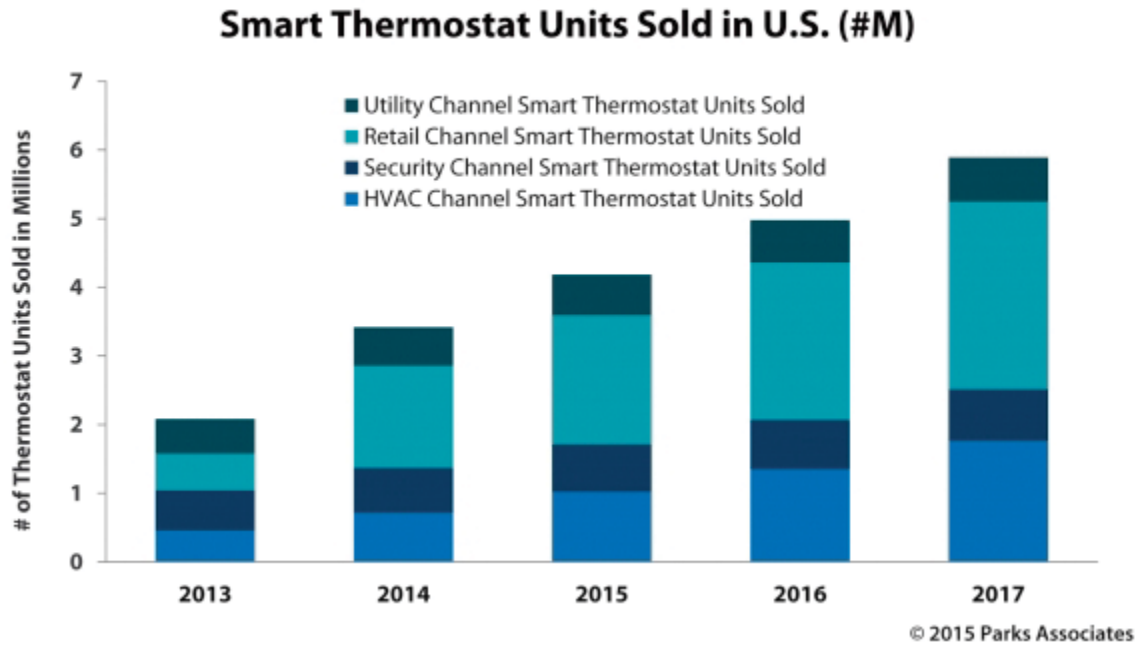


Figure 4-5



SDG&E's treatment will attempt to increase the purchase rate of smart thermostats by offering either a low or high subsidy for the purchase of a smart thermostat to two randomly selected groups of customers who have enrolled on one of SDG&E's two rate treatments. Given the normally low purchase rate, one of these offers will be made to all of the roughly 8,750

[42] Greentech Media, *Smart Thermostats Begin to Dominate the Market in 2015,* July 22, 2015. http://www.greentechmedia.com/articles/read/smart-thermostats-start-to-dominate-the-market-in-2015

customers who are targeted to be enrolled on one of SDG&E's two rate treatments,[43] including the oversample that will be recruited to evaluate the default usage alert treatment as discussed in the next subsection. Even though the purchase rate of thermostats is low, as discussed in Section 3.3.3, with a small incidence rate, statistically significant metrics can be estimated with small samples. As indicated in Figure 3-7, it is possible to estimate statistical significance with 90% confidence and ±5% precision with fewer than 100 observations.

Assuming that there will be a sufficiently large number of customers who purchase smart thermostats through the subsidies that will be offered, SDG&E will estimate load impacts for the purchasing households using a pseudo-control group developed using ex post statistical matching.

4.3.3 SDG&E Education and Outreach Plan

SDG&E's E&O plan includes elements similar to those included in PG&E and SCE's plans as discussed below. In addition, SDG&E plans to conduct a quantitative test of the impact of alerts on load impacts using an RED research design. The alert treatment will be a TOU version of an alert service that SDG&E already provides to approximately 45,000 residential customers. SDG&E has completed most of the work needed to offer this treatment and it will be ready for use prior to summer 2016. The weekly alert email will include bill to date and projected bill, weekly electric use, and usage by rate period.

The alert treatment will be deployed on a default basis to a sample of roughly 1,250 customers each in the moderate and cool climate regions for Rate 2. SDG&E expects to capture email addresses for the vast majority of pilot participants upon enrollment into the study (so that surveys can be conducted via email and perhaps for other purposes). As such, this treatment can be offered on a default basis, thus allowing for the use of an RED research design with a reasonably sized treatment sample. Given the RED design, it is not necessary to recruit a separate control group to estimate impacts for this treatment.[44] SDG&E will also assess customer interest in, satisfaction with and use of the usage alert treatment through surveys, and will compare feedback on this educational option with feedback on other education and outreach options such as welcome kits, appliance labels or other materials that SDG&E may offer.

[43] Given the small expected purchase rate for smart thermostats, any incremental impact the purchase of these devices might have on demand response under TOU rates will not bias the average impacts for the rate treatments by a detectable amount. As such, there is no concern that this treatment is being offered to the rate treatment population.

[44] Since the inland control group for the two rates will be segmented into two equal-sized groups for CARE/FERA and non-CARE/FERA, but the alert treatment will not be segmented, it will be necessary to weight the control group sample using the CARE/FERA-non-CARE/FERA population weights when using the control group for estimation of load impacts for the alert treatment.

In addition to the alert treatment outlined above, SDG&E plans to offer a variety of additional E&O materials to participants and to assess participant interest in and perceptions about the materials through surveys. SDG&E is interested in exploring the creation of welcome kits at various price points and creative approaches to determine the best options for communicating TOU rates to residential customers. These may include:

- Simple direct mail with a letter and minimal enclosures;
- A more comprehensive package with greater graphic materials;
- A "high impact" piece that might be delivered in a small box and include a small clock or another time related item along with printed materials.[45]

In addition to the welcome kit, SDG&E plans to provide ongoing communications, including:

- In-Season direct mail & email on their TOU rate and reminder about tips for bill savings;
  - Summer versions;
  - Winter and spring versions;
- Post-season email on rate, performance and tips reminder;
  - Summer versions;
  - Winter and spring versions;

SDG&E is also exploring having a unique website with information available to participants and possibly using social media to provide additional tips and reminders about energy savings. Still another possibility being explored is using bill alerts via text or e-mail (with and without goal setting) and using push notifications concerning when prices change each day through a pilot-specific functionality on the SDG&E mobile app.

- Push notifications – users can adjust settings on the mobile app to push out a notification at the time of day when prices are raised (or lowered.) Information within the app can contain all of the appropriate TOU times and prices.
- Tips and info – users who open the app can explore posted information about the cost to use certain appliances, which can be adjusted by the app depending on the time of day; the cost changes depending on what time it is in that moment, and the time could possibly be adjusted by the user to visualize the different cost to run at different times.
- Other Bill Alerts – expand My Account functionality within the mobile app to a customer's SDG&E account, to include a variety of bill notifications and alerts (e.g. when a pre-set dollar amount is reached)

SDG&E is planning to tailor some of its E&O materials to address the needs of special interest groups, including the following possibilities:

- Different ethnicities and non-English speaking customers:
  - In-language or bilingual for Spanish and Chinese options (the list of languages that will be versioned is under discussion);
  - Acculturated materials;

[45] The metrics that will be used to assess the relative effectiveness of these options are still under discussion.

- Seniors:
    - Materials in large print;
- Economically vulnerable customers:
    - Focus on low cost and no cost tips;
- Other options being explored:
    - Climate specific tailored E&O materials (e.g. areas without much A/C vs. areas with high A/C saturation can affect what "tips" are most relevant);
    - Live customer call.

The various E&O materials will be assessed by asking participants in surveys what they thought of the information (e.g., whether or not it was useful, whether or not they could understand it, what changes would make it more useful, etc.). The assessment may also include tracking open rates and click-thru rates for educational material sent via emails and tracking the number of customer engagements in channels and individual posts for social media channels. Through surveys, SDG&E plans to cover the following topics:

- Awareness of outreach
- Awareness of information regarding their rate
- Engagement with content
- Understanding and clarity of messaging around rate
- Understanding of how to apply tips and tools
- Understanding how tips and tools can help them manage their bill
- Perceived value of information (usefulness)
- Attitudes to outreach
- Satisfaction with outreach

Customer awareness and engagement with outreach will be measured periodically during the pilot, in 2016 as well as 2017. SDG&E envisions that questions pertaining to E&O will be included in the post-summer survey of 2016, post-winter/spring survey of 2017, and/or the end of pilot survey.

SDG&E may also leverage other, more limited quantitative surveys or qualitative research at specific times when questions can be more tailored to the specific E&O piece, such as for the "Welcome Kit" and for specific target groups such as senior citizens, CARE/FERA customers, or in-language messaging recipients. Considerations such as not wanting to bias customer behavior/main survey responses through over-surveying and inundating them with survey requests will be taken into account before planning any supplemental research.

5 Evaluation Plan

The pilots summarized in Section 2 are designed to answer a wide range of relevant questions using a variety of evaluation methods. Among the key objectives are determining how TOU prices impact electricity use by rate period for the tariffs being tested, determining bill impacts for various customer segments and assessing data to allow the CPUC to evaluate the extent to which TOU rates might impose unreasonable hardship on selected segments (seniors and economically vulnerable customers in hot areas). Addressing each of these objectives requires different data and methodologies, ranging from statistical analysis of load data to detailed surveys of both control and treatment customers. This report section summarizes the key research questions of interest and how each question will be addressed during the evaluation stage of the pilots.

5.1 Research Questions

Table 5-1 contains a high level overview of the primary questions that will be addressed by the TOU pilots and the conceptual approach that will be used to answer each question. More detailed discussions of the primary evaluation methods that will be used are provided in the remainder of this report section.

Table 5-1: Key Research Questions and How They Will Be Addressed

Research Question	How Addressed
1. What will load impacts be for each rate period and pilot rate under default conditions for the population as a whole in each service territory?	Default pilots cannot be implemented until 2018. The PTP opt-In TOU pilot is intended to attract participants that are more similar to the default population than would be true for a traditional opt-in pilot design. The RCT design produces internally valid load impact estimates for each tested rate. By pooling data across climate regions and all segments and properly weighting each customer, highly precise impact estimates will be produced using a difference-in-differences regression analysis as explained in Section 5.2.
2. How do load impacts by rate period vary across selected customer segments and climate regions for the pilot rates?	The same methodological approach described above will be used to estimate impacts using data partitioned for each segment of interest. For PG&E and SCE, load impacts will be estimated with confidence bands of roughly ±2 percentage points for the hot and moderate climate regions. Confidence bands in the cool climate regions may be broader for some IOUs. Load impacts will be estimated for CARE/FERA and non-CARE/FERA customers with similar levels of precision across the service territory as a whole and also for the hot climate region for PG&E and SCE. Because of the small number of customers in SDG&E's hot climate region, load impacts will not be estimated for any rate in this region for SDG&E. There will be more than 1,000 seniors on Rate 1 in PG&E's territory and on Rate 2 in SCE's territory, which will allow for estimation of load impacts for seniors and non-seniors with good statistical precision for those two rates.

Research Question	How Addressed
3. How do load impacts vary across rate options?	The tariffs included in the various pilots have significant variation in prices by rate period and in the length and timing of rate periods. As such, it will not be possible to sort out the independent impacts of price ratios, peak period length and peak period timing. It will be possible to estimate the aggregate load reduction or load increase (for super off-peak hours in spring) for specific hours of the day associated with each tariff, which will provide useful input to the selection of a default tariff for implementation in 2019.
4. How does customer acceptance vary across TOU pilot rates and customer segments?	The PTP approach does not allow for a direct measure of acceptance rates for each rate option because customers are being paid to participate in the study (and to stay on the rate) and will be randomly assigned to the rate options within each utility service territory. However, surveys will be used to assess customer satisfaction and perceptions about the rates and these metrics can be compared across rate options as an indirect measure of customer acceptance. As part of the second survey to be conducted in 2017, customers will be asked whether they would prefer to stay on the rate or return to the OAT. They will also be asked if they would prefer one of the other rates if they had an option. Following payment of the last portion of the incentive, differential dropout rates will be tracked as an indicator of customer preferences. To assess variation in acceptance across customer segments, average survey responses by segment can be compared for segments with large enough samples (primarily those mentioned in response to Q6 below). It might also be possible to estimate a regression model relating selected metrics, such as customer satisfaction or the desire to stay on the rate at the end of the pilot, to customer characteristics.
5. What actions do customers take in response to TOU pilot rates?	Survey responses to questions about the timing of end-use activities, thermostat settings by rate period, etc. will be compared across treatment and control group customers. Barriers to load shifting or load reduction activities can also be assessed through surveys.
6. What is the distribution of bill impacts associated with TOU pilot rates for various customer segments?	Bill impacts will be estimated by calculating bills based on the TOU rate and the OAT and taking the difference. This will be done based on pretreatment usage and on post-treatment usage. Sample sizes in hot climate regions will be large enough to produce valid bill distributions (such as those shown previously in Figure 3-5) for a variety of customer segments, including seniors, CARE/FERA, non-CARE/FERA, households with incomes less than 100% of FPG, and households with incomes between 100 and 200% of FPG. In moderate and cool climate regions, accurate bill impact distributions will be able to be produced for CARE/FERA and non-CARE/FERA households and for the population as a whole.

Research Question	How Addressed
7. How many seniors and economically vulnerable households in hot areas would be likely to suffer unreasonable hardship if they are defaulted onto TOU rates?	Survey questions designed to detect unreasonable hardship will be administered to both treatment and control households that fall into these segments. Answers will be compared between TOU and control households to determine whether hardship metrics are higher among households on TOU rates relative to households on the OAT. Other metrics may also be factored into the assessment of hardship, such as bill impacts.
8. What are the load impacts for selected TOU rates for households that have purchased smart thermostats?	The SCE technology treatment will address this question for a self-selected group of households that purchased a smart thermostat on their own using an RCT research design. SDG&E's smart thermostat treatment may provide additional insights for households that receive an incentive to purchase a smart thermostat equal to a portion of the cost of the thermostat. Load impacts for this treatment will be estimated using ex post statistical matching to create a control group after the fact (assuming enough participants purchase thermostats to make this feasible). PG&E's ethnographic study of thermostat owners may produce qualitative insights about how smart thermostats are being used in response to TOU rates.
9. What is the purchase rate of smart thermostats at different price points for customers on TOU rates?	SDG&E's smart thermostat treatment will offer purchase subsidies for smart thermostats to customers who are already on TOU rates. Acceptance rates for the incentives will be compared between the low and high priced incentive offers.
10. What is the impact of a TOU-oriented usage alert on load reductions, customer acceptance and customer satisfaction with TOU pilot rates?	SDG&E's usage alert treatment will offer alerts through email on a default basis to a large enough sample of customers on Rate 2 to estimate the impact of the alerts on load reductions using an RED research design. Surveys will be conducted among treatment customers to obtain data on customer interest in and satisfaction with the usage alerts. Answers to survey questions pertaining to customer satisfaction, acceptance, awareness, understanding of rates and other metrics will be compared between those who receive the alerts and those who don't to determine whether there are significant differences in these metrics.
11. What is the impact of a smart phone app on load reductions, customer acceptance and customer satisfaction with TOU pilot rates?	PG&E will divide rate treatment participants into two randomly selected groups and offer the smart phone app to one group and not to the other. If acceptance of the app is high enough, an RED impact assessment will be conducted to determine whether the information provided through the app increased load reductions for rate participants who receive it. If app acceptance is too low, statistical matching will be used to develop a control group for estimating load impacts. Answers to survey questions pertaining to customer satisfaction, acceptance, awareness, understanding of rates and other metrics will be compared between those who download the app and those who don't to determine whether there are significant differences in these metrics. App acceptance rates will also be reported and compared across rate options and customer segments.

Research Question	How Addressed
12. What E&O materials are most effective in enhancing customer acceptance and retention, engagement, satisfaction, knowledge of rates, etc.?	Answering this question requires offering E&O materials to some customers, obtaining data on the various metrics of interest and comparing the average metric values for those who receive the materials and those who don't. This type of assessment will be made for SDG&E's usage alert, PG&E's smart phone app and SCE's advanced curriculum E&O treatment. It will not be done for other E&O materials disseminated by each utility.
13. What E&O materials do TOU rate participants find most useful and most preferred?	Surveys will be used to assess customer awareness of, understanding of and engagement with the rates, to assess the usefulness and preferences for each of the primary types of E&O materials. Responses will be compared across rate options and customer segments to determine whether different treatment groups and customer segments find some materials or messages more or less useful or effective than others.
14. What E&O materials and efforts will be most effective for creating customer awareness and satisfaction leading up to default pricing in 2019?	This question cannot be addressed through an opt-in pilot with PTP recruitment. For non-mass media options, it can be addressed in conjunction with the 2018 default pilots. It can also be addressed through a controlled launch in 2019 in which various options are tested leading up to default deployment. Particularly effective options can be used on customers who did not initially get them to enhance awareness even after customers have been defaulted onto the new rates.

5.2 Load Impact Estimation Methodology[46]

The fundamental step in estimating load impacts is to determine what loads would have been for treatment customers if they hadn't been exposed to the treatment; this is referred to as a reference load. As discussed in Section 3.2, the basic approach for developing a reference load for all rate treatments in the proposed pilots is a randomized control trial (RCT). A randomized encouragement design (RED) will be used for estimating impacts for SDG&E's default usage alert and, if acceptance rates are high enough, it will be tried for PG&E's smart phone app.

An RCT randomly assigns volunteers to either treatment or control conditions. Because of the random assignment, this method ensures that the only difference between treatment and control customers, other than small differences due to random sampling variation, is that one group receives the treatment and the other does not. As such, control group load is a valid representation of what treatment customers would have used during the post treatment period if they were not on the treatment. An RCT design ensures that impact estimates are not affected by selection bias or other potential explanations for observed differences between the two groups of customers.

Load impacts can be estimated based on an RCT design by using what is called a difference-in-differences analysis. To estimate load reduction during the peak period, for example, the first difference calculation subtracts average load for the treatment group from the average load for

[46] The discussion in this section borrows heavily from Section 3.2 of SMUD's SPO final report cited previously. That section was written by Dr. Stephen George, who also authored this report.

the control group after the treatment goes into effect. A second difference value is calculated as the difference in peak period loads between treatment and control customers prior to the treatment going into effect. This second difference is subtracted from the first, which is why the analysis is called a difference-in-differences. The purpose of this second step is to adjust for any pretreatment differences between the control and treatment groups that might occur due to random variation in the assignment of customers to the treatment and control groups. This difference should be quite small if the treatment and control samples are large, since random error diminishes as sample sizes increase. If sample sizes are small, random error can be more impactful.

Difference-in-differences calculations can be done using regression analysis or simple averaging. Regression analysis allows each customer's mean usage to be modeled separately, which reduces the standard error of the impact estimates without changing their magnitude. Additionally, standard regression software allows for the calculation of standard errors for load impact estimates that correctly account for the correlation in customer loads over time.[47] A typical regression specification for estimating RCT impacts using an RCT design is shown below:

$$load_{it} = a_i + b_1 T_i I_1 + b_2 I_1 + u_{it}$$

The variable $load_{it}$ equals electricity usage during the time period of interest, which might be each hour of the day, the peak or off-peak rate periods, daily usage or some other period. The index *i* refers to customers and the index *t* refers to the time period of interest. The estimating database would contain usage data during both the pre-treatment and post-treatment periods for both treatment and control group customers.

The parameter $a_i$is equal to mean usage for each customer for the relevant time period (e.g., hourly, peak period, etc.). The primary parameter of interest is b_1, which provides the estimated demand impact of TOU during the relevant period. The parameter is the estimated coefficient on $T_i I_1$. T_i is equal to 1 for the treatment group during the treatment period (e.g., after they are placed on the TOU rate or other treatment) and 0 otherwise. Finally, I_1 is a variable equal to 1 during the treatment period for all customers and 0 otherwise; this is not a parameter of primary interest, but it allows the regression to estimate the primary parameter of interest without confounding differences between treatment and control customers with differences in usage across years.

As mentioned above, the RCT will be used for estimating load impacts for all rate treatments. An RED research design will be used for SDG&E's usage alert and will be tried for PG&E's smart phone app. With an RED design, the behavior of two randomly-chosen groups of customers who were subjected to different levels of encouragement to take up a treatment is observed. In this example, one group—the control group—is not encouraged and the other, the treatment group is. The different levels of encouragement induce different participation rates between two groups that had the same expected characteristics prior to the experiment. This

[47] More accurately, they account for the correlation in regression errors within customers over time.

allows one to estimate the effect of the treatment on customers who were affected by the encouragement, as summarized below.

Using an RED design to estimate unbiased treatment effects requires the assumption that customers who are offered a treatment but decline are unaffected by the offer. Put another way, it is necessary to assume that customers who decline the offer—either on an opt-in or default basis—behave afterwards in the same way they would if they had never seen the offer. An RED analysis also assumes that customers who are placed on a treatment through a default process, but would have opted in if the treatment had been offered on an opt-in basis (in other words, the always takers as described in Section 3), behave the same way no matter which way the offer was made. The analyses also require the assumption that there are no customers who would accept the offer on an opt-in basis, but decline it on a default basis. Each of these assumptions seems quite reasonable.

One fundamental difference between the analyses used for RCTs and for REDs is that with RCTs, all customers in the treatment group are enrolled and therefore are assumed to be affected by the treatment and none in the control group are affected. In contrast, for REDs, the treatment group consists of all customers who received some form of encouragement toward a treatment and the control group consists of customers who received less encouragement or no encouragement. This means the RED treatment group contains many customers who are assumed to be unaffected by the treatment because they declined. This introduces a potential for confusion in terminology when discussing REDs because it is often convenient to consider the treatment group of an experiment to be the group of all customers who are directly affected by the treatment of interest (e.g., all customers who actually enroll).

For an RED there are two treatments of interest, each vital to producing the final treatment impact estimate. First, there is the encouragement treatment, which gives an RED its name. In this case, that treatment consists of an invitation to opt-in to a treatment (for PG&E's smart phone app for example) or it consists of defaulting customers onto the treatment (for SDG&E's usage alert). Second, there is the impact of the treatment itself. That is, the impact for those who accept the treatment, not those that are offered it.

The same regression specification discussed above for an RCT design is used to estimate the first stage impact, which estimates the impact of the encouragement. The estimating database includes all customers who were offered the treatment, whether or not they accepted it. It also includes the control group. The impact in this case represents the average for all customers that received an offer, not the average for customers who accepted the offer. This initial load impact estimate is often referred to as the intention-to-treat effect. Under the reasonable assumption that non-compliers were unaffected by the offer, the intention-to-treat estimate can be transformed into the effect of the treatment on compliers by dividing the intention-to-treat estimate by the fraction of the population enrolled on the pricing plan. This scaled up effect is often referred to as the local average treatment effect or, alternatively, the treatment effect on the treated.

5.3 Bill Impact Estimation

The impact of TOU rates on customers' bills is an important metric of interest to multiple stakeholders that will be incorporated in the pilot evaluations. As with load impacts, looking at the bills of individual customers before and after they go onto a TOU rate is not a valid estimate of the impact of TOU rates on bills because many other factors can cause bills to change over time for an individual customer (e.g., appliance purchases, changes in the number of people in the household, housing renovations, etc.). Since these exogenous factors are equally likely to occur among control and treatment households, comparing average bills for treatment and control customers for selected customer segments will provide a high level assessment of whether TOU rates increase or decrease bills on average for customers in those segments. For example, such a comparison might show that average bills for CARE/FERA customers on TOU rates are 5% higher or lower than average bills for CARE/FERA customers on the OAT. Except for SDG&E's hot climate region, the proposed sampling plan for each utility will support valid comparisons of average bills for treatment and control customers for CARE/FERA and non-CARE/FERA segments in all climate regions and for seniors and for households with incomes below 100% of the FPG in SCE and PG&E's hot climate regions.

Comparing average bills, while useful, does not paint a complete picture, however. There can be very different distributions of bills and bill impacts underlying the same average value. For example, the same average bill of $200 would result from a bill distribution where half the population has a bill of $150 and the other half has a bill of $250 and a distribution where half the population has a bill of $50 and the other half has a bill of $350. Similarly, if the interest is in bill impacts, the same average bill impact of, say $10 could result from a bill impact distribution where half the population sees a bill decrease of $10 and the other half sees a bill increase of $20 and from a distribution where half see a decrease of $100 and the other half see an increase of $110. The first distribution of bill impacts would likely raise little concern for any stakeholder while the second distribution might be of significant concern to many stakeholders if those who saw the $110 bill increase could ill afford to pay it.

Given the above, the pilot evaluations will examine the distribution of bill impacts based on post-treatment usage[48] for treatment and control customers. Bill impact equals the difference in a customer's bill calculated with the same usage under the TOU rate and the OAT. Even though control group customers will not be placed on TOU rates, estimating their bill impacts as if they were will illustrate how much of the bill impact results from structural wins and losses (the control group distribution) and how much from changes in usage in response to the TOU rates (the treatment group distribution).

5.4 Customer Surveys

As indicated in Table 5-1, customer surveys will play an important role in evaluating the impact of treatments that will be tested in the TOU pilots. Given the pay-to-play recruitment strategy and the random assignment to rate treatments that will be employed in the pilots, it is not possible to measure customer acceptance of or preferences for the different rate options by

[48] The distributions between treatment customers (on each rate) and the control group should be identical during the pre-treatment period since customers will be randomly assigned to each rate and the control group.

comparing differential enrollment rates across treatments. However, surveys can be used to indirectly assess these important metrics by asking participants on the various rates their satisfaction with and perceptions about the rates, and asking participants near the end of the pilots to determine whether they would prefer to stay on their assigned rate, go on the OAT or go onto one of the other rate options. Surveys will be used (along with other metrics) to directly assess hardship for seniors and low income participants. And surveys will be used to test customer understanding of rate features, to obtain data on reported usage behavior and to obtain feedback on the usefulness of different educational and outreach materials and information and technology treatments. In short, surveys will be used to gather essential data on many key metrics and gain important key insights on all pilot treatments.

A detailed survey plan will be developed prior to pilot launch once a survey research firm has been hired to work with the IOUs, Energy Division and other stakeholders to refine the research strategy. The specific approach that will be used to obtain additional stakeholder input on survey topics will be determined by the Commission and announced to the TOU Working Group in early 2016. Input on survey topics will be obtained through this process but specific wording of survey questions and decisions about instrument design, survey mode, sample sizes and other factors will be left to survey professionals to ensure that the data gathered is as accurate as possible and representative of the target population. Having said that, the Commission will need to approve the survey content and plan prior to implementation.

During the October 28th TOU Working Group meeting, Nexant provided a number of guidelines for survey design. These guidelines should be kept in mind when selecting a survey research firm and when developing the survey plan that will be used to for pilot evaluation.

- Obtaining high response rates is always important but particularly so in this context. As indicated above, survey data will be used to assess many critical elements of the pilots, including whether certain groups may experience significant hardship after going onto TOU rates. Sample sizes in hot climate zones for some groups of interest are based on attaining high survey response rates. Furthermore, low response rates almost certainly introduce response bias and can completely undermine the internal validity of an RCT design if the survey data is used to estimate outcomes of interest. Random assignment to treatment and control conditions doesn't matter if assessments require comparisons between treatment and control groups using survey data and response rates (and potential bias) are significantly different between the two groups (which they often are).
- Tying a share of the pilot participation incentive to completing key surveys will help significantly in securing reasonably high response rates. So will obtaining good contact information for pilot participants through the enrollment survey. Participants will also be informed during the recruitment process about the importance of the surveys in terms of meeting the primary research objectives for the pilots. All of these factors, along with selecting a quality survey research firm with a strong reputation for obtaining high response rates through mixed-mode surveys and rigorous survey methods will help ensure that response rates are high and survey data is accurate.
- In spite of the above factors, response rates will suffer if surveys are too lengthy and too frequent. Keeping survey length and frequency manageable will be a particular challenge given the broad interests of the diverse stakeholder community that will provide input to survey design. For test cells that are large enough, it may be possible to avoid survey fatigue by randomly dividing a test cell into two groups and conducting

different surveys covering different topics with each group. Recall from Section 3.3.3 that for certain types of survey questions, samples in the 100 to 200 range are more than sufficient to measure outcomes with reasonable precision. As such, with a target enrollment of 625 CARE/FERA and non-CARE/FERA customers in each climate zone, it would be possible to divide each segment into two groups of 325 each and obtain insights representing the entire population of interest from each survey as long as response rates were in the 50 to 60% range (which they should be if the surveys are done properly).[49]

- For many issues of interest, it is essential to compare responses for treatment and control customers. For example, asking low income or senior participants on TOU rates if they reduced their usage on hot days to keep their bills down or experienced hardship on those days could be quite misleading because it's possible that the same customers on the OAT also reduced usage or experienced hardship. Only by comparing responses for treatment and control groups can one be sure that the observed outcomes for the treatment group are due to the TOU rates and not something that also exists under the OAT.
- Asking participants facts about their behavior will likely produce more accurate information than asking them about whether they changed their behavior. Survey respondents have a tendency to respond to subjective questions with answers they think the surveyor is expecting or wants to hear. Comparing responses from treatment and control customers regarding what appliances were used during peak periods may be more accurate than asking treatment customers only if they shifted usage in response to higher peak period prices.
- Survey timing is important from a number of perspectives. Recall is critical to survey accuracy. Asking someone what happened a year ago or what they thought about a welcome kit that they received six months earlier is unlikely to produce accurate information. Surveys about specific actions or materials received must be conducted as close as possible to the timing of those actions. A different type of timing issue has to do with variation in impacts over time. You could get a very different answer regarding satisfaction with a rate if a survey is conducted at the end of a summer period when bills are likely to be highest for the year than if the survey is done in the spring after consumers have experienced more lower-priced periods than higher-priced ones.
- Surveys can influence behavior. Asking participants about peak period usage behavior during the summer might produce changes in behavior during the peak period for the rest of the summer that wouldn't occur for participants who didn't receive the survey.
- Although each IOU is offering different rate, technology and information treatments, and the evaluations of these specific treatments may require specific questions tailored to them, much of the information to be gathered for evaluation will be common across the IOUs. In order to support a meta analysis of results across pilots, it will be very important that each IOU use the exact same question sin their surveys whenever the topics being covered in the surveys are the same.

[49] Survey response rates for California's Statewide Pricing Pilot in 2003 and 2004 average 90% across all treatment groups.

While the specific survey plan will be determined at a later date, surveys will likely be used to collect information on the following topics:

- Customer demographic data – a small amount of demographic data will be collected at the time of enrollment, which will be done online, through a call center or through a business reply card. Essential data to gather at this juncture includes household income, persons per household and age of household members so that classification of customers into senior and income segments can be updated based on information provided by participants rather than on the pre-enrollment data used for sampling purposes. Email addresses will also be obtained since email will be used for subsequent surveys as well as for some treatment options such as SDG&E's usage alerts. Information on smart phone and smart thermostat ownership will need to be obtained from PG&E participants to support the technology treatments being tested by PG&E. Air conditioning ownership may also be included in the enrollment survey.
- Behavioral information – factual questions about:
    - Appliance use by time of day;
    - For seniors, low income and perhaps other participants (both treatment and control participants), questions pertaining to assessment of hardship such as usage of air conditioning on hot days, tradeoffs being made between paying energy bills and other purchases, etc.; [50]
    - For customers with smart thermostats (such as SCE's smart thermostat test cells), questions about temperature settings by rate period for both treatment and control customers;
    - For SDG&E and PG&E information treatments, frequency of viewing usage alerts and smart phone information,[51] how the information is used, etc.
- Awareness and understanding of tariffs – testing knowledge of rate periods, price ratios or levels, variation in rate periods and prices across seasons, understanding of tiers for control customers, etc. These types of questions will be used to assess the effectiveness of E&O and information treatments.
- Understanding of usage behavior that underlies energy bills – that is, testing whether E&O materials improve customer understanding of end uses that drive peak period use and behavioral changes that can be made to reduce monthly bills.
- Satisfaction with/acceptance of rate, technology and information treatments and the reasons why participants are or are not satisfied.
- Recommendations for changes to treatments that would improve satisfaction and acceptance.
- Perceptions about and preferences for various E&O materials.
- Preferences for staying on the rates and other treatments, or shifting to one of the alternative rates, at the end of the pilot if such treatments were to continue to be offered.

[50] The TOU Working Group discussed the importance of aligning these questions about potential hardship with similar questions from the Statewide Low Income Needs Assessment surveys that are being conducted by the IOUs.

[51] If this type of information can be obtained through the software programs and databases used to administer the treatments, that approach would be both more accurate and less burdensome on participants compared with asking about this type of behavior in surveys.

- Additional demographic and appliance data.[52]
- Reasons why customers who were solicited for participation in various treatments declined to enroll in the pilot.

In addition to the collection of data through the brief enrollment survey, Nexant recommends that each participate be asked to respond to no more than two surveys. We believe the best timing for the first survey is at the end of summer 2016. This is not a good time to ask participants how satisfied they are with the new rates since many may have experienced higher summer bills just prior to completing the survey and not had the benefit of lower bills in the late fall, winter and spring months. However, it is the best timing for many other issues such as assessing hardship for seniors and low income participants, for asking about usage behavior during peak periods in the summer and perceptions about welcome kits and other summer related E&O materials, among other things.

There are two options regarding timing of the second survey. One is to conduct the survey just prior to summer 2017 after participants have been enrolled for a full year. The second is to conduct the survey following summer 2017, which is close to when the pilot will end. The earlier timing would be much better for assessing customer satisfaction with the rate treatments for reasons discussed previously. It would also be better for obtaining information about usage behavior during winter and during the important spring period for PG&E and SCE Rate 3, which has low priced periods in midday in the spring that reflect excess supply conditions. The primary reason for conducting the survey following the summer of 2017 is the desire to keep customers on the rate treatments through summer 2017 and the fact that the final incentive payment will be tied to completion of the last survey (in order to ensure high response rates). Making the final payment prior to summer 2017 risks losing a larger portion of the research sample than if the survey and final payment were done following summer 2017. On the other hand, this timing opens up a longer time period to observe the proportion of customers who drop off the rates because they prefer the OAT. Good information on dropout rates could be very useful for planning default pricing. Near the end of the planning process, a decision was made to schedule the second survey around June 2017 in order to provide a more accurate assessment of participant's perceptions and acceptance of the rates prior to a second summer of potentially higher bills, and to gather better data on winter and spring usage and post payment dropout rates.

Decliner surveys may also be employed, although this was not discussed at length during the TOU Working Group process. Nexant does not recommend conducting a decliner survey for the PTP recruitment process since this is a unique approach to the recruitment and reasons for declining to participate in the study have no relevance to customer decisions about opting out of default rates or preferences for one rate over another. On the other hand, surveying people

[52] There will be a temptation to gather extensive demographic and end use appliance data at a level of detail similar to the periodic residential appliance saturation surveys (RASS) that are conducted by California's IOUs. Nexant strongly recommends guarding against this temptation. There are much higher priorities for information gathering to assess the impact of various treatments and adding lengthy RASS-like questions will significantly jeopardize getting high response rates for much more important survey questions. If there is need for such data, it would be better to wait until the default pilots are conducted in 2018 when larger samples can be cost-effectively obtained and surveys can be parsed out across random subsets of the population in order to reduce survey length and frequency for any particular group of respondents.

who decline PG&E's smart phone app offer or SDG&E's smart thermostat incentive offer could be insightful.

It may also be useful to survey customers who drop off the rates and other treatments over the course of the pilots. The most efficient time to capture this information is when customers call in to drop off the rate, as long as the survey is kept quite short. Pursuing customers to complete a survey after they have dropped off may prove difficult and costly. It is also likely to have low response rates and could produce misleading information. In spite of these challenges, if dropout rates are high for selected tariffs, understanding why will be quite important and dropout surveys should be conducted.

5.5 Other Evaluation Efforts Being Considered

The TOU Working Group also briefly discussed other possible evaluation activities, including focus groups, conjoint surveys and data tracking. As discussed in Section 4.2.2, PG&E plans to use focus groups and perhaps in-depth surveys as part of its ethnographic study of thermostat behavior. Focus groups might also be useful for gaining deeper insights into SDG&E's usage alerts, PG&E's smart phone app and SCE's smart thermostat treatment.

Several TOU Working Group participants mentioned the possibility of using conjoint surveys to explore the potential impact of treatment features that were not tested in the pilots. Conjoint surveys ask respondents to indicate their preferences for various product bundles. The outcome of these choice exercises can be analyzed to produce estimates of the relative attractiveness of individual product features. Conjoint surveys almost always overstate (often significantly) actual acceptance rates for specific product bundles but can accurately reflect the relative acceptance rates for different product bundles. If surveys can be anchored to actual choice data, more accurate predictive models of actual take rates for alternative bundles can be produced.[53] Conjoint surveys can prove effective in predicting how a change in a particular product feature would impact the purchase of the product or, in the context of rate options, how a change in a rate feature (e.g., shortening the peak period, increasing the price ratio, etc.) might impact enrollment onto the rate. Since these pilots are not testing opt-in rates, there is no actual choice data that can be used to anchor the conjoint exercises not is opt-in pricing the primary focus at this point in time. If pilot dropout rates are high, it might be useful to use a conjoint study to assess whether specific changes in the rate features would significantly reduce dropout rates.

A final source of information that may be used for evaluation is tracking data. Dropout rates are important metrics for assessing customer preferences and satisfaction with rates. Call center tracking of complaints and customer inquiries can also be quite useful. It might also be useful to track whether customers on TOU rates or who receive some of the technology or information treatments participate at a greater rate in other IOU programs such as energy efficiency programs. This can be done by comparing enrollment rates in utility programs between treatment and control customers.

[53] For an example of how a conjoint survey cam be used in conjunction with actual choice data for TOU rate options, see Chapter 9 in Stephen S. George, Jennifer Potter and Lupe Jimenez. *SmartPricing Options Final Evaluation*. September 5, 2014.

6 Pilot Budgets

The pilots summarized in Section 4, collectively, will involve recruitment of almost 52,000 participants in a very short time period. As discussed later in this section, the average recruitment cost per participant is highly uncertain. It is primarily a function of the incentive amount that will be paid under the pay-to-play recruitment strategy and the acceptance rate by customer segment. Based on focus group research conducted by SCE in early December, acceptance rates may vary significantly depending on whether or not bill protection[54] is included in the recruitment offer. This uncertainty will be reduced significantly in January when each utility will conduct pre-launch tests that collectively will determine how enrollment rates will differ with respect to offer features, including incentive amount, the distribution of payments over time, delivery channel (e.g., courier, direct mail, email) and whether or not bill protection is incorporated into the offer. As discussed in Section 6.1, given the current uncertainty, recruitment costs across all three utilities could range from a low of roughly $5 million to well over $20 million.

In addition to recruitment costs, each utility will incur other TOU pilot-related costs covering a wide variety of activities including, but not necessarily limited to:

- **Pilot Design and Regulatory Work**: This cost category includes the pilot design work that has already been conducted and that will continue in 2016 when planning for 2018 default pilots will occur. It also includes preparation of the required regulatory filings that will be submitted by January 1, 2016.
- **Implementation Planning:** This cost category includes development of an implementation plan (e.g., what is to be outsourced, what will be done in house, etc.), analysis required to finalize sample size requirements, pulling the sample, focus groups for development of recruitment materials and all E&O materials such as welcome kits and in season support, the pre-launch test to determine incentive payments and acceptance rates by customer segment, development of enrollment procedures (including an enrollment site) and tracking databases, call center training, IT work to prepare for billing the new rates, development of any new business processes needed to support the pilots, etc. For SDG&E, implementation planning will also include finalizing the usage alert content and software and for PG&E, it will include getting contracts and procedures in place to support the smart phone app. For SCE, implementation planning will involve working with smart thermostat vendors to market and support recruitment of current smart thermostat owners into the pilot.
- **Implementation:** The largest component of implementation costs will be for recruitment (with the largest share of those costs being for the incentive payments that will be paid out in stages). If bill protection is included in the recruitment offer, the cost for bill protection payments will be incurred at the end of the first full year of the pilot. Costs will also be incurred for incremental staff or outsourcing for enrollment processing, call center and other ongoing customer support, the cost of printing and distributing E&O materials, data tracking, manual billing (if needed) and end of pilot transition. For PG&E, implementation costs will include payments to the smart phone app contractor throughout the duration of the pilot as well as costs for the ethnographic study that will be conducted to explore how consumers interact with thermostats. For SDG&E, it will

[54] Bill protection is discussed in more detail in Section 6.2.

include costs associated with implementing the smart thermostat incentive program and for delivery of usage alerts.

- **Evaluation and Reporting:** This cost category includes expenditures for the load impact evaluation, billing analysis and all survey work described in Section 5 (including survey planning in consultation with the TOU Working Group).

Each IOU has developed estimates of costs for the majority of the activities summarized above and will include these estimates along with supporting documentation in its advice letter to be filed with the CPUC along with this report. The remainder of this section provides estimates of recruiting costs based on a variety of assumptions. It also discusses the pre-launch test activities that will be used to significantly reduce the amount of uncertainty in the recruitment cost estimates and that will allow the utilities to better manage the recruitment process so that enrollment targets are met at the lowest cost.

6.1 Recruitment Costs

As discussed in Section 3.2, recruitment for the pilots will involve what is being called a pay-to-play (PTP) approach. The reasons for using this approach were summarized in Section 3.2. The PTP approach involves paying participants an attractive incentive to enroll in the study and to be assigned to one of three rate treatments or to the control condition. A portion of the incentive will be paid at the time of enrollment, another portion upon completion of a survey following summer 2016 and the final portion upon completion of the last survey in mid-2017.

The cost of recruitment per enrolled participant is a function of the incentive amount, the delivery channel(s) used (e.g., U.S. Postal Service (USPS), courier service, email, outbound calls, etc.), the "open rate" for each channel and the acceptance rate among those who open the recruitment letter or email, or take the call. Table 6-1 shows the cost per enrolled participant under numerous assumptions about incentive payment, open rate, acceptance rate and cost per communication.

As seen in the table,[55] the cost per participant ranges from as low as $103[56] under the very optimistic assumption that 90% of those who receive the recruitment letter via USPS[57] open it and 50% of those who open it enroll. A high end cost estimate of $486 per participant was arrived at assuming that only 50% of people who receive a courier package open it and only 10% of those who open it enroll even though they are paid an incentive of $300. The actual cost of recruitment for pilot participants is likely to be in between these extremes.

[55] The shaded values in the table are used as input to Table 6-2 and are discussed more fully below.

[56] The cost per enrolled participant equals ((delivery cost)/(open rate)/(acceptance rate)).

[57] The cost of $1.50 for USPS is based on the cost of the letter, postage and handling. The courier cost also includes materials and handling plus delivery costs based on standard FedEx rates.

Table 6-1: Cost per Participant

USPS Delivery					
Incentive	Delivery Cost	Open Rate	Acceptance Rate		
			10%	25%	50%
$100	$1.50	50%	$130	$112	$106
	$1.50	75%	$120	$108	$104
	$1.50	90%	$117	$107	$103
$200	$1.50	50%	$230	$212	$206
	$1.50	75%	$220	$208	$204
	$1.50	90%	$217	$207	$203
$300	$1.50	50%	$330	$312	$306
	$1.50	75%	$320	$308	$304
	$1.50	90%	$317	$307	$303
Courier Delivery					
$100	$9.30	50%	$286	$174	$137
	$9.30	75%	$224	$150	$125
	$9.30	90%	$203	$141	$121
$200	$9.30	50%	$386	$274	$237
	$9.30	75%	$324	$250	$225
	$9.30	90%	$303	$241	$221
$300	$9.30	50%	$486	$374	$337
	$9.30	75%	$424	$350	$325
	$9.30	90%	$403	$341	$321

These cost estimates are based on a single marketing wave. It is much more typical to use multiple marketing waves for opt-in recruitment but PTP is not a typical opt-in scheme since participants will be paid to enroll in the study. The operating assumption is that the attractive incentive will negate the need for multiple marketing waves as long as there is a high open rate and an effective recruitment letter is used. However, offsetting the attractiveness of the enrollment incentive is the high degree of perceived risk and uncertainty in prospective participant's minds about the potential for large bill increases. This perceived risk is a well-known marketing barrier for any time-varying rate as consumers tend to focus more on the downside risk associated with higher peak period prices than on the upside potential of lower bills due to lower prices being in effect for most hours. However, this typical concern is exacerbated here because of the increased uncertainty stemming from the fact that the rate that each participant will be assigned to is unknown to the prospective participant and the lack of transparency around the characteristics of all rate options during recruitment. This barrier could

mean that a second marketing wave, perhaps involving telephone recruitment, might be necessary.

The single wave assumption for mailings is also in part a function of the fact that the time available for recruitment is so short that there may not be sufficient time for multiple marketing waves to occur. The reason that the higher cost courier channel is being considered and tested in January is to see if it might increase the open rate enough compared with typical USPS delivery to be cost-justified, as that might partially compensate for the lack of multiple marketing waves. As discussed in Section 6.2, the relative effectiveness of the two marketing channels will be tested by PG&E and SCE in a pre-launch test in January.

There is limited data concerning what acceptance rates are likely to be for this PTP approach. Indeed, we are unaware of any prior pricing pilot that tested recruitment with random, post-enrollment assignment to one of four experimental conditions using a PTP approach. In 2003, California's IOUs conducted a Statewide Pricing Pilot (SPP)[58] that used a PTP approach with an incentive payment of $175 spread over three installments ($25 for completing a survey, $75 for staying through the first summer and $75 for staying through the end of a full year). As with the proposed pilots, recruitment for the SPP occurred just prior to summer. In the SPP, each potential recruit was offered one of the multiple rate options included in the pilot, and knew what rate they were signing up for. But, this made selection bias an issue. The opt-in TOU pilot's blind assignment avoids such selection bias.

In the SPP pilot, relatively few people responded to the initial letter (sent via USPS in the SPP). A key finding from a post enrollment survey for SPP[59] was that "the printed materials were quite ineffective. Respondents found them neither engaging nor persuasive. The materials made scant reference to any benefit – direct or indirect – that the customer might gain by participating, nor did they leave readers feeling they fully understood the program. Readership appeared to have been unusually low." To help avoid using a similarly ineffective letter, SCE conducted focus groups in early December to test letter content, offer features and back-up information to be included with the letter. As mentioned previously and discussed more fully in Section 6.2, two key findings from the focus groups were the potential barrier associated with the perceived risk of large bill increases and the fact that offering bill protection could significantly reduce that concern.

With the low initial response rate to the recruitment letter in the SPP, telephone follow-up calls were made to those being recruited. Eventually, about half of those who were sent letters were reached by phone. The overall acceptance rate for the SPP is subject to interpretation. The worst case interpretation, which divides those who were eventually enrolled by the total number of offers sent, was 20%. However, the numerator in this calculation includes more than 300 participants who agreed to enroll but were rejected by the utilities for various reasons, including the inability to install interval meters and the fact that the participant said they planned to move

[58] Stephen S. George and Ahmad Faruqui. *Impact Evaluation of California's Statewide Pricing Pilot*. Final Report, March 16, 2005.

[59] Focus Pointe, Inc. *Statewide Pricing Pilot: Enrollment Refusal Follow-up Research*. November 2003.

within 6 months.[60] If these customers are counted as accepting the offer, the acceptance rate equaled roughly 30%. A liberal interpretation of the acceptance rate for the SPP is 70%. This interpretation excludes from the denominator anyone who could not be reached by telephone, which was roughly half of all customers who were contacted.

With the above background information in mind, cost estimates were developed based on four sets of assumptions about acceptance rates, delivery channel and incentive payments. The cost estimates per recruited participant are taken from Table 6-1 and are highlighted there in the four cells shaded in grey. The low end estimate, $108, assumes USPS delivery, a $100 incentive payment, a 75% open rate and a 25% acceptance rate. The high end estimate, $486, assumes courier delivery, a $300 participation incentive, a 75% open rate and only a 10% acceptance rate. In between these two extremes are two scenarios that assume a $200 incentive, 75% open rate and 25% acceptance rate, with the only difference between them being that one uses USPS and the other courier delivery. The 10% acceptance rate assumption is half the value of the most pessimistic interpretation of the SPP acceptance rate while the 25% assumption is halfway in between the two low-end acceptance rate interpretations from the SPP.

Table 6-2 shows the total cost of enrollment for each utility based on the four sets of assumptions summarized above. The number of recruited customers in Table 6-2 for SCE includes the target enrollment for the rate options from Table 4-2 (18,275) plus an additional 3,750 for the smart thermostat technology treatment, for a total of 22,025. As noted in Section 4.2.1, the number of customers for PG&E is still a bit uncertain pending an update of PG&E's customer characteristics database, which will allow for a refinement of the number of customers that must be recruited into each segment in the hot climate region. For planning purposes, we assume that PG&E will recruit 18,500 customers into the pilots. The 11,250 customer recruitment estimate for SDG&E comes from the 8,750 in Table 4-6 plus 2,500 for the usage alert treatment discussed in Section 4.3.3.

The cost estimates in Table 6-2 are based on the payment schedule shown under the per participant portion of the table. For the $100 total incentive scenario, we assume that $25 would be paid at the time of enrollment, another $25 for completion of the survey at the end of summer 2016 and the final $50 paid at the end of summer 2017. For the $200 scenarios, the payment schedule is $25, $50 and $150, respectively, and for the $300 incentive scenario, payments equal $100, $75 and $125. The marketing costs shown in the table equal the difference between the incentive amount and the values in the highlighted cells in Table 6-1.

[60] Interval meters were not in place in 2003 so meters had to be installed for all participants prior to placing them into the pilot. The high cost of installing meters made it very important to screen out participants who were planning to move. The pilots proposed here are not based on screening out potential movers since meters are already in place and doing so would bias the participant population.

Table 6-2: Estimated Recruitment Costs for Selected Scenarios

Utility	# Recruited	Scenario	Per Participant					Total				
			Incentive	Upfront Payment	2016 Survey	2017 Survey	Marketing cost	Upfront Payment	2016 Survey	2017 Survey	Marketing Cost	Total Costs
SCE	22,025	USPS, 75% open rate, 25% acceptance rate	$100	$25	$25	$50	$8	$550,625	$512,081	$881,000	$176,200	$2,119,906
	22,025	USPS, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$8	$550,625	$1,024,163	$2,202,500	$176,200	$3,953,488
	22,025	Courier, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$50	$550,625	$1,024,163	$2,202,500	$1,092,440	$4,869,728
	22,025	Courier, 50% open rate, 10% acceptance rate	$300	$100	$75	$125	$186	$2,202,500	$1,536,244	$2,202,500	$4,096,650	$10,037,894
PG&E	18,500	USPS, 75% open rate, 25% acceptance rate	$100	$25	$25	$50	$8	$462,500	$430,125	$740,000	$148,000	$1,780,625
	18,500	USPS, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$8	$462,500	$860,250	$1,850,000	$148,000	$3,320,750
	18,500	Courier, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$50	$462,500	$860,250	$1,850,000	$917,600	$4,090,350
	18,500	Courier, 50% open rate, 10% acceptance rate	$300	$100	$75	$125	$186	$1,850,000	$1,290,375	$1,850,000	$3,441,000	$8,431,375
SDG&E	11,250	USPS, 75% open rate, 25% acceptance rate	$100	$25	$25	$50	$8	$281,250	$261,563	$450,000	$90,000	$1,082,813
	11,250	USPS, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$8	$281,250	$523,125	$1,125,000	$90,000	$2,019,375
	11,250	Courier, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$50	$281,250	$523,125	$1,125,000	$558,000	$2,487,375
	11,250	Courier, 50% open rate, 10% acceptance rate	$300	$100	$75	$125	$186	$1,125,000	$784,688	$1,125,000	$2,092,500	$5,127,188
All	51,775	USPS, 75% open rate, 25% acceptance rate	$100	$25	$25	$50	$8	$1,294,375	$1,203,769	$2,071,000	$414,200	$4,983,344
	51,775	USPS, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$8	$1,294,375	$2,407,538	$5,177,500	$414,200	$9,293,613
	51,775	Courier, 75% open rate, 25% acceptance rate	$200	$25	$50	$125	$50	$1,294,375	$2,407,538	$5,177,500	$2,568,040	$11,447,453
	51,775	Courier, 50% open rate, 10% acceptance rate	$300	$100	$75	$125	$186	$5,177,500	$3,611,306	$5,177,500	$9,630,150	$23,596,456

The costs shown in each column in the table under the "Total" heading factor in the timing of when the marketing and incentive payments are made. As discussed previously, the number of recruited customers factors in an assumed attrition rate of 25% between the start of the pilot and the end of summer 2017 (a period of 15 months). The marketing cost and the upfront payment of $25 are both multiplied by the number of recruited customers shown in the second column in Table 6-2. However, the 2016 survey cost is multiplied by that number of recruited customers minus the attrition that is estimated to occur between enrollment and completion of the survey roughly four months later. A straight-line attrition rate of roughly 1.67% per month was assumed (which is equal to 25% divided by 15 months). Thus, the number of customers that would be paid the 2016 survey incentive would equal the total number recruited minus roughly 7% (1.67x4). The number of customers who are expected to be paid for the second survey, which is planned to be done around June 2017, is roughly 20% of the recruited number of participants. If a different incentive payment schedule is assumed, the total costs will vary depending on how much is paid up front, how much at the end of summer 2016 and how much at the end of summer 2017.

Based on the above assumptions, total recruitment/incentive costs range from roughly $2 to $10 million for SCE, $1.8 to $8.4 million for PG&E and $1 to $5 million for SDG&E based on the scenarios included in Table 6-2. Total costs for all three utilities combined range from roughly $5 million to more than $23 million.

6.2 Pre-launch Test

Given the high degree of uncertainty in acceptance rates associated with the proposed RCT PTP pilot design, all three IOUs are planning to conduct recruitment tests in January. Collectively, these pretests will determine differential enrollment rates associated with different PTP incentive levels, different timing for incentive payments over time (e.g., percent paid up front versus later), different recruitment delivery channels (e.g., email, direct mail and courier), different customer segments (e.g., CARE/FERA and non-CARE/FERA) and with and without bill protection.

As previously mentioned, the issue of bill protection surfaced in focus groups conducted by SCE in early December. Bill protection means that, at the end of the first year on pilot rates, participant's bills on the TOU rates would be compared with their bills based on post-treatment usage and the OAT. If the bill amount on the TOU rate is higher than on the OAT, participants would be paid the difference. Put another way, under bill protection, a participant's bill cannot be higher than it would have been had they been on the OAT rather than the pilot rate.

SCE's focus groups were designed to obtain input on the content of the recruitment letter, the timing of incentive payments and concerns about the uncertainty associated with rate assignment given the PTP recruitment plan and random assignment to one of several rate options. Focus group participants expressed significant concern about the risk of not knowing what the potential bill impacts would be for the rate they would be assigned to and worried that the bill impacts might be larger than any PTP incentive they might receive. After hearing of this concern, the focus group facilitator presented the concept of bill protection and participants responded very favorably to it as a way of significantly mitigating the perceived risk.

The idea of bill protection was discussed by the TOU Working Group in early meetings and a preliminary decision was made not to incorporate this into the pilot plan because of prior evidence indicating that it may reduce load impacts and also because customers who are defaulted onto TOU rates in 2019 will only have bill protection for the first year. Prior research by Nexant on PG&E's SmartRate critical peak pricing tariff found that load impacts were roughly 25% lower for customers under bill protection compared with those that were beyond the bill protection period.[61] However, this analysis was based on a small sample using a quasi-experimental evaluation method rather than on an RCT design with larger samples. It also involved a very different type of rate. As such, it is difficult to say whether similar results might occur under TOU pricing. Put another way, these prior results are suggestive but far from conclusive.

By not incorporating bill protection into the recruitment plan, the load impacts would be more representative of what would exist under default pricing after the end of the bill protection period. However, after seeing the significant concern about risk expressed in the focus groups, the TOU Working Group felt that it was very important to at least test the impact of offering bill protection during the pretest. SCE has agreed to conduct this test. If bill protection significantly increases enrollment rates, it may be incorporated into the pilot in order to achieve the targeted enrollment levels over the very brief window during which recruitment must be done.

SCE plans to conduct a pretest among 3,200 customers segmented as shown in Table 6-3. These tests will determine the impact of bill protection, delivery channel and two different incentive levels on acceptance rates for CARE/FERA and non-CARE/FERA.

Table 6-3: Pretest Plan for SCE

Incentive	Delivery Channel	Without Bill Protection		With Bill Protection		All
		CARE/FERA	Non-CARE/FERA	CARE/FERA	Non-CARE/FERA	
$200	Courier	200	200	200	200	800
	Direct Mail	200	200	200	200	800
$300	Courier	200	200	200	200	800
	Direct Mail	200	200	200	200	800
n/a	Total	800	800	800	800	3,200

PG&E's pretest will focus on delivery channel, incentive level and the timing of the incentive payments. PG&E plans to send recruitment letters to 2,000 customers according to the plan shown in Table 6-4. This pretest will assess the differential acceptance rates between courier and direct mail, two different incentive levels and two different plans for upfront payment amounts versus later payment of incentives.

[61] Stephen George, Josh Bode and Elizabeth Hartmann. *2010 Load Impact Evaluation of Pacific Gas and Electric Company's Time-Based Pricing Tariffs.* April 1, 2011. Prepared for Pacific Gas and Electric Company.

Table 6-4: Pretest Plan for PG&E

Incentive	Courier		Direct Mail Letter		All
	Upfront Incentive = $100	Upfront Incentive = $50	Upfront Incentive = $100	Upfront Incentive = $50	
$175	250	250	250	250	1,000
$250	250	250	250	250	1,000
Total	500	500	500	500	2,000

SDG&E plans to test differential acceptance rates under different incentive levels, delivery channels and messaging. Table 6-5 shows the pretest plan for SDG&E. This plan will test three different incentive levels, email and direct mail three different letter types that vary in terms of content and format. The "senior letter" test is not targeted just at seniors, but will include large font for key messages points (as discussed in Section 3.7).

Table 6-5: Pretest Plan for SDG&E

Incentive	USPS (General Population)			Email Population			
	Letter 1 (Marketing) (A)	Letter 2 (Solicitation) (B)	Letter 3 (Seniors) (C)	Letter 2 Sent to email population via USPS (D)	Letter 2 Sent via email (E)	Letter 1 sent via email (F)	Letter 3 sent via email (G)
$200	250	250	250	250	250	250	250
$300	250	250	250	250	250	250	250
$400	250	250	250	250	250	250	250

7 Pilot Schedule

The time period available for implementing the 2016 pilots described in prior sections is extremely short. With advice letters being filed by each utility no later than January 4 and a decision by the Commission at the earliest on February 25 but perhaps not until March 17, there is very little time to complete all of the work needed to implement multiple rate, technology and information treatments and to recruit more than 50,000 pilot participants by June 1, 2016. Based on Nexant's extensive experience designing, implementing and evaluating numerous rate, technology and information experiments, it is no exaggeration to say that the successful launch of the pilots and recruitment of the target number of customers across multiple utilities in the time frame available will be unprecedented within the electricity industry.

Although Commission approval of the advice letters may not occur until three months from the date of this report, the IOUs are necessarily already working hard on implementation planning. Some of the details of these plans and the implementation schedule for each IOU will be included in their advice letters. Key milestones for each utility will vary depending on the treatments they are implementing, the approach they take to implementation (e.g., outsourcing some activities versus doing everything in house), the current capabilities of existing business processes and IT systems, and many other factors. Those details will be included in each utility's advice letter.

This section presents a very high level overview of key milestones and activities for each month over the more than two-year period starting in January 2016 and ending in March 2018. The focus is primarily on the timing of regulatory proceedings, customer recruitment, enrollment and communications, and evaluation activities. Table 7-1 is meant to give readers a rough idea of when selected activities will likely occur. It is not intended to represent a comprehensive list of all of the critical path activities and milestones that will occur, especially over the first six months of 2016 when implementation preparation will be at its peak. It also doesn't represent a consensus concerning when each item listed in the table will actually occur for each IOU. If there are differences between the high level timeline shown in Table 7-1 and the timelines contained in each utility's advice letters, the advice letter timelines should be taken as accurate.

Table 7-1: High Level Overview of Key Pilot Milestones and Activities

Year	Month	Activities
2016	January	1. Advice letters filed 1/4/16 (may be filed as early as 12/24/15) 2. Recruitment pre-test launched by all three IOUs in the first two weeks 3. Commission aims to circulate draft Resolution disposing of advice letters for 30-day public comment period on 1/25 4. Reply briefs on 745 issues 1/11 (not on critical path) 5. IOUs complete sampling power analysis as input to finalizing sampling plan and budgets 6. Utilities conduct focus groups as input to development of E&O materials 7. Utilities contract out for implementation support if needed 8. SDG&E finalizes Rate 3 pilot plan and includes details in Advice Letter
	February	1. Analyze results from pre-test and finalize recruitment strategy (e.g., delivery channel, incentive level, timing of incentive payments, bill protection, letter content and format, etc.) 2. Develop revised recruitment strategy (e.g., telemarketing) if pretest results indicate that hitting required enrollment targets will be difficult 3. Finalize sampling plan and draw samples based on input from pretest and sampling power analysis 4. Update budget estimates based on 1, 2 and 3 above 5. Develop tracking databases in preparation for start of recruitment in March 6. Ensure that systems are in place to prevent participants from getting mandatory rate comparisons so as to avoid customer confusion and so as not to push customers off the rates shortly after they enroll in the pilots 7. Earliest date for Commission approval of advice letter – 2/25
	March	1. Last date for Commission approval of advice letters 3/17 2. Initiate customer recruitment 3. Hire evaluation contractor and survey research firm (if different)
	April	1. Continue recruitment 2. OAT rate adjustments for all customers (not just pilot customers) likely to occur (could occur in either March or May)
	May	1. Continue recruitment 2. Send welcome kits to all participants 3. Initiate working group meetings in early May concerning topics to be covered in planned surveys
	June	1. Customers begin being transferred to TOU rates according to their billing cycle starting 6/1 2. Enrollment incentives begin to be paid according to switch date
	July	1. Enrollment largely complete – finalize enrollment incentive payments 2. Most participants receive their first bill under TOU rates 3. Utilities initiate monthly reporting of dropouts and customer churn 4. SDG&E launches default usage alert to selected participants 5. SDG&E launches Rate 3 pilot recruitment 6. PG&E initiates ethnographic study of thermostat behavior 7. Earliest that PG&E may launch recruitment for smart phone app (could be done in August or September depending on variety of factors) 8. IOUs submit final survey plan and questionnaires for approval on July 1 9. Initiate TOU Working Group meetings for 2018 default pilot planning
	August	1. Final approval of survey plan and questionnaires for 2016 survey 2. 2018 pilot planning continues
	September	1. Survey implementation preparation 2. 2018 pilot planning continues
	October	1. PG&E and SCE initiate survey effort (summer period ends 9/30 for PG&E/SCE but not until 10/31 for SDG&E)

Year	Month	Activities
		2. PG&E/SCE deliver interval data to evaluation contractor 3. SDG&E launches smart thermostat recruitment 4. SDG&E Rate 3 enrollment complete 5. 2018 pilot planning continues
	November	1. PG&E/SCE surveys largely complete – survey analysis begins 2. SDG&E initiates survey process 3. SDG&E delivers interval data to evaluation contractor 4. Impact evaluation and billing analysis initiated 5. Finalize 2018 pilot plan and submit advice letters
	December	1. SDG&E surveys largely complete – folded into PG&E/SCE survey analysis efforts 2. Evaluation activities continue
2017	January	1. Preliminary survey, billing and impact results presented
	February	1. Draft interim evaluation report submitted for review 2. PG&E and SCE alert customers on Rate 3 to impending spring season rate change 3. Detailed planning for second survey begins
	March	1. Final interim evaluation report submitted 2. Continue planning for second survey
	April	1. SDG&E alerts customers to impending summer rate change 2. Detailed plan for second survey submitted to Commission for approval
	May	1. SDG&E sends interval data to evaluation contractor for winter and spring months – impact and billing analysis initiated for SDG&E 2. Commission approval of second survey
	June	1. Second survey sent at the beginning of the month 2. Final incentive payments begin to be paid as surveys are returned 3. PG&E and SCE send interval data to evaluation contractor for winter and spring months – impact evaluation and billing analysis initiated
	July	1. Bill protection payments are calculated after 12 months of being on the rate and begin to be paid (if bill protection is employed) 2. Surveys should be largely complete – survey analysis begins 3. Impact and billing analysis continues
	August	1. Remainder of bill protection payments are sent 2. Impact and billing analysis continues – survey analysis conducted
	September	1. Second interim evaluation report covering full year impact and billing analysis and second survey analysis completed 9/15
	October	1. PG&E and SCE send interval data for summer 2017
	November	1. SDG&E sends interval data for summer 2017 for Rates 1, 2 and 3 2. Customers notified about impending end of pilot and date on which they will be switched to other tariffs – customers presented with rate comparison reports so they can make an informed choice regarding tariff options 3. Impact evaluation for summer 2017 is initiated
	December	1. Evaluation analysis
2018	January	1. All utilities deliver final interval data through 12/31 to evaluation contractor 2. All customers transferred to other rates 3. Evaluation analysis
	February	1. Evaluation analysis
	March	1. Final pilot evaluation report submitted 3/30

Appendix A TOU Working Group Participants

Organization	Name
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Distributed Energy Financial Group LLC	Nat Treadway
Ellison, Schneider & Harris	Chase Kappel
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Greenlining Institute	Stephanie Chen
KFW Law	Joseph Wiedman

Organization	Name
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Utility Consumer Action Network (UCAN)	David Croyle Don Kelly
Vote Solar	Susannah

Appendix B Analysis Method to Estimate Sample Sizes for Load Impact Determination

Date: October 15, 2015

To: TOU Pilot Design Working Group

From: Jon Cook and Steve George, Nexant

Re: Monte Carlo Simulations for Determining Default TOU Pilot Sample Sizes

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Summary

This memorandum provides documentation of the process used to establish sample size requirements for the CA Default TOU Pilot. Monte Carlo simulation was used in conjunction with a false experiment to determine the precision of estimated peak period load impacts that would result from using various sample sizes. Data for the simulation came from a convenience sample of customers that Nexant already had from work underway with PG&E to evaluate the impact of the Company's Home Energy Report (HER) program.

Data

The Default TOU pilot is being designed to provide valid estimates of what the impacts of TOU pricing would be for pilots to be conducted by each of the three CA IOUs. Ultimately, each utility will need to conduct their own analysis of a similar nature to determine the sample sizes needed for each test cell based on the unique usage characteristics of the customer population targeting each segment and treatment group of interest. The data used here came from a sample of approximately 70,000 customers used as a control group for PG&E's Home Energy Report program. Customers enrolled in this phase of the HER program had to meet the following criteria:

- Dual fuel (electric and gas);
- Currently on a flat rate, TOU, or seasonal rate;
- Do not reside in San Bruno or Marin County;
- Mailing address matches service address;
- No medical baseline;
- No net-metering;
- Usage in the top 3 quartiles of electricity usage for the territory;
- Not vulnerable or disabled; and
- Must have a SmartMeter installed.

Interval data from the summer (May-October) of 2013 was used for analysis. The outcome variable of interest was the average load (kW) during a hypothetical peak period of 2-7 pm on weekdays. Data were collapsed so that the analysis dataset is a panel made up of individual customers and daily observations of average peak period load. The average weekday peak period load in the dataset is approximately 1.15 kW.

Monte Carlo Simulation

Monte Carlo simulation (or experimentation) is a methodology that is commonly used for investigating the properties of econometric estimators and verifying that valid methods of statistical inference are being used.[62] The power of the methodology lies in its use of repeated sampling to understand the properties of a particular estimator or statistic under realistic data conditions.[63]

One of the key questions for the design of the TOU pilots is how large a sample should be to detect the expected effect of for each test cell. Sample size is important because it directly affects two related properties of statistical analysis – power and precision. Power is the ability of an analysis to detect an effect if it indeed exists, while precision deals with how close the estimates would be if the analysis was repeated many times using different samples. All else equal, larger sample sizes increase both power and precision since there is more data available to use for estimation. The primary focus of this simulation is precision. Precision is not only affected by sample size, but also by the inherent variability in the data along with the estimator that is used. We are interested in understanding how precisely peak period load impacts can be estimated using different sample sizes or alternatively, how large of a sample is needed to achieve a pre-determined level of precision.

To answer these inquiries, we conducted Monte Carlo simulations that incorporate a false experiment. The idea of a false experiment is to conduct an analysis in a situation where the magnitude of the treatment is known to be zero using data that is similar to what would be used in a real experiment. Knowing the answer beforehand allows us to assess whether or not the estimator used produces biased results, while using real data gives us an idea of how precise the estimator will be.

The simulation process is shown in Figure 1. For each sample size of interest, a random sample of that number of customers is drawn from the master dataset of 70,000 described above. Next, the "experiment" is created by randomly assigning half of the customers to a "treatment" group on a TOU rate and the other half to a control group who remain on their current rate. We then assume that the imaginary TOU treatment went into effect on August 1 for all customers. With this experimental framework, the "impact" of the fictional TOU rate can be estimated using the following equation, where i subscripts denote individuals and t subscripts denote time periods (days):

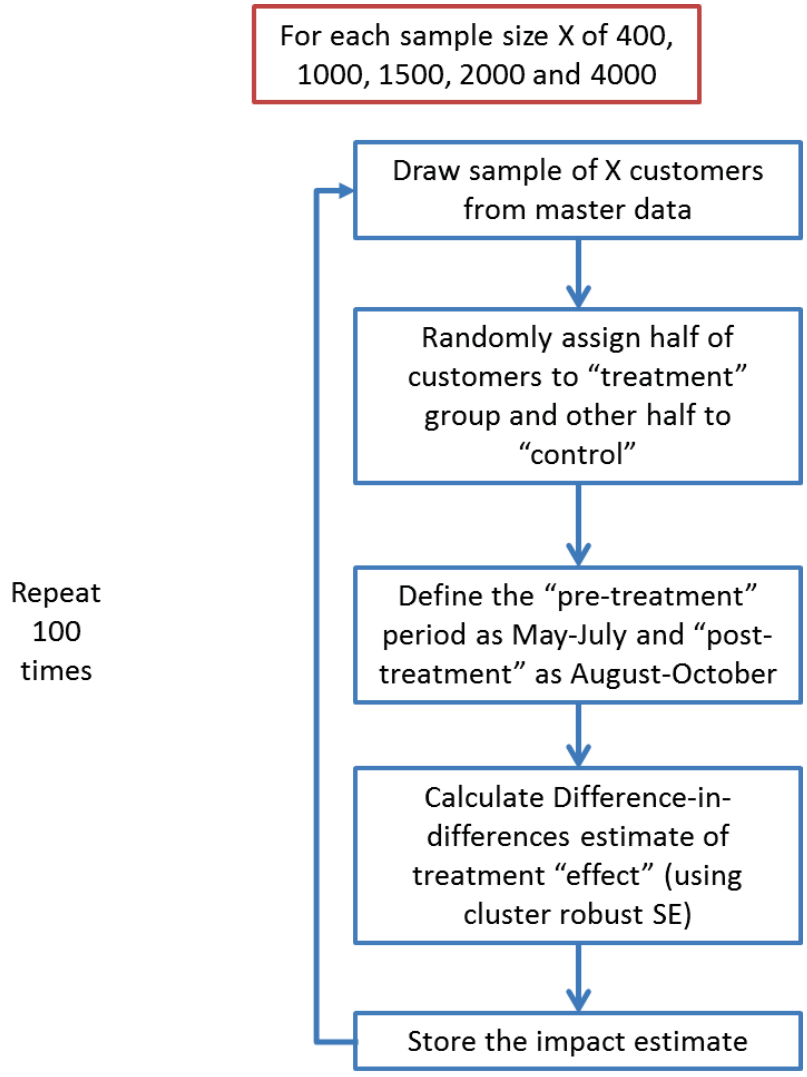
[62] For a more detailed discussion of Monte Carlo simulation, see Kennedy, Peter, "A Guide to Econometrics" (2008), Section 2.10 - http://www.masonlec.org/site/rte_uploads/files/Econometrics%20Book%20-%20Intro,%20Ch%201%20and%202.pdf

[63] Asymptotic properties of estimators are generally known, but rely on assuming sample sizes that approach infinity that are not appropriate in many applied research situations that rely on finite samples.

$$kW_{i,t}^{\text{peak}} = \alpha + \delta \text{treat}_i + \gamma \text{post}_t + \beta(\text{treatpost})_{i,t} + \varepsilon_{i,t} \quad (1)$$

In Equation 1, the variable *treat* is equal to 1 for treatment customers and 0 for control customers, while the variable *post* is equal to 1 for days in August-October and a value of 0 for days in May-July. The *treatpost* term is the interaction of *treat* and *post* and its coefficient β is the differences-in-differences estimator of the treatment effect that makes use of the "pre-treatment" data. In the simulation, Equation 1 is estimated using OLS regression with cluster robust standard errors to account for serial correlation that is likely to be present in the data. For additional robustness, bootstrapped standard errors are also calculated.[64]

Figure 1: Monte Carlo Simulation with False Experiment



[64] Serial correlation certainly exists in the variable of interest (*treatpost*) and is very likely to be present in the dependent variable (daily peak period average load). If unaddressed, serial correlation will lead to standard errors that are systematically too small. This results in overstating the precision of the impact estimate and misleading inference. To adjust for serial correlation, we follow the best practices described by Bertrand, et al. (2002), Wooldridge (2003) and Cameron (2010).

Simulation Results

At the end of the simulation, we have 100 impact estimates and 100 corresponding standard errors. The next step of the process is to use this information to draw conclusions about the precision that can be achieved with each sample size. The precision will be based on the standard error of the impact estimate, which we calculate using two methods. The first is simply to use the average of the 100 standard errors that we have for each sample size. The second is to calculate the bootstrapped standard error, which is equal to the standard deviation of the 100 impact estimates for each sample size.

The final step is to translate the estimated standard errors into confidence intervals, which form the basis of statistical inference. This is a straightforward calculation that consists of multiplying the standard error by the t-value corresponding to the desired confidence level (approximately 1.96 for 95% confidence and 1.65 for 90% confidence[65]) to obtain the margin of error (MOE) that will be added and subtracted from the impact estimate to form the confidence interval. In our false experiment, we know that the true impact is zero, however the MOE captures the precision of that estimate if it was non-zero. For this reason, we focus discussion on the MOE.

Results using each of the standard error methods are shown in Table 1. Importantly, both methods produce very similar MOEs.[66] The interpretation of the results would be, for example, "With a sample of 1,500 customers, we would expect to be able to estimate the impact of TOU rates on peak period usage to within plus or minus 2.7% with 95% confidence." Put another way, the 95% confidence interval around a true impact of 5% with a sample of 1,500 customers would be (2.3%, 7.7%).

Table 1: Expected Precision for Peak Period Load Impacts Using Different Sample Sizes

Sample Size (Treatment + Control)	Avg. SE Method		Bootstrapping Method	
	95% MOE	90% MOE	95% MOE	90% MOE
400	5.2%	4.4%	5.2%	4.4%
1,000	3.3%	2.8%	3.2%	2.7%
1,500	2.7%	2.3%	2.7%	2.2%
2,000	2.3%	2.0%	2.2%	1.9%
4,000	1.6%	1.4%	1.7%	1.4%

In addition to the precision for the average impact in the general population, certain population segments are of particular interest for the pilot—non-CARE, CARE, customers in hot areas and customers in cool areas. CARE customers are readily identifiable in the PG&E data and we

[65] We assume a two-tailed test.

[66] As an additional robustness check on the standard errors, we took advantage of the false experiment and counted the number of statistically significant results (i.e. reject the null hypothesis of zero impact) observed during the simulation for each sample size. With appropriate standard errors, the false positive rate should be roughly equivalent to the alpha used to calculate the confidence interval (by definition). For both the Avg. SE method and the bootstrap method, this is indeed the case, with the number of false positives out of 100 iterations ranging from 3-7.

define hot areas as PG&E climate region R, S and W, which are shown in Figure 2. Table 2 shows bootstrapped MOE estimates for these sub-populations at both 95% and 90% confidence.

Figure 2: PG&E Climate Regions

Table 2: Expected Precision for Peak Period Load Impacts Using Different Sample Sizes (Bootstrap Method)

Sample Size (Treatment + Control)	95% MOE				90% MOE			
	Non-CARE	CARE	Cool	Hot	Non-CARE	CARE	Cool	Hot
400	6.5%	5.0%	5.0%	4.3%	5.4%	4.2%	4.2%	3.6%
1,000	3.7%	3.0%	3.7%	2.9%	3.1%	2.6%	3.1%	2.4%
1,500	2.9%	2.2%	3.1%	2.4%	2.5%	1.9%	2.7%	2.0%
2,000	2.6%	2.2%	2.4%	2.0%	2.2%	1.8%	2.0%	1.7%
4,000	1.7%	1.3%	1.7%	1.4%	1.4%	1.1%	1.5%	1.2%

Table 2 shows that the underlying variability in peak usage is not the same across the different subpopulations. Variance is higher for Non-CARE customers due to higher usage levels, while greater variability in cool climates is likely due to more heterogeneity in demographics, home size and weather conditions on the coast versus the mountains compared to more homogeneity in the central valley.

Power

In addition to precision, a related concept that is generally of interest when determining sample sizes is statistical power. Power refers to the likelihood of finding a statistically significant impact when an impact actually exists and depends on the magnitude of the impact, sample size, inherent variability in the data and desired level of confidence. Based on the estimated standard errors from the simulations, we can map out the power level associated with different impact sizes for each sample size. These "power curves" are shown in Figure 3 for the 95% confidence level.

Figure 3: Power Curves for Sample Sizes of Interest Using Bootstrapped Standard Errors (95% Confidence)

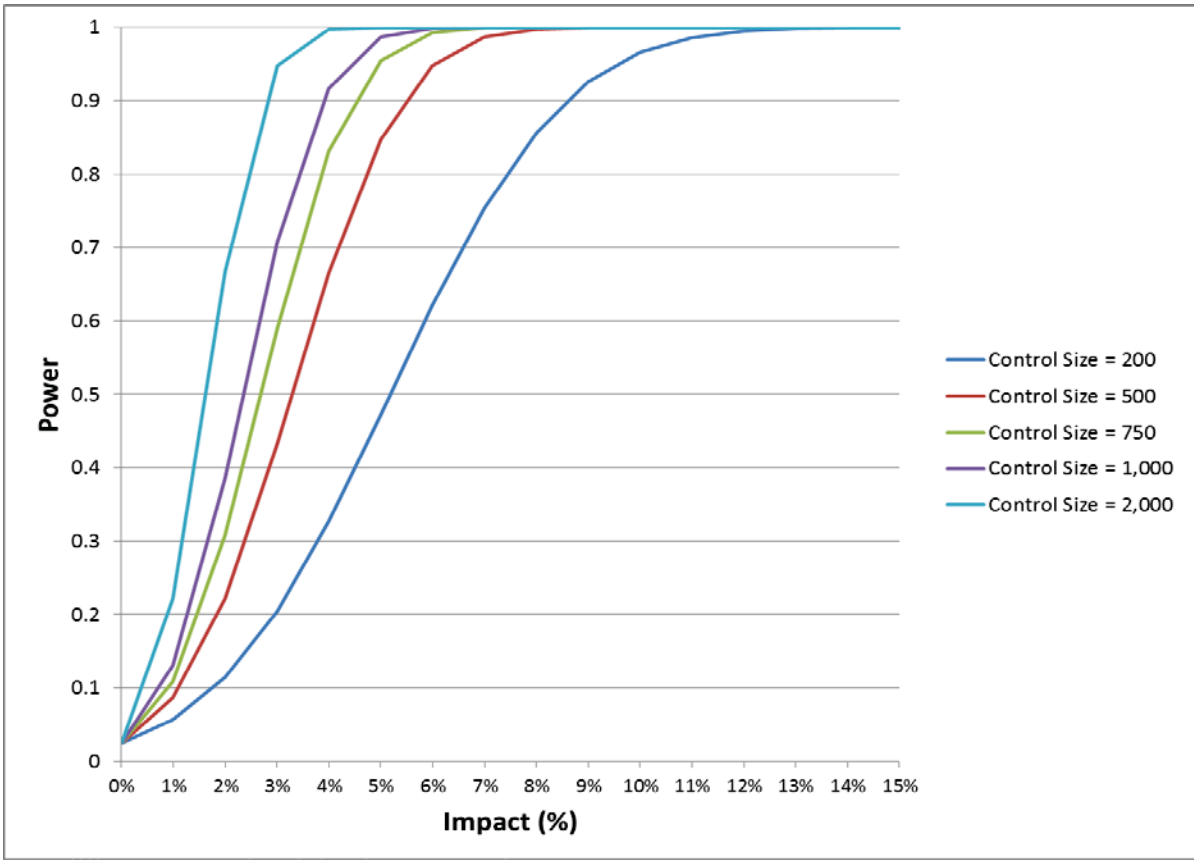


Figure 3 shows that as the sample size increases, so does the likelihood of finding statistically significant results for a given sized impact. For example, the power associated with detecting a 3% impact (95% confidence) using 500 treatment and 500 control customers is about 0.4, but with 1,000 treatment and 1,000 control customers, power increases to about 0.7.

Conclusions

The above analysis provides indicative estimates of sample sizes tied to confidence bands. The specific sample sizes for a given confidence level will vary across utilities and across customer segments within a utility. Each utility should plan to conduct similar analysis to determine target sample sizes for each test cell once the treatments and segments are finalized.

References

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Appendix C Selected Comments from TOU Working Group Participants

The appendix contains selected comments (accompanied by report sections from a prior draft) from selected TOU Working Group members who may have different opinions about some of the decisions that were made by the Working Group.

Section 2.1:

Specifically, the AC/ALJ ruling indicated that each IOU must:

- Prepare a menu of at least three opt-in TOU rate designs;
- Include at least one TOU rate design with a more complex combination of seasons and time periods than traditional TOU rates that better matches system needs, which may incorporate more dynamic pricing features and enabling technologies, and this pilot must begin no later than October 1, 2016; and
- All other opt-in TOU pilots must begin no later than June 1, 2016.

EDF: *"In additional to system needs, the plan should consider customer needs and capabilities, and the goal of providing customers with a menu of rate options. Thus far, with the exception of the SDG&E Rate 3, the rate treatments differ by very little in terms of price, and the off-peak rates do not provide a significantly lower priced time to use energy. The lack of a price differential undercuts the financial rewards for load shifting, so the current proposals will tend to dampen enthusiasm for customer action. Similarly, peak price time periods that extend beyond several hours pose a more daunting load shifting objective than short period peak price windows, so shorter peak price windows should be available for the TOU pilots."*

With the CPUC direction summarized above as input, the TOU Working Group developed the following, more specific pilot objectives as input to pilot design…estimate load impacts by rate period for different rate structures that vary in terms of the timing and length of rate periods, the number of rate periods, changes in rate periods across seasons, price ratios, and perhaps other features.

EDF: "*One very important feature to test is the ability for customers to INCREASE their demand at low-priced (or negative priced) times of the day/year, such as the "spicy" Rate 3 options: so far only SDG&E has contemplated crediting bills when customers use energy at times when wholesale energy prices are negative"*

With the CPUC direction summarized above as input, the TOU Working Group developed the following, more specific pilot objectives as input to pilot design…assess the incremental effect of enabling technology on load impacts and customer satisfaction; and assess the relative effectiveness of various information, education and outreach options…

EDF: "*These are important objectives that should be pursued to identify bill impact mitigation strategies. Evaluation plans regarding the testing of mitigation strategies should be part of the TOU pilots."*

Section 3.1:

Table 3-1: Prices and Price Ratios

Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-peak (22¢)																Peak (22¢)					Off Peak (22¢)		
	Summer																								
	Winter																								
PG&E Rate 2	Spring	Off Peak (22¢)																PP (22¢)		Peak (22¢)			PP (22¢)	Off Peak (22¢)	
	Summer																								
	Winter																								
PG&E Rate 3	Spring	Off Peak (22¢)										Super Off Peak (22¢)						Peak (22¢)					Off Peak (22¢)		
	Summer	Sumer Off Peak (SOP) (22¢)																Summer Peak					SOP		
	Winter	Off Peak																Peak					Off Peak		
SCE Rate 1	Spring	Off Peak (17.0¢)								Partial Peak (21.7¢)						Peak (22.7¢)						PP (21.7¢)	Off Peak (17.0¢)		
	Summer	Off Peak (16.8¢)								Partial Peak (22.6¢)						Peak (56.8¢)						PP (22.6¢)	Off Peak (16.8¢)		
	Winter	Off Peak (17.0¢)								Partial Peak (21.7¢)						Peak (22.7¢)						PP (21.7¢)	Off Peak (17.0¢)		
SCE Rate 2	Spring	Off Peak (17.1¢)								Partial Peak (21.8¢)								Peak (24.3¢)				PP (21.8¢)	Off Peak (17.1¢)		
	Summer	Off Peak (17.0¢)								Partial Peak (28.5¢)								Peak (58.7¢)				PP (28.5¢)	Off Peak (17.0¢)		
	Winter	Off Peak (17.1¢)								Partial Peak (21.8¢)								Peak (24.3¢)				PP (21.8¢)	Off Peak (17.1¢)		
SCE Rate 3	Spring	Off Peak (20.7¢)											Super Off Peak (16.5¢)					Peak (23.2¢)					Off Peak (20.7¢)		
	Summer	Off Peak (17.2¢)											Peak (33.9¢)					Super Peak (49.9¢)					Peak (33.9¢)		OP (17.2¢)
	Winter	Off Peak (21.4¢)																Mid Peak (24.2¢)					Off Peak (21.4¢)		

UCAN: *"The more complex the TOU rate design, the more difficult it is to interpret the results of the pilot. SCE and PG&E have two pilots that involve relatively simple designs with shorter and longer on-peak time periods and corresponding adjustments to the on-peak to off-peak price ratios. However, each utility also offers a more complicated rate design that diverges from the simple approach and makes it more difficult to interpret the results of the rate experiment. For example, in the more complex rates with more periods and prices in which to respond, it becomes more difficult to determine to which features of the rate the customer is responding to.*

Since one goal of the experiment is to cull features from these opt-in rates for use in the TOU default rate, the more complicated the pilot TOU rate, the harder it will be to isolate the most critical design features. SDG&E is redesigning its rate options but originally had no period length differential in Pilot 1 and 2, and Pilot 3 was a dynamic pricing rate and not a TOU rate at all. Those rates were unclear regarding what features were being tested for the TOU default rate. UCAN is concerned about the usefulness of the TOU rate experiment results if there is no coordination among the pilot rates that lead to a default TOU design that serves the needs of the residential population in 2019. Will we learn what we need to know by the end of the experiment if the nine pilot rates are not logically coordinated?"

Section 3.3.1:

Table 3-2: Expected Precision for Peak Period Load Impacts Using Different Sample Sizes (Based on a sample of customers from PG&E's service territory)

Number of Treatment + Customers Combined	95% Confidence Band	90% Confidence Band
400	5.2%	4.4%
1,000	3.2%	2.7%
1,500	2.7%	2.2%
2,000	2.2%	1.9%
4,000	1.7%	1.4%

The values in Table 3-2 indicate that, with a sample of 1,000 treatment customers and an equal sized sample of 1,000 control customers (the fourth row in the table), an estimated impact of, say, 5%, would have a 90% confidence band from 3.1% to 6.9%. If the sample of treatment and control customers was doubled, to 2,000 each, the 90% confidence band would narrow to ±1.4% (e.g., it would range from 3.6% to 6.4% if the estimate was 5%). Importantly, in the above example using 1,000 treatment and control customers, if the estimated value was 1% rather than 5%, the 90% confidence band would span 0. Put another way, it would not be possible to conclude with 90% confidence that the 1% load impact was statistically different from 0.

EDF: *"1) Let's make sure the WG members are clear on what this means. I think this means that we are 90% confident that the real peak load impact is between 3.1% and 6.9% when we experimentally determine it to be 5%. If so, quadrupling the sample from 1,000 to 4,000 means we reduce the range from 3.8% (= 6.9 – 3.1) to 2.8% (= 6.4 – 3.6). That's a significant reduction in the range.*

With the NERC reliability standard of a 12% reserve margin, 1% difference in peak load is significant. If approaching conservatively, the minimum end of the band - peak load reductions to be put into the CEC IEPR forecast for the TOU default would be 3.1% or 3.6%, depending on the confidence interval used. While this is only 0.5% difference, the

financial implications can be significant; also, this would be a bigger difference if we were calculating a 99% confidence interval.

However, this confidence interval ignores bigger sources of uncertainty in the estimate, such as the assumptions used to build the baseline peak load. Nevertheless, the outputs will inform load forecasts used in Resource Adequacy assessments. There is significant potential for significant avoided capacity value associated with TOU default, so this study should endeavor to produce a 99% confidence interval.

2) The ±1.4% figure is erroneous – this is a sample size of 4,000, not 2,000.

3) A 90% confidence range isn't adequate for resource adequacy purposes; need at least a 95% confidence band, probably a 99% band would be preferable for local and state resource adequacy applications. What would CAISO and CEC expect to see for use in IEPR load forecasts?"

Section 3.4:

The objective of the TOU pilots is to estimate the change in usage (and bills) for customers who are defaulted onto TOU rates in 2019."

EDF: *"This is incomplete and misplaced. See page four's more complete list of pilot objectives."*

There is substantial evidence from many pilots that people can understand TOU prices quickly and make adjustments in peak period usage rapidly."

EDF: "*Right, so we should not be testing this question in the present TOU pilot."*

With this in mind, if control customers were placed on the 2019 OAT at the same time that treatment customers were placed on the TOU rates, it's highly unlikely that the control group customers would modify their usage immediately to reflect the pattern of usage that customers would actually have in 2019 after going through four years of gradual changes in the tier structure. Given this, while one might think that basing the pilots on the 2019 OAT and TOU rates would produce a valid comparison of usage under the 2019 OAT with usage under the 2019 TOU rate, in fact it would more likely involve a comparison in usage under the 2019 TOU rate with usage under the 2016 OAT that control group customers will have been on for a couple of months at the start of the pilot.

EDF: *"We need to reveal how customers will make long term investments in DERs. We need to test for more than short term price elasticity; we also need to test what will lead to customer actions, testing what will influence customer economics in rate design is just one factor; can also survey for customer understanding, capabilities and preferences."*

Section 3.6:

Relatively few prior studies have combined enabling technology with static TOU rates such as those that will be examined in these pilots. Also, it is very important to keep in mind that when comparing load impacts for the average household with and without air conditioning load

control, for example, observed differences are influenced by more than just the load control technology. All households with air conditioning load control have air conditioning whereas many households on TOU rates without load control do not have central air conditioning, especially in California. As a result, the difference in load impacts for households with and without air conditioning load control reflects not just the difference due to the load control device but also the difference due to variation in the saturation of air conditioning between the two groups. Very few public studies on this subject adequately control for this significant selection effect.

> EDF: *"This is an important point worth exploring in more detail as part of the TOU design; it is important to identify and engage non-central AC customers in TOU pilots."*

We are not aware of any studies that have examined the incremental effect of customer purchased devices such as smart thermostats or simpler programmable thermostats, with or without outside control, on load reductions under static TOU rates or the impact of TOU rates on the purchase of smart thermostats.

> EDF: *"Good questions; what about surveys of customers' interest in and willingness to purchase technologies and DERs?"*

It may also be true that TOU rates, especially widespread default rates, will hasten the penetration of these devices. Furthermore, these devices offer opportunities for vendors and utilities to partner with consumers to automate adjustments in usage during peak periods. This is already happening in conjunction with dynamic rate programs at selected utilities. For example, Nest, a provider of smart thermostats, offers its Rush Hour Rewards service to consumers in utility service territories where peak time rebate programs exist, such as SCE's Save Power Days (SPD) program. Nest automatically adjusts the consumer's thermostat according to directions provided by the consumer on PTR event days. It may be possible for utilities and vendors to develop similar services that enable demand reductions for consumers in conjunction with static TOU tariffs.

> EDF: "*This is what the TOU pilots can be testing: how to provide utility and vendor services that enable demand reductions for consumers in conjunction with static (default) and dynamic (optional) TOU rates."*

SCE's technology treatment will focus on smart thermostats and, more specifically, on the population of customers that already have these devices installed.

> EDF: "*This seems to refocus the rate pilot into a technology pilot; that is not what EDF has recommended. Rather, EDF recommends a dynamic "technology friendly" tariff to be deployed with a diversity of technologies and practices. With that said, this SCE proposal looks meritorious, just not what EDF was expecting in terms of a tariff for rewarding technologies."*

On the other hand, if it is only adopted by a small group of tech savvy consumers, it might not be worthy of investment as part of the mainstream offer down the line. Thus, one of the primary

learnings from this treatment will be to determine what the acceptance rates are across various customer segments, climate regions, usage levels and rate options.

> EDF: "*This is the wrong test - timing of who adopts depends on lots of factors; currently we're still in the early adopter phase and there is more innovation to come…it would be like piloting the California Solar Initiative for one summer in 1998 only to determine it wasn't worth doing (simply because it was too soon in terms of the economics.)"*

Section 4.2.1:

Figure 4-2: PG&E Pilot Tariffs

Weekday Rate Periods

Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-Peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
	Summer	Off-Peak (30.3¢)																Peak (40.6¢)					Off Peak (30.3¢)		
	Winter	Off-Peak (25.1¢)																Peak (27.0¢)					Off Peak (25.1¢)		
PG&E Rate 2	Spring	Off-Peak (25.0¢)																		Peak (27.0¢)			Off-Peak (25.0¢)		
	Summer	Off-Peak (29.0¢)																PP (36.2¢)		Peak (42.3¢)			PP (36.2¢)	Off-Peak (29.0¢)	
	Winter	Off-Peak (25.0¢)																		Peak (27.0¢)			Off-Peak (25.0¢)		
PG&E Rate 3	Spring	Off-Peak (25.3¢)										Super-Off-Peak (22.7¢)						Peak (26.6¢)					Off-Peak (25.3¢)		
	Summer	Summer Off Peak (SOP) (30.1¢)																Summer Peak (40.4¢)					SOP (30.1¢)		
	Winter	Off-Peak (25.6¢)																Peak (27.5¢)					Off-Peak (25.6¢)		

Weekend Rate Periods

Tariff	Season	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PG&E Rate 1	Spring	Off-Peak (25.1¢)																							
	Summer	Off-Peak (30.3¢)																							
	Winter	Off-Peak (25.1¢)																							
PG&E Rate 2	Spring	Off-Peak (25.0¢)																		Peak (27.0¢)			Off-Peak (25.0¢)		
	Summer	Off-Peak (29.0¢)																PP (36.2¢)		Peak (42.3¢)			PP (36.2¢)	Off-Peak (29.0¢)	
	Winter	Off-Peak (25.0¢)																		Peak (27.0¢)			Off-Peak (25.0¢)		
PG&E Rate 3	Spring	Off Peak (25.3¢)										Super-Off-Peak (22.7¢)						Off Peak (25.3¢)							
	Summer	Summer Off Peak (SOP) (30.1¢)																							
	Winter	Off-Peak (25.6¢)																							

> EDF: *"Rate 3 is almost identical to Rate 1. EDF proposed a "smart home rate" in writing at the first working group meeting; it is appropriate for this report to include the EDF proposal, and for the IOUs to provide a response to it: why it won't work or when it will be tested as part of the TOU pilots."*

Section 4.3:

SDG&E will also market a third rate option using a more traditional opt-in recruitment strategy. This rate is quite different from the other rates in that the supply component of the tariff will have prices that vary hourly. The rate will also include adders that vary by time of day for system peak events and for distribution circuit peak events. Credits for surplus energy events will also be included. This tariff will be bundled with enabling technology that will provide greater automation for this dynamic rate than is provided simply through a smart thermostat. This treatment will be targeted at a small group of electricity consumers with the specific characteristics that are yet to be determined but may include electric vehicle owners.

EDF: "The third rate option should be offered with the other rate options in the pilot, not pursued thru separate traditional channels. Put differently, EDF questions the rationale for testing this rate through a separate pathway?"

Section 5.1:

3. How do load impacts vary across rate options? The tariffs included in the various pilots have significant variation in prices by rate period and in the length and timing of rate periods. As such, it will not be possible to sort out the independent impacts of price ratios, peak period length and peak period timing. It will be possible to estimate the aggregate load reduction for specific hours of the day associated with each tariff, which will provide useful input to the selection of a default tariff for implementation in 2019.

EDF: *"It is important to specify here that we will examine how TOU rates can inspire load *increases* to align demand with renewable generation. Traditionally, the focus has been only on how customer shift load away from peak, which is also important but not a new research question. In addition to measuring load impacts, the pilots should develop an understanding of the dynamic relationships between TOU prices, marketing strategies and technology enablement programs."*

8. What is the impact of smart thermostats on load reduction? The SCE technology treatment will address this question for a self-selected group of households that purchased a smart thermostat on their own using an RCT research design. SDG&E's smart thermostat treatment may provide additional insights for households that receive an incentive to purchase a smart thermostat equal to a portion of the cost of the thermostat. Load impacts for this treatment will be estimated using ex post statistical matching to create a control group after the fact (assuming enough participants purchase thermostats to make this feasible). PG&E's ethnographic study of thermostat owners may produce qualitative insights about how smart thermostats are being used in response to TOU rates.

EDF: *"Based on prior studies and a Faraqui et al. study, we should be able to predict load impacts once the IOUs have specific their rates. These predictions can be used to establish performance expectations for IOU ME&O."*

9. Do customers on TOU rates purchase smart thermostats at a higher rate than customers who are not on TOU rates? SDG&E's smart thermostat treatment will offer customers who are already on TOU rates and control group customers various incentive amounts to be applied to the purchase of a smart thermostat of their choosing. Acceptance rates for the incentives will be compared between treatment and control customers to determine whether TOU customers take up thermostats at a higher rate than non-TOU customers.

EDF: *"This is a subset of a broader question: what strategies will both mitigate risk of bill impacts and maintain/enhance customer satisfaction? This question should be answered for all customer segments, but the priority will be for customers facing a high risk of hardship impacts associated with TOU default."*

11. What is the impact of a smart phone app on load reductions, customer acceptance and customer satisfaction with TOU rates? PG&E will divide rate treatment participants into two randomly selected groups (not necessarily equal in size) and offer the smart phone app to one group and not to the other. If acceptance of the app is great enough, an RED impact assessment will be conducted to determine whether the information provided through the app increased load reductions for rate participants who receive it. If app acceptance is too low, statistical matching will be used to develop a control group for estimating load impacts. Answers

to survey questions pertaining to customer satisfaction, acceptance, awareness, understanding of rates and other metrics will be compared between those who download the app and those who don't to determine whether there are significant differences in these metrics. App acceptance rates will also be reported and compared across rate options and customer segments.

> EDF: *"PG&E could go further in specifying what it will do – in 2018 pilot and 2019 default – based on what is learned by the phone app study. If acceptance is low, then PG&E should have a plan B for communicating with and assisting customers when they are defaulted to TOU rates. What is "great enough interest", what is "too low"? If acceptance is low, then PG&E should commit now to additional studies and strategies toward a goal of increasing customer acceptance. This is particularly important if the app is funded by ratepayers; it would not be a good investment to simply do a one-off test of customer acceptance, but it would be worthwhile to commit to studies that examine and then pursue specified levels of customer acceptance (and satisfaction)."*

What E&O materials are most effective in enhancing customer acceptance and retention, engagement, satisfaction, knowledge of rates, etc.?

> EDF: *"Need to include interest in investing in distributed energy resources."*

PG&E Gas and Electric
Advice Filing List
General Order 96-B, Section IV

AT&T
Albion Power Company
Alcantar & Kahl LLP
Anderson & Poole
Atlas ReFuel
BART
Barkovich & Yap, Inc.
Bartle Wells Associates
Braun Blaising McLaughlin & Smith, P.C.
Braun Blaising McLaughlin, P.C.
CENERGY POWER
CPUC
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission
California State Association of Counties
Calpine
Casner, Steve
Center for Biological Diversity
City of Palo Alto
City of San Jose
Clean Power
Coast Economic Consulting
Commercial Energy
Cool Earth Solar, Inc.
County of Tehama - Department of Public Works
Crossborder Energy
Davis Wright Tremaine LLP
Day Carter Murphy
Defense Energy Support Center
Dept of General Services
Division of Ratepayer Advocates
Don Pickett & Associates, Inc.
Douglass & Liddell
Downey & Brand
Ellison Schneider & Harris LLP
G. A. Krause & Assoc.
GenOn Energy Inc.
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie
Green Power Institute
Hanna & Morton
International Power Technology
Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Leviton Manufacturing Co., Inc.
Linde
Los Angeles County Integrated Waste Management Task Force
Los Angeles Dept of Water & Power
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenna Long & Aldridge LLP
McKenzie & Associates
Modesto Irrigation District
Morgan Stanley
NLine Energy, Inc.
NRG Solar
Nexant, Inc.
ORA
Office of Ratepayer Advocates
OnGrid Solar
Pacific Gas and Electric Company
Praxair
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions
SCE
SDG&E and SoCalGas
SPURR
San Francisco Water Power and Sewer
Seattle City Light
Sempra Energy (Socal Gas)
Sempra Utilities
SoCalGas
Southern California Edison Company
Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
Tiger Natural Gas, Inc.
TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists
Verizon
Water and Energy Consulting
Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)
YEP Energy